ABSTRACT

The objective of this study was to determine the factors affecting non-adherence to anti-hypertensive medication. This study also attempted to develop an instrument to elicit the reasons for non-adherence to anti-hypertensive medication among hypertensive patients in the Malaysian context.

This sequential mixed-methods study was utilized among hypertensive patients attending government primary health clinics in Hulu Langat and Klang districts in the state of Selangor, Malaysia between early December 2012 and early April 2014. It was divided into three parts, namely Study Part I, II and III. Study Part I was the quantitative study (pilot study), Study Part II was the qualitative study and Study Part III was divided into two sections, III (a) and III (b). Study Part III (a) comprised items generation and instrument development. Study Part III (b) was the quantitative study (major survey). In Study Part I, 665 participants were involved in the validation of the original version of the Medication Adherence Reasons Scale (MAR-Scale). In Study Part II (qualitative study), the reasons for anti-hypertensive medication non-adherence were explored using in-depth interviews via phenomenological approach involving 25 participants. Study Part III (a) was the process of items generation and the development of self-administered instrument, Medication Adherence Reasons Scale for Malaysian context (myMAR-Scale) was administered to 680 participants. Study Part III (b), (major survey) was conducted among 1200 participants using complex sampling. This quantitative-correlational research methodology was

conducted to identify factors affecting non-adherence to anti-hypertensive medication.

Study Part I verified four factors with 11-items. However, these 11-items could only be applied across gender among the participants. Therefore, Study Part II was conducted to explore in greater detail the reasons for non-adherence to anti-hypertensive medication among Malaysia's multi-ethnic population. After examining construct validity and reliability in Study Part III (a), myMAR-Scale resulted with a six factors structure consisting 20 items which was can be used across the major ethnic groups (Malay, Chinese and Indian). In Study Part III (b), four factors were identified to be determinants for high non-adherence among the sampled hypertensive population. These included marital status of divorced/separated/widowed which contributed the most [OR=3.60; 95% CI(1.66, 5.55)], followed by low family support [OR = 3.22; 95% CI(2.51, 3.94)], poor blood pressure control [OR = 2.54; 95% CI(1.78, 3.40)], and participants' low concern about their own health [OR = 1.83; 95% CI(1.52, 2.32)].

The revised MAR-Scale in the Malaysian context (myMAR-Scale) demonstrated construct validity and reliability which suitable to be use across gender and ethnicity among the three major ethnic group. There were four factors of non-adherence that determined high non-adherence to antihypertensive medication among hypertensive patients in primary health care settings in Malaysia.

ABSTRAK

Tujuan kajian ini ialah untuk menentukan sebab-sebab yang mempengaruhi ketidakpatuhan terhadap pengubatan anti-hipertensi. Kajian ini juga bertujuan untuk membangunkan alatan urus tadbir bagi ketidakpatuhan pengubatan di kalangan pesakit hipertensi dalam konteks Malaysia dan, untuk mencari sebab-sebab ketidakpatuhan.

Kajian kaedah gabungan berturutan telah dilaksanakan dalam kalangan pesakit hipertensi yang hadir ke klinik-klinik kesihatan utama kerajaan di daerah Hulu Langat dan Klang di negeri Selangor, Malaysia antara awal Disember 2012 dan awal April 2014. Ia terbahagi kepada tiga bahagian. Bahagian-bahagian kajian ini ialah: Kajian Bahagian I adalah kajian kuantitatif (kajian rintis), Kajian Bahagian II merupakan kajian kualitatif dan Kajian Bahagian III telah dibahagikan kepada dua bahagian, III (a) dan III (b). Bahagian III (a) adalah penghasilan item dan pembangunan skala. Bahagian III (b) adalah kajian kuantitatif (kajian utama). Dalam Kajian Bahagian I, 665 peserta telah terlibat dan pengesahan Skala Sebab-Sebab Pematuhan Pengubatan (Skala-MAR) daripada versi asal telah dilakukan. Dalam Kajian Bahagian II (kajian kualitatif), sebab-sebab untuk ketidakpatuhan pengubatan anti-hipertensi diteroka menggunakan temubual terperinci melalui pendekatan fenomenologi dengan 25 pesakit hipertensi. Bahagian III (a) adalah penghasilan item-item bagi membangunkan alatan urus tadbir, Skala Sebab-Sebab Pematuhan Pengubatan dalam konteks Malaysia (myMAR) telah dilaksanakan dalam kalangan

680 peserta bagi menambah pemboleh ubah yang dikenal pasti daripada kajian kualitatif. Bahagian III (b) (tinjauan utama) telah dilaksanakan dalam kalangan 1200 peserta menggunakan persampelan kompleks. Fasa kajian kuantitatif-korelasi yang dijalankan adalah untuk mengenalpasti faktor-faktor ketidakpatuhan terhadap pengambilan ubat anti-hipertensi.

Kajian Bahagian I menentusahkan lima faktor dan 11 item. Walau bagaimanapun, 11 item ini hanya boleh diaplikasikan merentasi jantina dalam kalangan peserta. Oleh itu, Kajian Bahagian II dijalankan untuk lebih mendalami sebab-sebab bagi ketidakpatuhan pengubatan anti-hipertensi dalam populasi berbilang kaum di Malaysia. Selepas pemeriksaan terhadap kesahan dan kebolehpercayaan konstruk dalam Bahagian III (a), skala myMAR menghasilkan struktur enam faktor dengan 20 item yang boleh digunakan merentasi jantina di kalangan kaum utama (Melayu, Cina dan India) di Malaysia. Dalam Bahagian III (b), empat faktor telah dikenal pasti sebagai penentu untuk ketidakpatuhan terhadap pengambilan ubat anti-hipertensi di kalangan populasi darah tinggi yang dikaji. Ini termasuk faktor status perkahwinan bercerai/berpisah/janda yang menyumbang peratusan tertinggi [OR=3.60; 95% CI(1.66, 5.55)], diikuti dengan sokongan keluarga yang rendah [OR = 3.22; 95% CI(2.51, 3.94)], kawalan tekanan darah [OR = 2.54; 95% CI(1.78, 3.40)], dan tahap kebimbangan yang rendah tentang kesihatan sendiri [OR = 1.83; 95% CI(1.52, 2.32)].

Skala-myMAR yang disemak semula dalam konteks Malaysia menunjukkan kesahan dan kebolehpercayaan konstruk yang sesuai untuk tiga kaum majoriti. Terdapat empat faktor ketidakpatuhan tinggi yang menentukan ketidakpatuhan kepada pengambilan ubat yang tekanan darah di kalangan pesakit hipertensi di Malaysia.

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LIST OF ACRONYMS

AGFI	Adjusted goodness-of-fit-index
BMI	Body mass index
CVD	Cardiovascular diseases
CFA	Confirmatory factor analysis
CFI	Comparative fit index
DALYs	Disability adjusted life years
DBP	Diastolic blood pressure
EFA	Exploratory factor analysis
EV	Eigenvalue
GFI	Goodness-of-fit index
HBPM	Home blood pressure monitoring
HPT	Hypertension
ICC	Intraclass correlation coefficient
IDI	In-depth interview
KMO	Keiser-Meyer-Olkin
MMAS	Morisky Medication Adherence Scale
MOH	Ministry of Health
MSA	Measures of sampling adequacy
NCD	Non-communicable disease
NHMS	National Health Morbidity Survey
PAF	Principal axis factoring
PCA	Principal component analysis
RMSEA	Root mean square error of approximation
SBP	Systolic blood pressure
SRMR	Standardized root mean square residual
TLI	Tucker-Lewis index

LIST OF PUBLICATIONS OR CONFERENCE PROCEEDINGS

Conference

a) **Oral** presentation title: "*Psychometric properties of the Malaysian Version of Reasons Scale for Medication Adherence: Reliability and Factorial Validation amongHypertensive Patients in Primary Health Care Setting*" in the Selangor Health State Technical Meeting" on 26th June 2013.

b) **Oral** presentation title: "*Psychometric properties of the Malaysian Version of Reasons Scale for Medication Adherence: Reliability and Factorial Validation among Hypertensive Patients in Primary Health Care Setting*" in the "3rd International Public Health Conference and 20th National Public Health (Colloquium. http://www.pubhealthcollo.org/pubhealthcollo.asp)

c) **Poster** presentation title: "*Psychometric properties of the Malaysian Version of Reasons Scale for Medication Adherence: Reliability and Factorial Validation Among Hypertensive Patients in Primary Health Care Setting"* in the Research Week on 24th March 2014 at the Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia organized by the Department of Social and Preventive Medicine, Faculty of Medicine.

Journals

a) **Publication** of the ABSTRACTtitle: "*Psychometric properties of the Malaysian Version of Reasons Scale for Medication Adherence: Reliability and Factorial Validation among Hypertensive Patients in Primary Health Care Setting*". Chosen as conference proceeding in the Malaysian Journal of Public Health Medicine (MJPHM). (URL:http://www.mjphm.org.my/mjphm/journals/2013%20-%20Volume%2013%28Sup%201%29/Proceeding%20of%203rd%20International%20Public%20Health%20Conference.pdf)

b) **Publication** of the manuscript title: "*A Qualitative Study on Hypertensive Care Behavior in Primary Health Care Settings in Malaysia"* in the Patient Preference and Adherence Journal.

(Reference:Shima, R., Farizah, M. H., & Majid, H. A. (2014). A qualitative study on hypertensive care behavior in primary health care settings in Malaysia. *Patient preference and adherence*, *8*, 1597).

c) **Acceptance** of the manuscript title:"*The 15-Item Medication Adherence Reasons Scale (MAR-Scale): Reliability and Factorial Validity among Hypertensive Patients in Malaysian Primary Health Care Setting*" in the Singapore Medical Journal (SMJ).

d) **Preparation** of a manuscript title: "*Factors Affecting Non-Adherence to Antihypertensive Medication and it's Association with Blood Pressure Control in Primary Health Care Settings in Malaysia."*

e) **Reviewer** of one manuscripttitle: Psychometric Properties of the Persian Version of the Morisky Medication Adherence Scale (8) in British Journal of Medicine and Medical Research (Appendix I).

CHAPTER 1 : INTRODUCTION

This chapter highlights the magnitude of hypertension and anti-hypertensive medication non-adherence in Malaysia. Briefly, the current practice including programmes implemented within the government set-up to reduce the burden of hypertensionis included. Based on literature review, the need for this particular study is also justified. Qualitative and quantitative methods were employed to answer the research question. Thus, an overview of the mixed methods study is also included in this chapter.

1.1 Background

Definition of hypertension

Hypertension is a chronic condition. It is defined as persistent elevation of systolic blood pressure (SBP) of 140 mmHg and/or diastolic blood pressure of 90 mmHg or greater(Chobanian, Bakris, Black, Cushman, Green, Izzo Jr, et al., 2003; Ministry of Health Malaysia, 2013). Ithas been a challenging public health issue and it has been found to be the leading risk for cardiovascular mortality in the world (Refer to Figure 1.1). It is the leading risk factor for cardiovascular diseases (CVD) worldwide (Mancia, Fagard, & Narkiewicz, 2013). Globally, hypertension was responsible for 12.8% of global deaths besides other risks, namely tobacco use (8.7%), high blood glucose (5.8%), physical inactivity (5.5%) and, overweight and obesity (4.8%) (World Health Organization, 2009). It was listed as one of the major causes of death in the world. The World Health Organization fact sheet documented hypertension as one of the ten leading causes of death over past decade (2000 and 2012) (World Health Organization, 2014). Poor blood pressure control is a serious risk factor for cardiovascular events such as stroke and target organ damage

(Mancia, et al., 2013). Annually, millions of people die from hypertension-related diseases, such as CVD, kidney diseases, and premature mortality and disability.

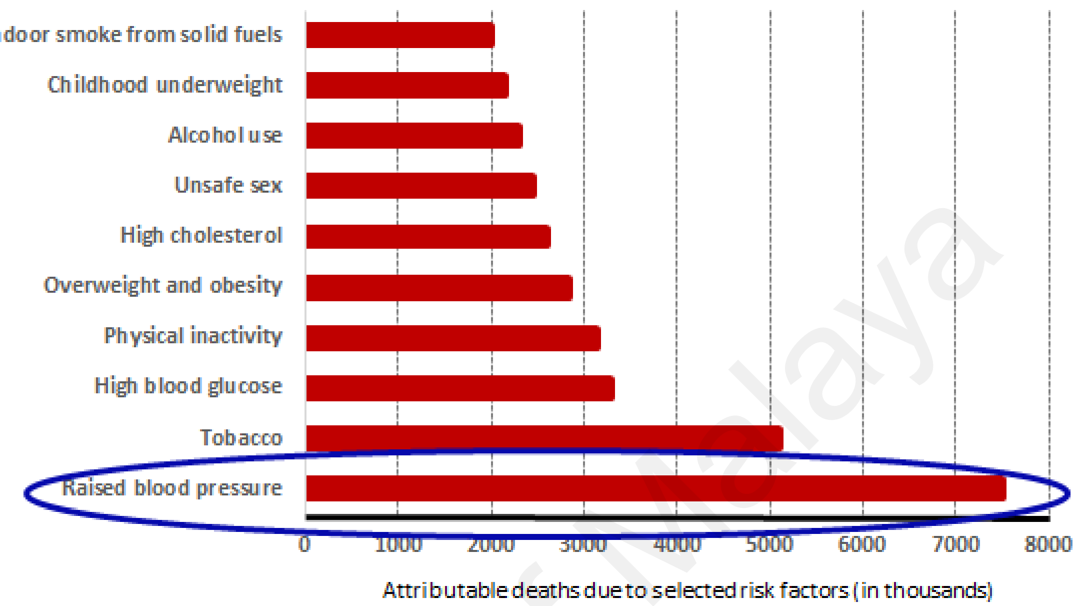


Figure 1.1: Leading Risks for Cardiovascular Mortality based on Attributable Deaths due to Selected Risk Factors
(Source: World Health Organization, 2011)

Burden of hypertension (globally and in Malaysia)

Globally, in terms of the leading risks for disease burden, hypertension was the fifth risk factor for disability adjusted life years (DALYs). It was accounted for 3.7% of morbidity besides other risks, namely childhood underweight (5.9%), unsafe sex (4.6%), alcohol use (4.5%) and, unsafe water, sanitation, and hygiene (4.2%) (World Health Organization, 2009).Nearly one third (9.4 million) of 17 million of CVD related deaths per year were due to hypertensive related complications, in which at least 45% of deaths were attributed to total ischaemic heart disease mortality and 51% of deaths due to total stroke mortality (Lim et al., 2013; World Health Organization, 2008).

Nevertheless, the number of people with hypertension had been increasing due to population growth, urbanization, increase in longevity, and increasing trends in prevalence of obesity and physical inactivity (World Health Organization, 2011). In fact, more than one-quarter of the adult population worldwide suffered from hypertension(Aronow et al., 2011). An analysis of worldwide data by Kearney et al, suggested that the estimated total number of adults with hypertension in 2000 was 972 million, of which 333 million were in economically developed countries and 639 million were in economically developing countries. Meanwhile, the overall worldwide prevalence of hypertension in 2000 was 26.4%, and it was predicted to rise to 29.2% in 2025 (Kearney et al., 2005) (Refer to Figure1.2).

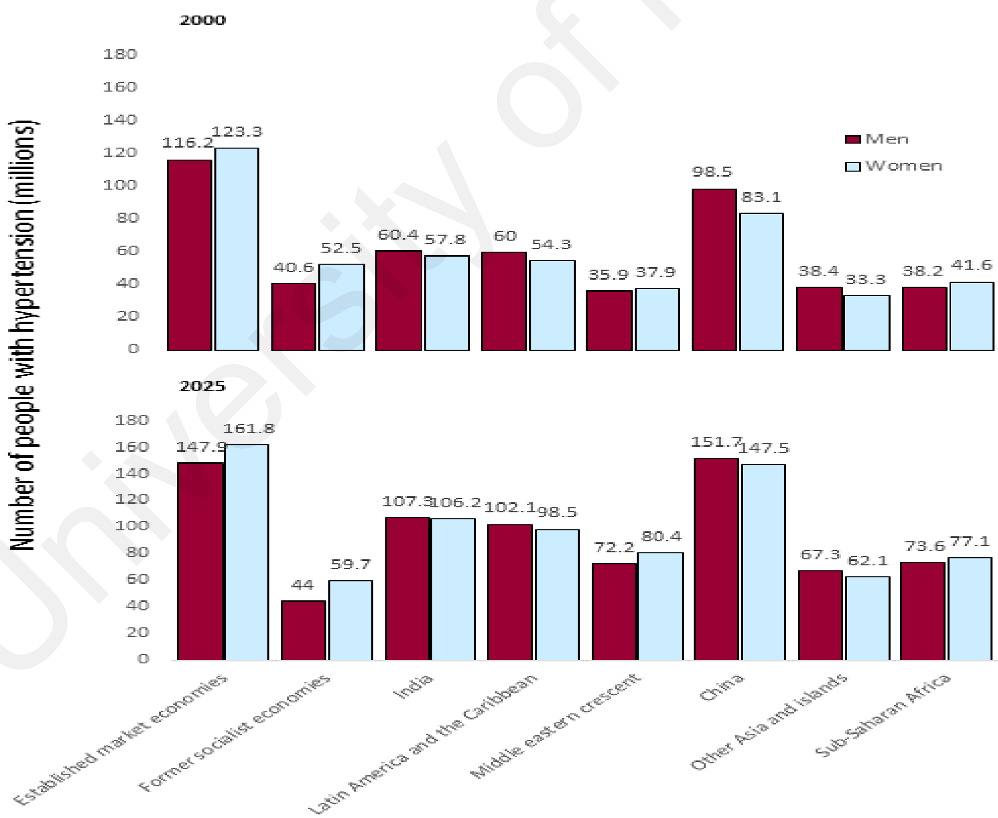


Figure 1.2: Worldwide Prevalence of Hypertension in the Year of 2000 and forecast for year 2025 according to sex
(Source: Hung, 2012)

A report on the global status of non-communicable diseases by World Health Organization (WHO) stated that, in 2008, approximately 40% of adults aged 25 and above had been diagnosed with hypertension and the number of people with this condition had increased from 600 million in 1980 to one billion in 2008 (World Health Organization, 2011).

It was reported that obesity and weight gain were the most significant determinants of hypertension (Aneja, El-Atat, McFarlane, & Sowers, 2003; Dıaz, 2002; Narkiewicz, 2006). In the Framingham study, it was noted that a 10% rise in the body weight was associated with a 7 mmHg rise in SBP (Garrison, Kannel, Stokes III, & Castelli, 1987). In addition, the National Health and Nutrition Examination Survey reported a linear association between increase in Body Mass Index (BMI), and systolic, diastolic, and pulse pressures in the American population (Harlan et al., 1984). It was reported that an increase in BMI of 1.75 kg/m^2 in men will cause 1 mmHg rise in systolic blood pressure (SBP) (Harlan, et al., 1984). An increase in BMI of 1.25 kg/m^2 in women will cause 1 mmHg rise in SBP (Harlan, et al., 1984). Globally, it was estimated that the number of overweight adults was 2.1 billion in 2013, as compared to 857 million in 1980 (Ng, Fleming, Robinson, 2014). Besides, the rate of obesity also increases with age at least up to 50 or 60 years old (Kopelman, Caterson, & Dietz, 2009).

Insufficient physical activity was found to be the fourth leading risk factor for mortality worldwide (World Health Organization, 2009). Approximately 3.2 million deaths and 32.1 million DALYs (representing about 2.1% of global DALYs) each year had been attributed to insufficient physical activity (World Health Organization, 2009). Globally, 31% of adults aged 15 years or older were not active (men 28% and women 34%) in 2008 (World Health Organization, 2009). People who were not active physically had a 20 to 30%

increased risk of all-cause mortality including hypertension and stroke and compared to those who engaged in at least 30 minutes of moderate intensity physical activity on most days of the week (World Health Organization, 2010b). Randomized clinical trials had demonstrated that physical activity was associated with lower levels of blood pressure in both hypertensive and normotensive individuals (Arroll & Beaglehole, 1992; Fagard, 2001; Whelton, Chin, Xin, & He, 2002). Studies have shown that the relative risk of developing hypertension decreased in individuals who are physically active (Blair, Goodyear, Gibbons, & Cooper, 1984; Haapanen, Miilunpalo, Vuori, Oja, & Pasanen, 1997; Hu et al., 2004; Paffenbarger, Jung, Leung, & Hyde, 1991; Pereira et al., 1999).

The amount of dietary salt consumed is an important determinant of blood pressure levels and overall cardiovascular risk (World Health Organization, 2010a). Hence, salt intake of less than 5 grams per person per day is recommended by WHO to prevent CVD (World Health Organization, 2007). However, data from various countries have indicated that most populations consume more salt than recommended (Brown, Tzoulaki, Candeias, & Elliott, 2009). It is estimated that a decrease in dietary salt intake from the current global levels of 9 to 12 grams per day to the recommended level of 5 grams per day would have a major impact in reducing blood pressure and CVD (He & MacGregor, 2008). In Malaysia, a study on dietary practices among 334 adults showed that 83% of participants always added salt or salty sauce to foods during cooking and 44.6% always added monosodium glutamate to their cooking (Khor, Hsu-Hage, & Wahlqvist, 1998). In addition, there is also convincing evidence that saturated fat and trans-fat increase the risk of coronary heart disease, and replacement with monosaturated and polyunsaturated fat reduces the risk (Hu et al., 1997).

In Malaysia, the Third National Health Morbidity Survey (NHMS) in 2006, reported that, the most common chronic illness was hypertension (7.9%) and followed by diabetes mellitus (4.0%)(Institute For Public Health, 2008). Subsequently, NHMSIV in 2011, reported a tremendous increase in the overall prevalence of hypertension (32.7%) (knownand undiagnosed) (Institute for Public Health (IPH), 2011).Meanwhile, the prevalence of known hypertension (based on self-report that is, being told to have hypertension by a doctor or medical assistant) was 12.8%. It was noted that, there was a general increasing trend in the prevalence of hypertension as documented in NHMS I, II, III and IV (Refer to Table 1.1).

Table 1.1: Prevalence of Hypertension as Reported in NHMS I, II, III and IV

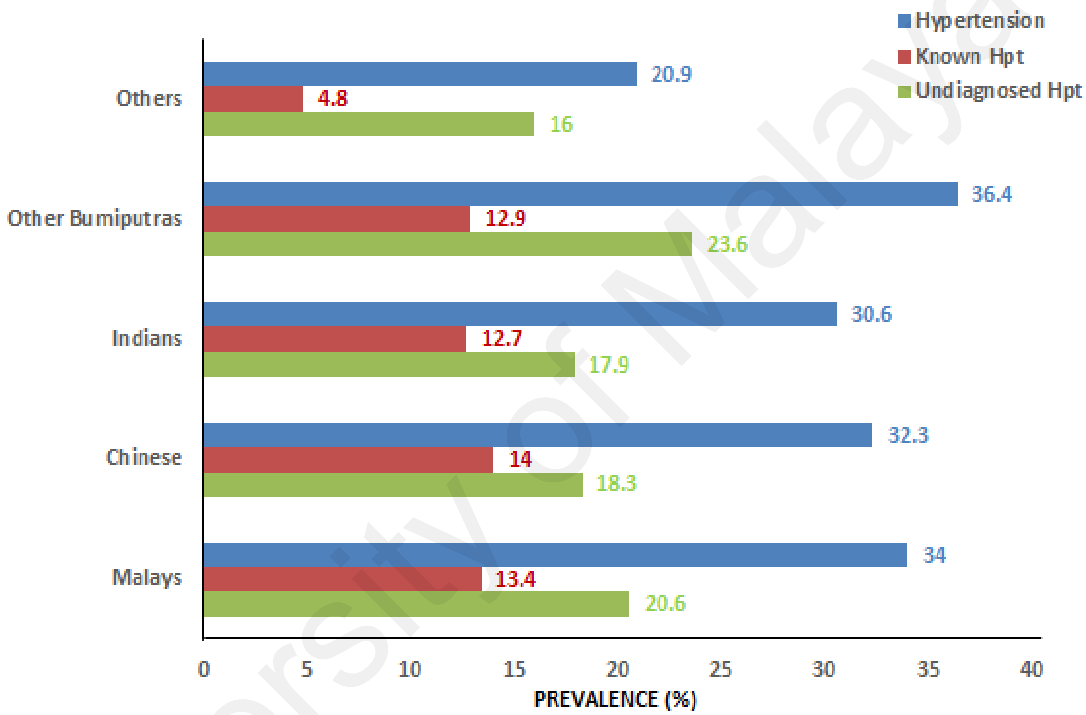
	NHMS I (1986)	**NHMS II (1996)**	**NHMS III (2006)**	**NHMS IV (2011)**
Age group	≥25 years	≥18 years	≥18 years	≥18 years
Definition hypertension (mmHg)	≥160/95	≥140/90	≥140/90	≥140/90
Prevalence (%)	**14.4**	**29.9**	**32.2**	**32.7**

Source: Institute for Public Health, Malaysia (Institute for Public Health (IPH), 1996, 2006, 2011)

Prevalence and time trends by age, sex, ethnic group

In addition, in terms of overall hypertension prevalence by ethnicity, the Other Bumiputeras had the highest prevalence (36.4%), followed by the Malays (34%), Chinese (32.3%) and Indians (30.6%) (Institute for Public Health (IPH), 2011). As for prevalence of known hypertension, the Chinese had the highest prevalence (14%), followed by Malays

(13.4%), the Other Bumiputeras (12.9%), and Indians (12.7%). For the prevalence of undiagnosed hypertension, the Other Bumiputeras had the highest prevalence (23.6%), followed by Malays (20.6%), Chinese (18.3%), and lastly, Indians (17.9%) (Refer to Figure 1.3).



Note: 'Hpt' referred to 'Hypertension'

Figure 1.3: Prevalence of Hypertension, Known Hypertension, Undiagnosed Hypertension by Ethnicity in Malaysia, ≥18 years
(Hung, 2012)

CVD had been the main cause of death in government hospitals in Malaysia, which contributed to 25.4% of deaths in 2010 (Institute for Public Health (IPH), 2011). In 2005, there were 37,580 hypertension related admission to the government hospital incurring a total annual cost of RM 110 million (Ong & Rozina, 2009).

Risk factors/determinants; prevention and management (lifestyle modification, medication, population programmes, screening).

Overweight and obesity have also shown an increasing trend in Malaysia. Based on the classification suggested by the Malaysian Clinical Practice Guidelines (CPG) 2004, approximately 60% of Malaysian adults were pre-obese and obese (Ministry of Health Malaysia, 2004). The prevalence of overweight and obesity as reported in NHMS II, III and IV are as depicted in Figure 1.3 (Institute for Public Health (IPH), 1996, 2006, 2011).

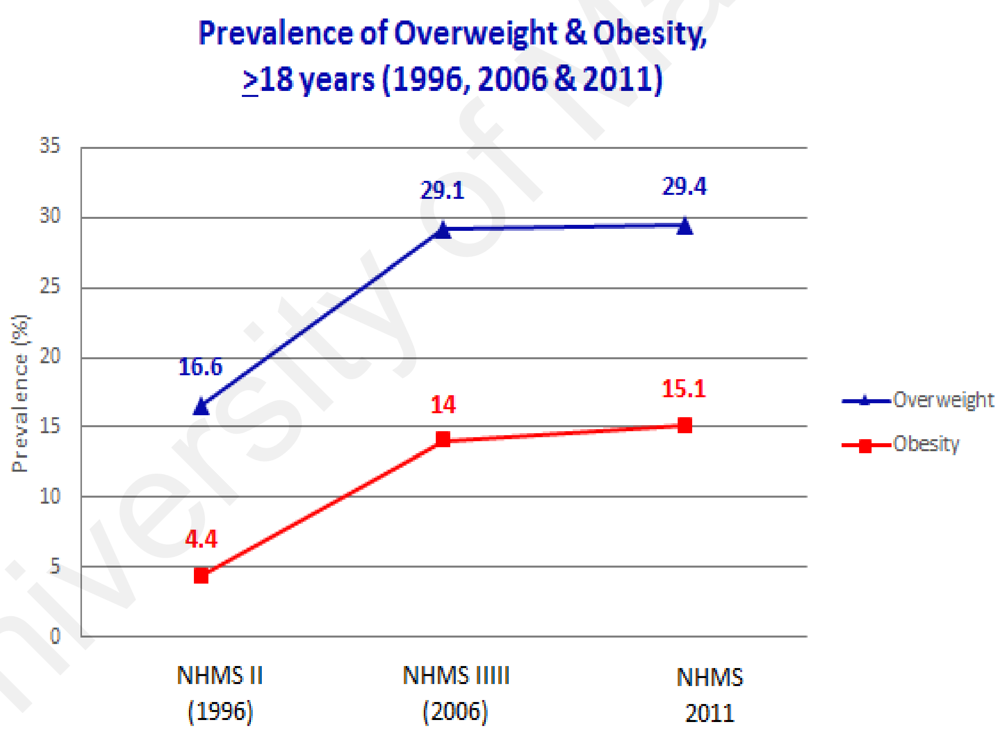


Figure 1.4: Malaysian Prevalence of Overweight and Obesity ≥18 years in 1996, 2006 and 2011

Source: Malaysian National Health Morbidity Survey IV(Ministry of Health Malaysia, 2014)

In terms of physical activity, the NHMS IV report showed that, there was an increase in the prevalence of physical activity (64.3%) as compared to the NHMS III report

(56.3%) (Institute for Public Health (IPH), 2011). The findings in NHMS IV reported that, generally, 64.3% of Malaysian adults aged 16 and above were active physically. It was observed that there was an increased level of physical activity from adolescents aged 16 to 19 years old (Institute for Public Health (IPH), 2011). The level of physical activity gradually decreased as age increased and this was particularly apparent among the elderly (Institute for Public Health (IPH), 2011). In terms of ethnicity, the highest prevalence for physical activity was observed among “Others” (82.2%), followed by Other Bumiputras (72.5%), Indians (64.8%), Malays (61.6%) and Chinese (61.4%) (Institute for Public Health (IPH), 2011).

It was found that appropriate hypertension treatment was associated with 40% reduction in the risk of cerebrovascular complication and approximately 15% of reduction in the risk of myocardial infarction(Trialists’Collaboration, 2003). As blood pressure increased the risks of getting cerebrovascular, coronary artery, chronickidney and peripheral vascular diseaseswerealso increased (World Health Organization, 2003b). Besides, there is substantial evidence that the risk for developingCVD can be reduced by lowering the blood pressure among patients with hypertension. Evidence from randomized controlled trials (RCTs) had shown the benefits of antihypertensive drug treatment in reducing important health outcomes among patients with hypertension (Beckett et al., 2008; SHEP Cooperative Research Group, 1991; Staessen et al., 1997). Furthermore, a report by a large scale meta-analysis done by Prospective Studies Collaboration in 2002, stated that among patients aged 40 to 69 years old, a reduction by 20 mmHg in SBP was associated with 50% risk reduction for cerebrovascular disease and more than 50% of reduction in coronary mortality (Collaboration, 2002). A large meta-analysis of trials involving antihypertensive drugs reported a significant reduction in overall cardiovascular risk with reduction in blood pressure (Trialists'Collaboration, 2003). In addition, a study done in Malaysia also reported similar findings with those reported worldwide, whereby increasing the adherence of hypertensive patients to their antihypertensive medication significantly improved blood pressure control (Turki & Sulaiman, 2010). Besides, medication adherence also may contribute to lower health care use and costs (Roebuck, Liberman, Gemmill-Toyama, & Brennan, 2011).

Meanwhile, the use of home blood pressure monitoring (HBPM) as an adjunct to clinics' blood pressure readings in the management of hypertension has been advocated by the Malaysian National Hypertension Guideline as well as many other international guidelines (Chobanian, Bakris, Black, Cushman, Green, Izzo, et al., 2003; Ministry of Health Malaysia, 2013; Parati et al., 2008). The advantages of home blood pressure readings include that they have the ability to detect the phenomena of both white coat and masked hypertension (Bobrie et al., 2004). The home blood pressure readings also was more effective than clinic as a predictor of changes in left ventricular hypertrophy thus it help to prevent cardiac hypertrophy in treated hypertensive patients (Tsunoda, Kawano, Horio, Okuda, & Takishita, 2002).In addition, HBPM also improved patient confidence in self-management (Murden & Stamoolis, 2009).Better blood pressure control could be achieved in patients who monitor their blood pressure at home (Cappuccio, Kerry, Forbes, & Donald, 2004; Cuspidi et al., 2004). In a meta-analysis of 18 randomized control trials, patients using HBPM were found to have an improvement of approximately 2.2 mmHg systolic and 1.9 mmHg diastolic blood pressure. Although this reduction was modest, it is likely that this might contribute to an overall reduction in complications (Cappuccio, et al., 2004). However, a recent meta-analysis suggests that HBPM is more effective but more costly thanoffice/clinic BP measurements in achieving target BP(Omboni, Gazzola, Carabelli, & Parati, 2013).

Globally, the use of HBPM by patients is gaining popularity. The prevalence of use ranges from 24% to 66% (Cesare Cuspidi et al., 2005; Tan, Khin, & Pagi, 2005). In the Asia Pacific region, a study conducted among attendees of a district polyclinic in Singapore showed a prevalence of HBPM was 24% (Tan, et al., 2005). Whereas, in Italy, a survey of hospital outpatient attendees found that 66% of them regularly use HBPM (Cesare Cuspidi, et al., 2005). Patients with hypertension found it acceptable to monitor their blood pressure at home (Aylett, Marples, & Jones, 1999). Primary care patients who were given home monitoring equipment by doctors to use at home reported no technical difficulty using the equipment, and many welcomed the opportunity to be more involved in the monitoring of their blood pressure (Rickerby & Woodward, 2003). In this study, the patients who reported positive experiences with HBPM were more ready to be involved in the management of their hypertension. However, studies have also reported that many patients have purchased blood pressure equipment and used HBPM, even without the advice or guidance of their doctors (Cesare Cuspidi, et al., 2005; Rickerby & Woodward, 2003).

A study conducted in China showed that 40% of hypertension patients used HBPM frequently in primary care settings. However, certain patients chose the improper BP monitoring device (Wang et al., 2014). A qualitative study conducted in Malaysia, reported that, there were both positive and negative influences of self-initiated HBPM (Abdullah & Othman, 2011). The HBPM readings both influenced their adherence to exercise and diet (Abdullah & Othman, 2011). The readings also provided certain reassurance when they experienced symptoms. In addition, the act of discussing their HBPM readings with their health care providers resulted in an enhanced doctor-patient therapeutic relationship.

Nevertheless, HBPM created confusion at times in some patients, particularly with regard to the target blood pressure level and the need for medication and this led to some patients making their own medical decisions based on their own standards (Abdullah & Othman, 2011). A study done among primary care providers' in the United States regarding recommending home blood pressure monitoring (HBPM) for their hypertensive patients, reported that, the top reasons for not recommending HBPM were "patient can't afford it" and "patient doesn't need it" (Tirabassi, Fang, & Ayala, 2013).

In Malaysia, the prevention and control programme for non-communicable disease (NCD) was initiated in the late 1980s and was further strengthened at the turn of the century. Despite various prevention and control programmes, the prevalence of NCD and its associated risk factors continue to rise in Malaysia. Several challenges that have been identified included; the continuous increase in NCD burden and risk factors, lack of effective inter-sectoral coordination between the relevant government agencies, resource constraints with competing priorities, climate change and increasing mental health problems amongst the population (Ministry of Health Malaysia, 2010). Furthermore, the Malaysian MOH has published the National Strategic Plan for Non-Communicable Diseases (NSP-NCD) 2011-2015 in December 2010 (Ministry of Health Malaysia, 2010). This document provides the necessary framework for actions needed to decrease the prevalence of NCD, including hypertension by taking diabetes as an entry point. MOH has established a good web-based application for Diabetic Registry but has not yet for other chronic diseases such as hypertension. In line with the seven strategic action areas contained in the Western Pacific Region's Approach to Operationalize the Global Action Plan for the Prevention and Control of NCD, Malaysia's own framework for operationalizing the NSP-NCD was based on the following Seven Strategies; 1) Prevention and promotion, 2) Clinical management, 3) Increasing patient compliance, 4) Action with Non-governmental Organizations (NGOs), Professional bodies and other stakeholders, 5) Monitoring, research and surveillance, 6) Capacity building, and 7) Policy and regulatory interventions (Ministry of Health Malaysia, 2010).

The responsibility of hypertension prevention goes beyond the MOH. While increasing knowledge is important, the MOH has continued to strengthen health promotion and education activities, including within schools, to achieve behavioural change, whereby a supportive environment is needed. Eventhough, the government has implemented programmes to prevent and reduce the burden of hypertension in the population, communities and individuals have to take responsibility for their own health, as well as to decrease their exposure to unhealthy lifestyles. On the other hand, Non-governmental Organizations (NGOs) can play a role in community engagement. Therefore, the Malaysian Health Promotion Board also known as “MySihat” was established in 2006 to support NGOs and promote community empowerment. Cardiovascular risk factor screening is also provided, which is currently conducted as either population-based or high-risk based via voluntary participation in government primary health clinics. Expansion and strengthening of community-based programmes or projects in both educational and health-promoting activities, with emphasis on, promoting physical activity manuals and training, improving access to healthy food and increasing barriers to unhealthy food and community-based NCD risk factor screening and intervention.

The Health Clinic Advisory Committee (HCAP) was established in the government primary health clinics to provide support in health promotion activities in the local community to increase the awareness and importance of regular health screenings for NCD risk factors (Ministry of Health Malaysia, 2007). Members of the HCAP can also be involved directly in the screening activities to assist the health personnel in running the programme. The health screening was done with the concept of ‘active case detection’, whereby the members of health advisors support and aid the health care screening programme and co-organise NCD prevention activities with the health care personnel on individuals identified at risk of developing NCD. The programmes and activities to increase patients’ compliance is the third strategy which is documented in Malaysia NSP-NCD are as follows (Refer to Table 1.2).

Table 1.2: Programmes and Activities to Increase Patients’ Compliance in Malaysia

No.	Programmed/Activities	Proposed progress Indicators and Target
1.	Expansion of the coverage of inter-personal health education programmes, including diet consultations, at all MOH health care facilities	Coverage of interpersonal health education programmes at MOH health care facilities
2.	Development of self-guided intervention packages to help patients with NCD and NCD risk factors and their families to monitor and manage their disease or condition	Audit the use of these ‘self-monitoring’ booklet of self-guided intervention packages
3.	Ensure that all health facilities have an NCD Resource Centre, staffed by appropriately trained diabetes educators or suitably trained health care personnel, and equipped with equipments, tools and Information, Education and Communication (IEC) materials specified in Standard Operating Procedure (SOP)/ guidelines	Number of health facilities with NCD Resource Centres
4.	Specifically for diabetes, making available subsidized glucostrips for Self Monitoring of Blood Glucose (SMBG)	Coverage of availability of subsidized glucostrips

(Source: Ministry of Health Malaysia, 2010)

Nonetheless, successful implementation of the NSP-NCD would not have been possible without active participation from other government agencies and stakeholders to further reinforce CVD prevention and control programmes and activities in Malaysia, while taking into account the social and cultural contexts of Malaysia's multi-ethnic population.

1.2 Research Issues

Hypertension is a chronic asymptomatic disease and many patients do not experience symptoms of hypertension such as headache and dizziness. Despite the availability of evidence-based efficacious treatment and guidelines, large number of hypertensive patients still struggle with uncontrolled hypertension (Mohan & Campbell, 2009). Studies have shown that treatment of patients who were asymptomatic was is more likely to result in non-adherence. As reported from a study conducted by Steward et al, patients with angina perceived their health as compromised, whereas hypertensive patients did not have such perception (Stewart et al., 1989). A study of hypertensive patients who were treated with beta-blocker showed six times higher non-adherence rate compared to patients with stable angina (Krall, 1991).

It was observed that, more than half of hypertensive patients dropped out of care within 12 to 24 months of diagnosis and only 46% of them achieved optimum blood pressure control due to adherence to their anti-hypertensive medication (Busnello et al., 2001; Centers for Disease Control Prevention, 2011; Mapes, 1977).

Management of hypertension in Malaysia

Meanwhile, a study carried out in Malaysia reported that levels of awareness, treatment, and control are still low among hypertensive patients in the Malaysian population (Rampal, Rampal, Azhar, & Rahman, 2008). It was found that, only 34.6% of the participants with hypertension were aware of their hypertensive status, and 32.4% took their anti-hypertensive medication. Amongst the latter group, only 26.8% had their blood pressure undercontrol (Rampal, et al., 2008). Another study reported that only 47.2% ofthe hypertensive patients in Malaysia achieved the blood pressure targets (Abougalambou, Sulaiman, & Hassali, 2011).

There are many terminologies related to the definitions and measurements of why patients do not take their prescribed medication and do not follow health recommendations such as adherence, compliance, concordance and persistence, but the evidence converged on average at only 50% (Lüscher, Vetter, Siegenthaler, & Vetter, 1985; World Health Organization, 2003a). The most widely used terms to describe patients' behaviour are adherence and compliance. The main difference is that adherence requires patients' agreement to the recommendations prescribed by the health care provider (World Health Organization, 2003a), while compliance suggests that the patient passively follows the doctor's orders and that the treatment plan is not based on a therapeutic alliance or contract established between the patient and the physician (Osterberg & Blaschke, 2005). However, most of the studies did not state if there was previous agreements by the patients to the recommendations were taken into consideration.

Meanwhile, the term concordance is being increasingly used in relation to medication-taking. The term concordance suggests that patients should take more responsibility even if everyone is not willing to do this. "It is a new approachto prescribing and taking medicines. It is an agreement reached after negotiation between a patient and a health care professional that respects the beliefs and the wishes of the patient in determining whether, when and how medicines are to be taken" (Marinker & Feely, 1997). This is an alliance, whereby health care professionals recognize the primacy of the patient's decisions about taking the recommended medications (Nichols-English & Poirier,1999). The agreement may arise after an interaction between the doctor and the patient. Nonetheless, no one could tell if a patient wishes to take part in this interaction and if this could lead to useful outcomes (Gray, Wykes, & Gournay, 2002; Jones, 2003; Marinker & Feely, 1997).

On the other hand, concordance is sometimes used, incorrectly, as a synonym for adherence. The term concordance attemptsto re-conceptualise the problem of compliance. It acknowledges that, for many patients, noncompliance is a rational response to their personal perceptions of illness and treatment. Reviews of the literature have shown that non-compliance was often the outcome of a prescribing process that failed to take into account of the patient's beliefs, expectations and preferences (Horne, 1993; McGavock, 1996), which could be an indicator of poor communication within the consultation. Moreover, the fault line within the consultation is the failure to recognise that patients and clinicians bring two sets of (potentially opposing) beliefs about the nature of the illness and treatment. Consultations that ignore the patient's perspective are more likely to lead to treatment decisions that are not 'agreed' by the patient resulting in an increased risk of non-compliance. Such consultations can be considered to be non-concordant. Conversely, in concordant consultations, the patient's beliefs are elicited and are considered to be of paramount importance (Marinker, 1997).

Next, medication persistence is defined as "the duration of time from initiation to the discontinuation of therapy" (Cramer et al., 2008). Continuing to take any amount of medication should be consistent with the definition of persistence. This definition can be operationalized in both prospective and retrospective assessments by determining the initiation of treatment, or the appointed time during chronic treatment, which is also defined as the end of the observation period (Burrell et al., 2005; Peterson et al., 2007).

On the other hand, adherence is an umbrella used to embrace various components involved in the process of patients taking medication as prescribed (Urquhart, 2001). Adherence encompasses compliance, and therefore, can be used interchangeably (Bartels, 2004). It was reported that approximately only 50% of hypertensive patients had taken at least 80% of their prescribed medication, and adhered to dietary regimen and/or follow-up appointments (World Health Organization, 2003a).

Medication adherence is a major concern in health care research, especially in chronic diseases management, such as hypertension where drug treatment is the key to prevent cardiovascular, cerebrovascular and renal morbidities, and mortality (Ruilope, 2013; World Health Organization, 2009). Adherence is a cluster of behaviours and it is affected by multiple factors. Although most researchers have just focused on adherence to medication, adherence also encompasses numerous health-related behaviours that extend beyond prescribed pharmaceuticals (World Health Organization, 2003a). Besides, a report entitled *Adherence to Long-Term Therapies: Evidence for Action in 2003* had defined adherence as "the extent of which a persons' behaviour that involves taking medication, following a diet, and/or executing lifestyle changes, corresponds with the agreed recommendations from a health care provider" (World Health Organization, 2003a). This report stated that, it was estimated that 30% to 50% of medicines prescribed for long-term illnesses were not taken as directed. Medication non-adherence, the extent to which a person's behaviour does not coincide with medical or health advice, was found to negatively affect blood pressure and is associated with greater health care utilization, via cardiovascular-related hospitalizations and emergency health visits, which contribute to an increase in total health care costs (Ramli, Ahmad, & Paraidathathu, 2012; Rihal et al., 2010).

The rate of compliance for short-term therapy was much higher at between 70% and 80% and, furthermore, the rates of non-compliance with different types of treatment also differ greatly. Estimates showed that almost 50% of the prescription drugs for the prevention of bronchial asthma were not taken as prescribed (World Health Organization, 2003a). Patients' compliance with medication therapy for hypertension was reported to vary between 50% and 70% (World Health Organization, 2003a). On top of that, a meta-analysis of 569 studies of medication adherence revealed an average of non-adherence rate of about 25% (Dulmen et al., 2007). In developed countries, adherence among patients suffering from chronic illnesses averaged to only 50% (Haynes, McDonald, Garg, & Montague, 2002). The magnitude and impact of poor adherence in developing countries is assumed to be even higher given the paucity of health resources and inequities in access to health care. For example, in developed country, such as the United States, about 51% of the patients treated for hypertension adhered to their prescribed treatment (Munger, Gradman, Lee, & Steinberg, 2000), while in developing countries, such as China, Gambia and Seychelles, only 43% , 27% and 26%, respectively, for patients with hypertension who adhered to their anti-hypertensive medication regimen (Bovet, Burnier, Madeleine, Waeber, & Paccaud, 2002; Guo, He, & Jiang, 2001; Van der Sande et al., 2000).

Adherence to recommendations involving lifestyle changes such as exercise frequently poses significant difficulties for patients. For example, those with chronic illnesses in the Medical Outcomes Study had average adherence rates to exercise regimens of only 19% (Kravitz et al., 1993). In another study involving a physical therapy exercise regimen, only 35% of patients adhered; 76% followed their prescribed regimen partly but not wholly (Sluijs, Kok, & van der Zee, 1993). Programs involving lifestyle changes such as exercise programs tend to be more successful in supervised rather than home-based programs (McKelvie et al., 2002). Compliance with lifestyle changes was the lowest at 20%–30% (M. DiMatteo, 1995). Studies showed that pharmacist and dietitian interventions demonstrated improvements in patients' adherence (Arcand et al., 2005; Davis, Packard, & Jackevicius, 2014). Therefore, management of hypertensive patients should be part of a multidisciplinary care system.

Treatment adherence in Malaysia

In addition, it has been proposed that primary health care centres play a major role in providing care to hypertensive patients (Al-Mustafa & Abulrahi, 2003). In Malaysia, 78% of known hypertensive patients had claimed to be on oral anti-hypertensive medications within the past two weeks; 82.7% were on specific dietary advice, 67.6% claimed to have been advised by healthcare personnel to lose weight, and 75.2% were advised to be more physically active or to start exercising. Furthermore, most of the hypertensive patients in Malaysia receive treatment at the Malaysian Ministry of Health (MOH) primary health clinics (53%), followed by MOH hospitals (23.0%), private clinics (19.7%), and private hospitals (2.5%) (Institute for Public Health (IPH), 2011). About 1.5% adopted self-medication by purchasing medications directly from pharmacies, and 0.3% opted for traditional and complementary medicines. Nevertheless, good medication adherence rate among hypertensive patients treated at primary care facilities in Malaysia was only 53.4% (Ramli, et al., 2012). Therefore, this thesis focussed on the reasons for non-adherence among hypertensive patients attending government primary health care setting.

Primary health care in Malaysia is divided into public and private. The public primary healthcare facilities are further divided into Community Health Clinic (which this research utilized), maternal and Child Health Clinics and Dental Health Clinic. The primary care services for public health consists almost 80% of the overall primary healthcare services in Malaysia. The government/public primary health clinics in Malaysia can serve between 3000 to 4000 patients per day. It includes Outpatient Clinic, Chronic Disease Clinic, Maternal and Child Health Clinic and Dental Clinic. These clinics are easy accessible in every community in Malaysia. The norm is to have one primary health clinic for every 15,000 to 20,000 people in the population.

From the MOH records, 88.5 percent of the population lives within 5 km of a health facility and 81 percent within 3 km. Every clinics consist one Family Medical Specialists, medical doctors (minimum 2 and maximum 10), medical assistants, specially trained staff nurses and midwife who can provide simple out-patient care (Primary HC, 2009). It comprise of outpatient department as the first point of contact, including maternal child healthcare, dental services, school health services, ambulance services and support services such as clinical and imaging facilities, pharmacy and registration. It also provide staff quarters inside the clinic area. There is Malaysia CPG for hypertension to guide in the management hypertension in the primary health clinics in Malaysia. The latest CPG for hypertension is in the year 2013 (Ministry of Health, Malaysia. 2013).

Meanwhile, a study carried outat an outpatient hypertension clinic in Penang General Hospital, Malaysia revealed that 51.3% of hypertensive patients had poor adherence to anti-hypertensive medication, and a study conducted at the Family Medicine Clinic in University of Science Hospital in Kelantan, Malaysia had identified that 55.8% of hypertensive patients were noncompliant to their anti-hypertensive medications (Amal, 2010 ; Hassan et al., 2005).

Since the policy on Integrated Services at Primary Health Care Clinic using Reviewed Approach (REAP) was approved for implementation in 2008, a cumulative totalof 266 health clinics have implemented these integrated health services at the health clinics to deliver comprehensive services for wellness, management of illnesses, clinical support, emergency care, and health informatics (Ministry of Health Malaysia, 2009). In 2009, data derived from the census captured in six states namely, Sabah, Sarawak, Johore, Kedah,Perlis and Malacca, out of 880,198 patients registered with the health clinics, 13,422 (1.5%) were screened and 7,804 were noted to have at least one risk factor (Ministry of Health Malaysia, 2009). Hypertension ranked third among the top ten health risks detected during the screening. The interventions carried out for those detected with risk factors were health education and distribution of health education pamphlets among 70% of the cases.

Furthermore, patients with hypertension are commonly seen at health clinics and the indicator to assess the quality of care for hypertensive patients is the percentage of patients with blood pressure reading less than 140/90 mmHg. Currently, the classification and the management of hypertension in Malaysia is based on the latest Clinical Practice Guidelines for Management of Hypertension endorsed by Malaysian MOH in 2013, which is guided by the World Health Organisation International Society of Hypertension Guidelines (Ministry of Health Malaysia, 2013).

Besides, there are many factors that may affect the level of adherence in a person diagnosed with hypertension. There are five sets of factors, which are interrelated in the determination of adherence, namely,a) health system factors, b) patient related factors, c) socio-economic factors, d) therapy related factors and e) condition related factors (WHO, 2003a). A study in Malaysia, which was conducted among hypertensive patients in community health clinics fromthe state of Selangor, Malaysia found that the participants perceived prescribed western medicine from the health clinic as scientifically proven, but had undesirable side effects. Therefore, complementary and alternative medicines were used by the patients to counteract the harmful effects of the western medicine. The types of adherence behaviour found in the study included faithful follower, self-regulator and intentional non-adherer (Lee, Halimatun, Steven, Ong, 2012). The factors that may affect the level of adherence in hypertensive patients are discussed further in the chapter pertaining to literature review.

Measures of adherence to treatment and lifestyle changes

Although different tools have been used to evaluate and assess patient's adherence to medication, there is no single measurement of patient adherence to medications that can be referred as the "gold standard"(Osterberg & Blaschke, 2005; Vermeire, Hearnshaw, Van Royen, & Denekens, 2001). In developing countries such as Malaysia, information derived from the self-administered health questionnaires is of the greatest importance because it is comprehensive, practical, and inexpensive. The most commonly and widely used self-reporting measures of medication adherence scale for hypertension are the Morisky Medication Adherence Scale (MMAS) (Morisky, Ang, Krousel-Wood, & Ward, 2008; Morisky, Green, & Levine, 1986) and the Hill-Bone Compliance to Medication Scale (Kim, Hill, Bone, & Levine, 2000). The MMAS classifies non-adherence as intentional and unintentional related to forgetfulness, carelessness and stopping medications when feeling better or worse, the Hill-Bone Compliance to Medication Scale addressed barriers and self-efficacy of patients' in taking their medications. However, a study showed that the use of both scales cannot be recommended because their ability to identify medication adherence was essentially by chance, with inconsistency for nearly every third hypertensive patient (Koschack, Marx, Schnakenberg, Kochen, & Himmel, 2010). In addition, the literature have reported other important reasons on why individuals are non-adherent to their anti-hypertensive medications in addition to those listed by these two scales. Therefore, if more reasons for non-adherence can be identified, it is likely to identify, quantify, and reduce non-adherence to a greater extent.

Moreover, identifying specific reasons for non-adherence in a specific population is problematic, and relevant validated quantitative instruments on reasons for non-adherence to anti-hypertensive medication are not available in the Malaysian population. Therefore, the main purpose of this study was to identify the reasons that affected non-adherence to hypertensive medication among hypertensive patients attending government primary health clinics in Selangor, Malaysia.

Research Methods

In order to achieve the objectives of this study, the qualitative component was added. Therefore, the mixed methods study design was employed. There are several definitions for mixed methods that have emerged over the years. An early definition states that, the mixed methods design is one that includes at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words), where neither type of method is inherently linked to any particular inquiry paradigm (Greene, Caracelli, & Graham, 1989). Ten years later, the definition shifted from mixing two methods to mixing all phases of the research process, whereby the researchers define mixed methods as the combination of qualitative and quantitative approaches in the methodology of a study (Tashakkori & Teddlie, 1998). In addition, a consensus was sought for the definition of mixed methods based on 19 different definitions provided by 21 highly published mixed methods researchers and thus, the mixed methods research is defined as a combination of quantitative and qualitative elements research approach for the purpose of obtaining breadth and depth of understanding and corroboration (Johnson, Onwuegbuzie, & Turner, 2007). It is an evolving philosophical assumption of the research process that combines methods, a philosophy and a research design orientation (Creswell, Plano Clark, 2011).

There are six prototypes of major mixed methods designs, namely, convergent parallel, b) explanatory sequential (follow-up), c) exploratory sequential (builds to), d) embedded, e) transformative and f) multiphase (Creswell, Plano Clark,2011). The exploratory sequential mixed method design was adopted in this study. This design was chosen because, in this study, after Phase I (quantitative study), the researcher further explored the reasons for non-adherence to hypertensive medication in Phase II (qualitative study). This was to ensure that the instrument was ethnic sensitive and it would be more meaningful to utilize it in the future among hypertensive Malaysian population in primary health care settings. Finally, the study proceeded to Phase III (a) and (b) (quantitative study). All these three phases were conducted sequentially.

This mixed-method study was implemented in three phases. Phase I was the pilot study to examine the construct validity and the reliability of the 15-item Medication Adherence Reasons Scale (MAR-Scale) (Unni & Farris, 2009). Phase II (qualitative study) was conducted to explore the reasons for non-adherence, while Phase III (quantitative study) was carried out to develop the Medication Adherence Reasons Scale for the Malaysian population based on the 15-items in MAR-Scale with additional reasons identified in Phase II and to determine if the newly modified scale (myMAR-Scale) was sensitive among the three major ethnic groups in Malaysia (Malays, Chinese, and Indians), besides examining the association between the risk factors for non-adherence and blood pressure control.

There are three key concepts for a mixed methods study design which this study adopted, namely, priority, implementation and integration (Creswell, Fetters, Ivankova, 2004). Priority is determined by the researchers, either, quantitative data, qualitative data, or equal priority shared between the two forms of data (Tashakkori & Teddlie, 2010). This study utilized the quantitative phase compared to the qualitative phase, as reported by Creswell, who stated that instrument development design emphasizes more on the quantitative phase of the study (Creswell & Clark, 2007). The design of this study was represented by "Phase I (quantitative study) which is the pilot study; followed by Phase II (qualitative study); Phase III (quantitative study) which was the major survey. These phases indicated the importance of sequential ordering of the quantitative study.

Meanwhile, implementation refers to the fact that if quantitative and qualitative data are collected in sequential (one following another) parts or gathered concurrently at roughly the same time during the study (Morgan, 1998). This study adopted a sequential exploratory mixed methods design, characterized by three parts, which were the initial quantitative study to validate and examine the validity and reliability of the construct among Malaysian population from the original version of the 15 Items of Medication Adherence Reasons (MAR-Scale)(Unni & Farris, 2009). Then, a qualitative Part II (qualitative study) was carried out to explore more reasons for non-adherence, which was then followed by quantitative study (major survey), namely, Part III for examination of the construct validity and reliability of the modified myMAR-Scale for Malaysians and to determine the association between the risk factors for non-adherence and blood pressure control. The sequential progression of the study is as depicted in the methods chapter (Refer to Figure 3.1, 3.2 and 3.3).

The integration of data occurred in the final stages of interpretation and explanation of the results. It refers to the point in the process of research procedures as the investigator mixes or integrates the quantitative and qualitative data collection and analyses (Tashakkori & Teddlie, 1998). These are explained in the chapter that looks into the results.

1.3 Rationale of the Study

In recent years, the prevalence of hypertension had been increasing in Malaysia (Institute for Public Health (IPH), 1996, 2008, 2011). Non-adherence being one of the factors for poor blood pressure control, is a significant public health problem (World Health Organization, 2003a). Unless fundamental changes are made, Malaysia will face tremendous health and economic burden in the future as a result of non-adherence to hypertensive medication, diet and physical activity among hypertensive patients in Malaysian population. It is important to recognize the reasons why hypertensive patients do not follow the hypertensive care recommendations as advised by their health care provider before implementing any intervention programmes for hypertensive patients undergoing follow-up in primary health care facilities in Malaysia. The identification of the reasons, which may affect non-adherence, is important since blood pressure control among hypertensive patients in Malaysia is still poor. This study was conducted in government primary health clinics due to large pool of known hypertensive patients attending these clinics for follow-up. About 53% of hypertensive patients in Malaysia sought treatment at the Malaysian Ministry of Health (MOH) primary health clinics (53%) (Institute for Public Health (IPH), 2011). Therefore the findings of this study will add to a better understanding regarding the reasons affecting non-adherence to medication among hypertensive patients attending government primary health clinics.

Besides, most studies done in Malaysia focused on compliance to medication, but not adherence (Amal, 2010 ; Hassan, et al., 2005; Ramli, et al., 2012). To our knowledge, this study was the first in Malaysia which identified the reasons for non-adherence to anti-hypertensive medication, physical activity, and diet as a holistic approach. It provides essential information for healthcare providers, public health specialists, and policy makers regarding the implementation of the intervention and the management programmes for hypertensive patients as a holistic approach for the Malaysian population in the future.

Many studies on adherence in Malaysia have been either cross-sectional or solely qualitative studies. This study is methodologically different from other previous studies conducted in Malaysia, because a sequential mixed methods approach was employed. The combination of quantitative and qualitative approaches provide opportunities in terms of; 1) the resulting mixture, which has complementary strengths and non-overlapping weaknesses, 2) expanding or complementing a set of results, and 3) discovering trends that would be missed if either approach had been used alone. To disseminate research results for practical purposes, researchers must speak at least two languages which are the technical language of research and the language that makes the results simple to communicate and easy to understand (Brannen, 2005).

Furthermore, this study developed a self-administered instrument which suitable to be used among the three major ethnicity in Malaysia (Phase III), and it could be further utilized as there had been no exploration between ethnic differences in terms of the reasons for non-adherence and the factors which influenced them to adhere to the anti-hypertensive medication in other previous studies carried out in Malaysia (Al-Qazaz et al., 2010).

1.4 Research Questions and Objectives

General Research Question:

In line with the nature of empirical inquiry in this study, the research questions were articulated using the guidelines for exploratory research design (Creswell, 2013).

1. What are the factors that affected level of non-adherence (high and low) to anti-hypertensive medication among hypertensive patients attending government primary health clinics in Selangor, Malaysia?

Objectives:

General Objective

To determine the factors affecting level of non-adherence (high and low) to anti-hypertensive medication among hypertensive patients attending government primary health clinics in Selangor, Malaysia.

Specific Objectives

Study Part I (quantitative study)

To describe the reliability and construct validity of the 15-item in Malay version of the Medication Adherence Reasons Scale (MAR-Scale) among hypertensive patients attending government primary health clinics in Selangor, Malaysia.

Study Part II (qualitative study)

To explore patients' experiences related to their illnesses and reasons, which influenced them for not taking anti-hypertensive medication among hypertensive patients attending government primary health clinics in Selangor, Malaysia.

Study Part III (quantitative study)

a) To develop the Medication Adherence Reasons Scale (myMAR-Scale) based on the original version of MAR-Scale with additional reasons identified in Phase II and to test it among hypertensive patients attending government primary health clinics in Selangor, Malaysia.

b) To examine the association between the level of non-adherence (high and low) to anti-hypertensive medication and the variables in the theoretical framework of medication non-adherence used in this study based on Andersen's Behavioural Model and Leventhal's Common Sense Model.

1.5 Outline of the Thesis

The main body of this thesis is divided into six chapters, beginning with Chapter One which contains the prevalence and negative effect of non-adherence, with the content of the subsequent chapter are as follows. Chapter Two contains the literature review. The literature review provides the conceptual framework for this study and an overview about the various aspects of non-adherence to anti-hypertensive medication. These includes, factors of non-adherence, development of theoretical models to predict non-adherence, the development of interventions to improve adherence, and the development of methods to measure medication non-adherence. Chapter Three presents the methodology which utilized the sequential mixed-methods study and is divided into three parts.

The first part covers the methods and the design of the quantitative phase. The second part describes the methods of the qualitative segment to explore the reasons for non-adherence to antihypertensive medication, physical activity and diet. The third part describe the quantitative study which was the major survey. This phase was divided into two section. Section (a) explained how the items found in the qualitative study were generated into the Medication Adherence Reasons Scale (MAR-Scale) to ensure that it would be sensitive to the three major ethnic groups (Malays, Chinese and Indians) in Malaysia. Section (b) described the association between the risk factors of non-adherence and blood pressure control. Chapter Four presents the results of the three parts, and the findings of the methodological triangulation. Chapter Five contains the discussion and interpretation of the findings based on the research objectives. This chapter also discussed the specific recommendations, public health implications and recommendations for future research. Chapter Six is the conclusion, and it includes the summary of overall findings and the public health policy implications regarding non-adherence to hypertensive care (anti-hypertensive medication, physical activity and diet).

Participants attending government primary health clinics chosen for Phase I (Bangi, Semenyih, Kapar and Meru) were not chosen for the study in Phase III (a) (Sungai Chua, Beranang, Pelabuhan Klang and Pulau Indah) and III (b) (Kajang, Batu 9 Cheras, Bandar Seri Putra, Bandar Botanik, Bukit Kuda and Pandamaran). All participants for this study had similar demographic characteristics and the services provided at all government primary health clinics are of the same standard. Anti-hypertensive medication was defined as any anti-hypertensive medication taken by the participants to control or to treat their high blood pressure.

CHAPTER 2 : LITERATURE REVIEW

This chapter provides the conceptual framework for this study and an overview about the various aspects of non-adherence to anti-hypertensive medication. This includes the factors affecting non-adherence, reasons affecting non-adherence to anti-hypertensive medication, theories and models developed to predict medication non-adherence, classification of non-adherence, interventions developed to reduce non-adherence, and measures developed to identify and quantify non-adherence.

2.1 Conceptual Framework

The conceptual framework for this study was based on the combination of Andersen's Behavioral and Leventhal's Common Sense Models (Unni & Farris, 2011) (Refer to Figure 2.1). Various theoretical models have been used to predict medication non-adherence. Each theoretical model has its advantages and disadvantages. However, to date, there is no single theory or model that can explain medication non-adherence adequately (World Health Organization, 2003a). Besides, there has been absence of a single systematic descriptor of non-adherent patient, and therefore require a range of variables to describe individuals who are non-adherent to their medications (Vik, Maxwell, & Hogan, 2004). The major factors of medication non-adherence can be grouped into socio-demographic, economic, disease, treatment, and psychosocial factors. Therefore, in this study, a conceptual framework using constructs that summarize the socio-demographic, economic, disease, treatment and psychosocial variables that predict non-adherence might provide a better understanding of anti-hypertensive medication non-adherence. Thus, the Anderson's

Behavioral Model can be used to explain medication adherence at the individual level and the Leventhal's Common Sense Model can be used to explain the individual mental representations made by individuals regarding illnesses. Therefore, the improved version (overlapping these two models) by Unni et al. (Unni & Farris, 2011), may provide a better conceptual model to explain medication non-adherence (Unni & Farris, 2011).

The Anderson's Behavioral Model is aimed at demonstrating the factors that lead to the use of health services. Although the model was originally developed to predict service use, it can also be used to predict medication adherence (Andersen, 1995). This model was originally developed in the late 1960s to facilitate the understanding of why families use health services, which was later revamped to predict the use of health care services at the individual level (Andersen, 1995; Murray et al., 2004). The original model that was developed in the 1960s is depicted in Figure 2.2. In the 1970s, the model was modified and health care system (policy, resources, and organization) was added as a construct, while consumer satisfaction was included as an outcome of health services (Aday & Andersen, 1974). Subsequently, in the 1980s and 1990s, the model included the external environment (physical, political and economic components) and also incorporated personal health practices such as self-care and diet to predict health behaviour (Evans & Stoddart, 1990).

The latest iteration of this model stated that the individual level of health service use was determined by three factors, namely predisposing factors, enabling factors and need factors (Andersen, 1995). The two major domains of beliefs in medications are the necessity beliefs (perceived role of medication in protecting the health of the patient) and concern beliefs (perceived potential for the medication to cause problems for the patient such as developing dependency on the medications) (Horne, 1999). Meanwhile, predisposing factors are defined as those factors that shape attitudes towards health care use, namely demographics (age and gender), social factors (education, occupation, and ethnicity), and patients' beliefs towards medications (attitudes, and knowledge) (Unni & Farris, 2011). In addition, disease characteristics (psychological disorders such as depression and anxiety) and treatment characteristics (frequency of medication and duration of treatment) were added to the predisposing factors (Unni & Farris, 2011). Furthermore, studies have suggested that depression and anxiety are associated with medication adherence (DiMatteo, 2004; Morrison & Wertheimer, 2004; Siegel, Lopez, & Meier, 2007).

On the other hand, enabling factors are resources that promote or inhibit health care utilization namely personal factors (income, health insurance, self-efficacy, self-regulation and internal locus of control) and community factors (social support and attitude of others to illness). Self-efficacy determines an individual's ability to take medications as prescribed, while self-regulation defines a patient's motivation to be healthy and internal locus control determines the amount of influence they perceive they have on their own health.

Meanwhile, the need factors represent the individual's illness that necessitates the use of health care services namely perceived need (perceptions of illness), and evaluated need (professional judgment of health status for a patient). Andersen also introduced the concept of mutability of the factors(Andersen, 1995). The concept of mutability is important to promote access to health services. This concept can be used in the medication adherence model to organize non-adherence based on the mutability of the underlying reasons causing non-adherence. Demographic factors, such as age, gender, and ethnicity have low mutability as they cannot be changed. Therefore, tailored interventions to improve medication adherence might be confined to reasons or factors that can be altered such as beliefs in medication and insufficient knowledge about medication or disease (Unni & Farris, 2011).

Perceived need was included using the illness cognition component from the Leventhal's Common Sense Model. The Common Sense Model outlines how individuals cognitively and emotionally process symptoms, illnesses, and treatments (Refer to Figure 2.3) (Diefenbach & Leventhal, 1996; Leventhal, Diefenbach, & Leventhal, 1992). This model identified the cognitive and the affective factors involved in the processing of information made by patients regarding their diseases or illnesses (Leventhal, et al., 1992). Based on this model, perceptions of illnesses are expected to affect illnesses and emotional problems. In addition to this, the coping strategies mediate the relationship between illness perceptions and outcomes (Leventhal, et al., 1992). Besides, perceptions of illnesses are personal perspectives that individuals create when they try to make sense of a threat to their health and to obtain control over the threat (Tiggelman, van de Ven, van Schayck, Kleinjan, & Engels, 2014). Applied toillnesses, this model distinguishes three phases in patients' self-regulation namely the formation of a perception of the illness, the coping reaction and the appraisal process in which the results of the coping reaction are evaluated. According to Leventhal, individuals make mental representations of their illnesses based on information available to them in terms of identity (the disease label and the individual's ideas about the somatic representation of the disease), timeline (the expected time frame of the disease), causation (the cause for the disease), perceived controllability (the personal control the patient has on the illness) and the consequences (anticipated repercussions of the ill individuals). Thus, how patients perceive their illnesses play a crucial role in how they deal with it. Furthermore, this model had been used to determine the illness cognition among hypertensive patients and a positive relationship had been found between illness cognitions such as identity and levels of medication adherence (Meyer, Leventhal, & Gutmann, 1985).

Unni et al.,2011, combined these two models by overlapping and modifying them based on the significant predictors highlighted in the literature review to be replaced with medication adherence, which is the mediating factor to evaluate blood pressure control among hypertensive patients in the health care service (Unni & Farris, 2011). Therefore, the main aim of this study was to identify all the factors related to blood pressure control based on Andersen's Behavioral and Leventhal's Common Sense Model. In this study, blood pressure control was the outcome variable and is depicted in the conceptual framework (Refer Figure to 2.1).

Literature on medication adherence has been available since the 1970s and one of the first studies on adherence was conducted by Haynes and Sackett in 1979, which is considered as a significant beginning (Haynes & Sackett, 1979). Their study explored the factors that were associated with non-adherence, focusing on the understanding, measurement and resolution of non-adherence. Eventually, over the next three decades, many studies were carried out to identify the factors of non-adherence, development of theoretical models to predict non-adherence, the development of interventions to improve adherence, and the development of methods to measure medication non-adherence.

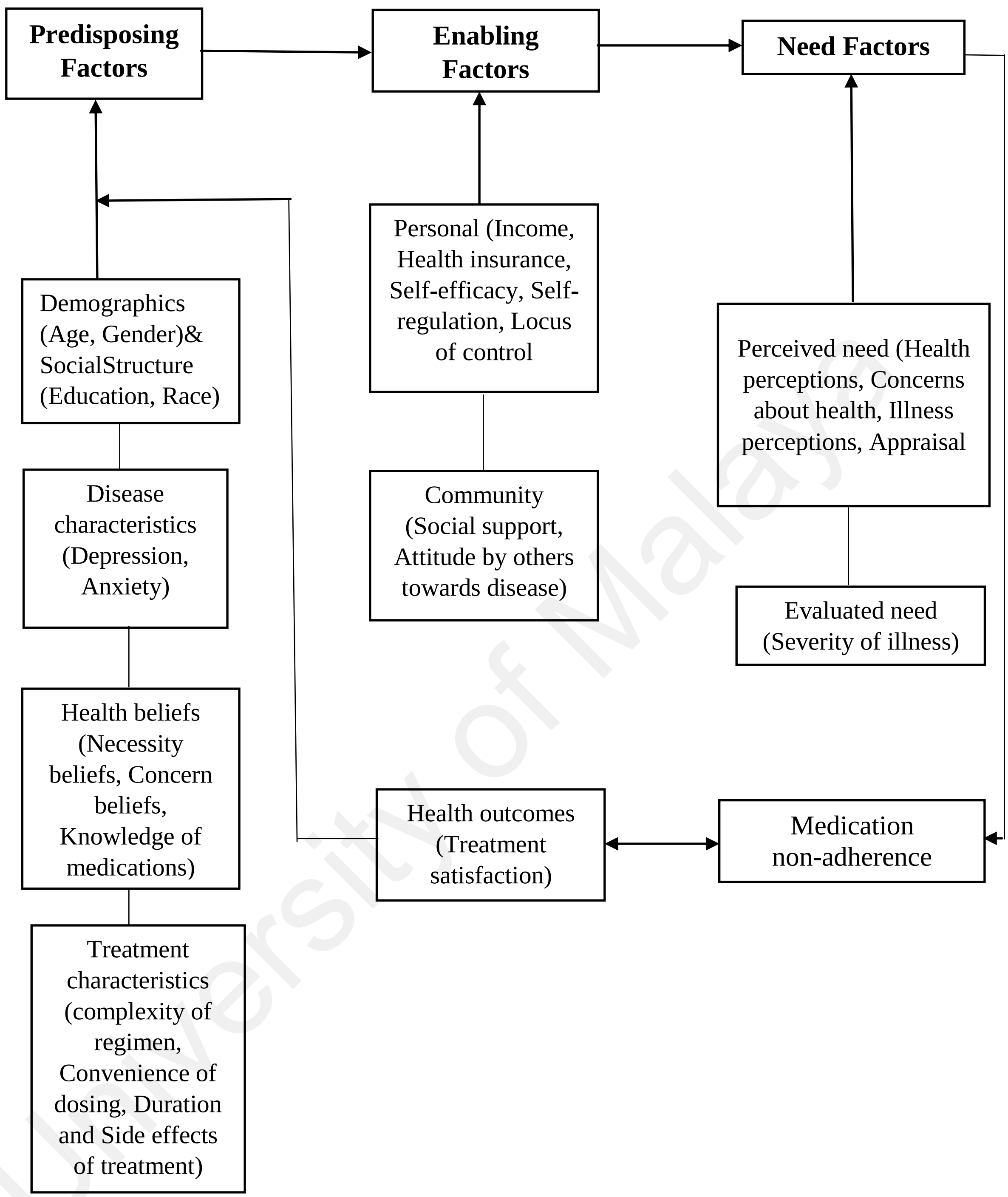


Figure 2.1: Conceptual model in medication non-adherence adapted based onAndersen's Behavioral and Leventhal's Common Sense Models with adjustment (Unni & Farris, 2011)

Note: The dotted lines represent added relationship which was investigated in this study and the dotted box represents an added factor, namely the blood pressure control

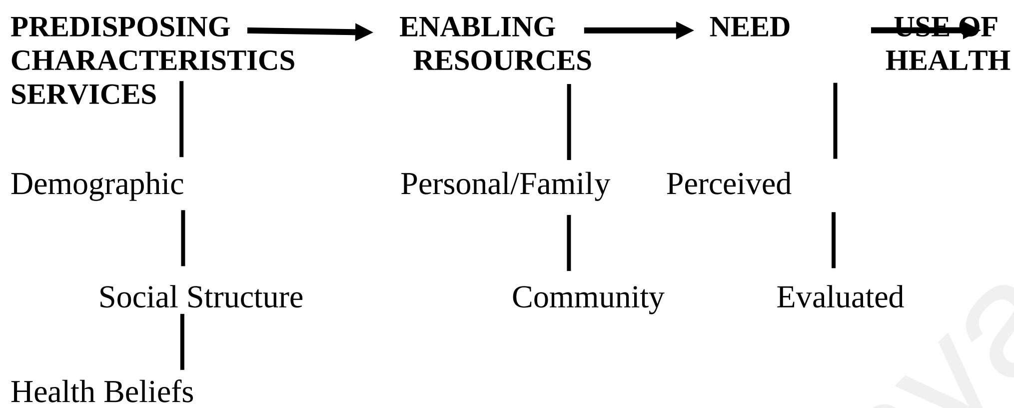


Figure 2.2: The Anderson's Behavioural Model
(Andersen, 1995)

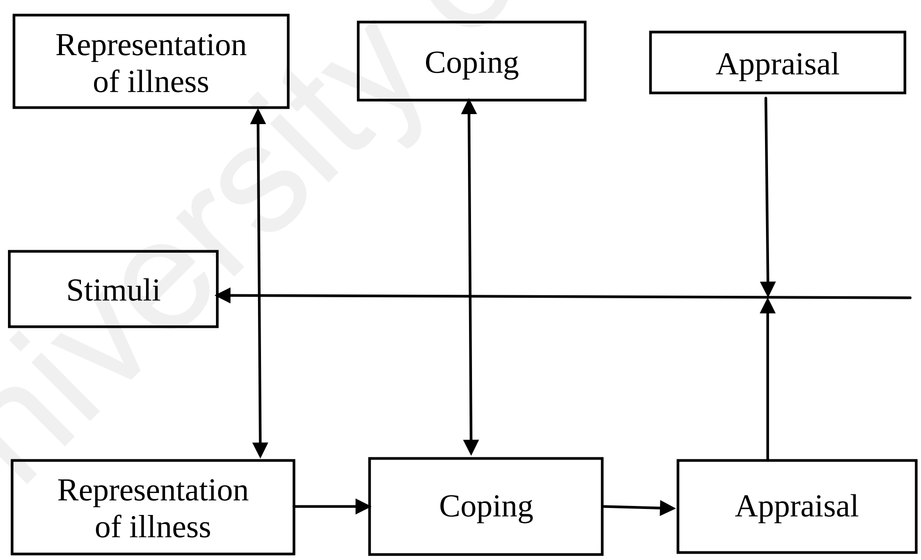


Figure 2.3: The Leventhal's Common Sense Model
(Leventhal et al., 1997; Leventhal, et al., 1992)

The criteria for including articles

Articles were collected by reviewing the globally published literature on non-adherence to anti-hypertensive medication. A search was conducted for relevant literature dated between the 1970s and 15thOctober 2015. It was implemented using Ovid, EMBASE (Excerpta Medica database), Cumulative Index to Nursing and Allied Health Literature(CINAHL) and Google Scholar. In addition, electronic search via University Malaya Library (www.umlib.edu.my) found articles by search strategies using terms of Medical Subject Headings (MeSH) terms. The combination of search terms were "adherence" AND "anti-hypertensive medication". Since there were very limited articles pertaining to non-adherence in hypertensive medication, wider search terms such as "non-adherence" AND "anti-hypertensive treatment", "non-compliance/concordance" AND "hypertension/ high blood pressure/ raised blood pressure/ elevated blood pressure" AND "reasons associated" OR "factors" OR "predictors" OR "determinants" OR "correlates" were also used. The search was conducted only on studies published in English. Both quantitative and qualitative studies on adherence were included. The references of all the articles retrieved were screened to identify additional publications. To be included in the review, the paper had to (1) address or contain information on adherence to anti-hypertensive medication, (2) be in English, (3) have been published between the 1970s and 15th October 2015, and (4) include the studies on reasons and factors affecting non-adherence to anti-hypertensive medication, theories and models developed to predict medication non-adherence, classification of non-adherence, interventions developed to reduce non-adherence, and measures developed to identify and quantify non-adherence.

Article selection

There were 1220 articles evaluated against the inclusion criteria based on the search engine mentioned. Those articles that did not meet the necessary requirements were excluded, resulting in total of 103 articles that were retrieved and included in the review (Refer to Figure 2.4).

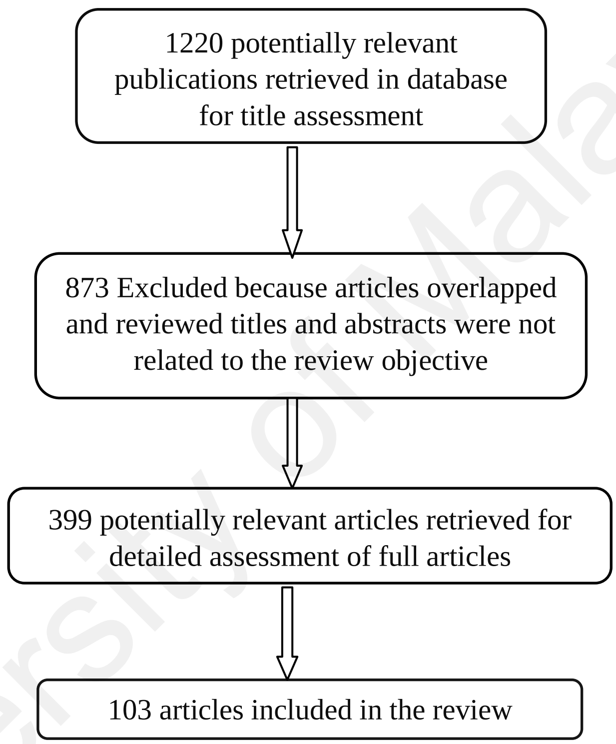


Figure 2.4: Number of Articles Included in the Review

2.2 Reasons affecting non-adherence

The reasons for poor medication adherence are often multifactorial. Non-adherence to medications can be intentional or non-intentional reasons. Intentional non-adherence refers to non-adherence that is deliberate and largely associated with patient motivation whereas unintentional non-adherence is non-adherence that is largely driven by a lack of capacity or resources to take medications (Clifford, et al., 2008). However it is important to acknowledge that the reasons underlying intentional and unintentional non-adherence are not entirely independent in that certain types of unintentional non-adherence e.g. forgetting, are logically more likely when motivation for medication is low (Molloy, et al., 2014).

A major challenge in treating CVDs such as hypertension is lack of patients' understanding of their health condition and adherence to the treatment (Shehab, et al., 2015). Patients also resist to modify their lifestyle and follow pharmacological regimen which further leads to development of vascular diseases. A qualitative study on medication adherence by Laba et al which conducted among patients with diverse range of chronic diseases including hypertension reported that although patients was strongly intent to follow prescribers' recommendations, most of them demonstrated range of non-adherent behaviours. They articulated clear reasons for doing so ranging from treatment-related factors of experienced and/or feared side-effects and perceived inefficacy, as well as unaffordable medication costs (Laba, et al., 2015). On the other hand, trusting prescriber-patient relationships, perceived negative family values about non-adherent behaviour, and a perceived lack of personal control over medication taking decisions seemed to maintain adherent intentions (Axelsson, et al., 2013).

The most common reasons for non-adherence was 'no perceive need' and 'insufficient routine'. These reasons were affected by personality trait and perceived disease control (Axelsson, et al., 2013).Forgetfulness and adverse effects have been reported in many studies as the main reasons for non-adherence and are significantly associated with non-adherence (Lee, et al.,2011, Sajatovic, et al., 2011). A study by Tang et al reported the reasons for non-adherence to anti-epileptic medication in patients with epilepsy. The reasons identified mostly were forgetfulness, followed by being seizure-free, fear of adverse medication side-effects, belief that the medications were ineffective, belief that it's unnecessary to take medication, no access to refill medications at nearby hospital and medication was too expensive (Tang, et al., 2013). A study done by Murota et al had investigated reasons for discontinuing medication use without being instructed to do so by a physician (Murota, et al., 2015). For oral medication, forgetfulness (42.4%) and feeling better (39%) were the major reasons for not taking medicines. Although uncommon overall, alcohol consumption was a reason for not taking medicines in patients with atopic dermatitis or tinea unguium. For topical medication, messiness of treatment (42.1%), forgetfulness (45.8%), and feeling better (35%) were the major reasons for not taking medication. The rates of a shortage of medications and feeling worse as reasons of feeling that the drugs were ineffective was relatively low in atopic dermatitis compared with those in other skin diseases.Marital status, alcohol consumption and experience of medication effectiveness had an influence on the level of oral medication.

In the field of dermatology, a study done by Richmond et al who assessed the adherence level of new patients in reported that the reasons of poor adherence to medication were lack of time and poor insurance coverage for medication (Richmond et al., 2014).

A study conducted by Vieta et al had reported psychiatrists' perceptions of the reasons for their patients stopping medication. The reasons stated were mostly irregular daily routine or living circumstances followed by feeling better, drug or alcohol consumption, worsening of symptoms and intolerable side-effects(Vieta et al., 2012).

Several common factors contribute to poor hypertension control regardless of race or ethnicity. Nurse-led, culturally adapted patient education appears to have a beneficial effect on diastolic blood pressure (DBP) and adherence to lifestyle recommendations for African-Surinamese and Ghanaian patients with uncontrolled hypertension when compared with usual care Beune et. al, 2014).A study done by Cuffee et al had reported that as mean discrimination scores decreased, the medication adherence category was increased. The analytic sample consisted of 227 African American men and 553 African American women, with a mean age of 53.7 ±9.9 years. In the study, it showed that racial discrimination was associated with lower medication adherence, and this association was partially mediated by trust in physicians. Patient, physician and system approaches to increase "earned" trust may enhance existing interventions for promoting medication adherence (Cuffee et al, 2013). One of the studies conducted in a Chinese population found that that many of the reasons associated with anti-hypertensive drug adherence among Chinese patients were similar to those identified by studies conducted in Western populations (Wong et al, 2011).

A study by Venkatachalam et al which conducted in a rural population of Kancheepuram district in Tamil Nadu, South India reported concludes the prevalence of adherence to hypertension management was low in study population due to inadequate perceived susceptibility, perceived, severity, perceived benefit, and perceived cue to action and poor lifestyle factor like alcohol and smoking habits. These barriers could be avoided by improving literacy of the study population, and also measures should be taken for effective health education and behaviour change communication (Venkatachalam et al, 2015).A study conducted by Gascónet al reported that patients had fears and negative images of anti-hypertensive drugs. There were also lack of basic background knowledge about hypertension. The clinical encounter was viewed as unsatisfactory because of its length, few explanations given by the physician and low physician–patient interaction (Gascón et al, 2004).

2.3 Factors affecting non-adherence

A review of the literature during the past three decades had identified several factors that may affect medication non-adherence. Comprehensive reviews on medication non-adherence found that there was absence of a single systematic descriptor of non-adherent patient or consistent factors that may affect non-adherence (Vermeire, et al., 2001; Vik, et al., 2004). Besides, a study by Lim et al. which was conducted in Malaysia, found that compliance was the only significantly associated factor with good blood pressure control (Lim et al., 1992). Therefore, classification of variables is needed to describe individuals who are non-adherent to their medication.

The major factors of medication non-adherence can be grouped into socio-demographic factors, economic factors, disease factors, treatment factors and psychological factors. In addition, according to WHO 2003, non-adherence is complex and it involves multidimensional factors determined by the interplay of five sets of factors, namely socio-economic, patient-related, therapy-related, health system/ health care team-related and condition-related factors (World Health Organization, 2003a). There is evidence from Malaysia to show that Malays may have increased beta adrenergic receptor sensitivitycompared to Chinese and Indians (Rasool et al., 2000). Chinese were least sensitive to the bradycardic and hypotensive effects of propranolol at rest and exercise. Indians and Malays had significant reduction of supine systolic blood pressure with propranolol but not Chinese (Rasool, et al., 2000). There is also evidence that Malays have different genotype frequency to angiotensin receptor polymorphism than other races (Rehman, Rasool, Naing, Roshan, & Rahman, 2007).

However, the association between socio-demographic factors and medication non adherence was not consistently established (Balkrishnan, 1998; Li, Wallhagen, & Froelicher, 2008; Morrison & Wertheimer, 2004). Numerous factors such as age, race, gender and marital status had also been reported as factors that might affect adherence. Besides, some studies reported that patient-provider interaction had shown more significant change in how patients' adhere to their medication as compared to socio-demographic factors (Svensson, Kjellgren, Ahlner, & Säljö, 2000; Theunissen, de Ridder, Bensing, & Rutten, 2003).

Socio-economic factors have not consistently been found to affect adherence. In developing countries low socio-economic status may put patients in the position of having to choose between competing priorities such as meeting the needs of their family members. Moreover, socioeconomic disadvantage increases the likelihood of primary non-adherence with medication, particularly among elderly people, older age, and especially among women (Wamala, Merlo, Bostrom, Hogstedt, & Agren, 2007). Gender differences were also observed in relation to those living alone; particularly among older women aged 65 – 84 years (45%) who were more likely to live alone than older men (22%) (Wamala, et al., 2007). In addition, a review regarding low socio-economic status and hypertension reported that low socio-economic status was associated with higher blood pressure (Grotto, Huerta, & Sharabi, 2008). Meanwhile, in a study from Malaysia, females were found to be more adherent towards their medication compared to males (Ramli, et al., 2012). However, no reason was found as to why this situation occurred. In contrast, studies in United Kingdom and in India found that males were more adherent towards medication (Gohar, Greenfield, Beevers, Lip, & Jolly, 2008; Kumar et al., 2014; Ramli, et al., 2012). Women in India were reported to be using herbal complementary and alternative therapies compared to men

(Kumar, et al., 2014). A study in Malaysia reported that, in general, race and sex have not been consistently associated with patient adherence (Misra & Lager, 2009; Osterberg & Blaschke, 2005; Ramli, et al., 2012).

Studies also have reported that age was associated with non-adherence to anti-hypertensive medication (Kauric-Klein, 2013). Older age was found to have better adherence than younger age (Hashmi et al., 2007; Lee, Grace, & Taylor, 2006; Lee et al., 2013). In the Pakistani population, a better social support structure ensuredby the common extended family system, reduced self-reliance and could be the reason for better adherence in this age group (Hashmi, et al., 2007). It isusual for other family members to take full responsibility for the medication routine of the patients (Hashmi, et al., 2007). This finding is consistent with a number of other studies including a regional study in Malaysia, although there are studies that showed either no association or decreasing adherence with increasing age (Caro, Salas, Speckman, Raggio, & Jackson, 1999; Gryglewska, 2005; Hassan, et al., 2005; Krousel-Wood, Thomas, Muntner, & Morisky, 2004; Youssef & Moubarak, 2002). Nonetheless, no significant association was found between age and adherence by Azlin et al (Azlin, Hatta, Norzila, & Sharifa Ezat, 2007). In fact, older adults fail to adhere for a variety of reasons, including the following: a) forgetfulness or cognitive impairment; b) lack of understanding of the role their medications play in managing their disease including over-the-counter and herbal medications; c) inability to manage and reliably self-administer multiple medications; d) attitudes (ignoring medication advice offered by health care professionals and beliefs, especially those influenced by their spirituality and culture; e) limited access to medications, due to lack of transportation or money; f) inadequate infrastructure for communicating information pertaining to medications among patients, physicians, pharmacists,and nurses; g) inaccurate patient drug histories; h) vague and incomplete documentation of adverse drug effects and drug-drug interactions; and i) poor monitoring processes (Murray, et al., 2004). However, age should be compared and evaluated differently between younger and older age group as cognitive and memory functions may have impact in elderly patients as reported by Park et al (Park, Kim, Jang, & Koh, 2013). Meanwhile, busy lifestyle and middle age had been good predictors of non-adherence (Park, et al., 2013). In addition, medication non-adherence among the elderly is not well described in the literature,despite being a major cause of morbidity, and thus, it is difficult to draw a systematic conclusionon potential barriers based on the current literature (Gellad, Grenard, &Marcum, 2011). Therefore, future research should focus on standardizing medication adherence measurements among the elderly in order to gain a better understanding of this important issue (Gellad, et al., 2011).

Ethnicity had also been frequently reported to have influence on adherence (Morgan & Watkins, 1988). According to some studies, Caucasians are believed to have good compliance,compared to African-Americans, Hispanics, and other minorities (Morgan & Watkins, 1988), whereas, the Hispanics and other minorities were found to have comparatively poor compliance associated with lower medication adherence, and this association was partially mediated by trust in physician (Cuffee et al., 2013). On the other hand, Azlin et al., reported that prevalence of non-compliance was highest among Chinese compared to Malays and Indians among the Malaysian population (Azlin, et al., 2007). In contrast, a study conducted in Malaysia reported that Malay [OR= 1.68, 95% CI(1.03, 2.73)] and Chinese [OR= 2.64, 95% CI(1.52–4.58)], patients were more likely to adhere compared to Indian patients (Ramli, et al., 2012). In addition, marital status was seen as related to family and social support in adherence to anti-hypertensive medication (Hashmi, et al., 2007). Lower educational attainment was related to higher adherence among men, but lower adherence among women (Braverman, 2009). In contrast, a study carried out by Barreto et al., reported that gender, age, marital status, level of education,economic level, and race were statistically insignificant to the outcome of interest. This might be partially explained by the difference of methods used to measure non-adherence to the therapy (Barreto, Reiners, & Marcon, 2014).

Patient-related factors represent knowledge, attitudes, beliefs, perceptions and expectations of the patient (World Health Organization, 2003a). Lack of knowledge pertaining to the treatment and perception of the severity of complications of hypertension showed significant associations with poor compliance (Kaboru, 2013). Studies done in Malaysia, other Asian countries and developed countries reported that educational level had a significant association with blood pressure control (Cha, Park, & Cho, 2012; Rampal, et al., 2008; Sun et al., 2014; Wilkins, Gee, & Campbell, 2012; Yang et al., 2014). Furthermore, higher educational attainment was found to be an important correlate of hypertension awareness (Group, 2001). In addition, the prevalence of hypertension was negatively associated with different education levels. Compared with subjects with a tertiary education, the likelihood of having hypertension was highest amongst those with no formal education (Rampal, et al., 2008).

Studies in Malaysia which reported that smoking was found to be not statistically associated with hypertension adherence (Loh et al., 2013; Raihan & Azmawati, 2013). The chronic effect of smoking on BP is small. Differences between men and women in this association are likely to be due to complex interrelations among smoking, alcohol intake, and BMI (Primatesta, Falaschetti, Gupta, Marmot, & Poulter, 2001).

Some of the patient-related factors associated with medication non-adherence were; (a) forgetfulness (Marshall, Wolfe, & McKevitt, 2012), (b) negative beliefs regarding the efficacy of the treatment (Fongwa et al., 2008; Rajpura & Nayak, 2014), (c) lower perceived susceptibility to hypertension-related complications (Li, Kuo, Hwang, & Hsu, 2012), (d) perceived side-effects of anti-hypertensive medication (Svensson & Kjellgren, 2003), (e) fear of complications of the medication (Tsiantou, Pantzou, Pavi, Koulierakis, & Kyriopoulos, 2010) and, (f) low self-efficacy (Warren-Findlow, Seymour, & Huber, 2012). Studies showed that patient with high self-efficacy tend to have good compliance and well blood pressure control (Ross, Walker, & MacLeod, 2004). Meanwhile, patients with greater dietary self-efficacy had lower serum potassium and weight gain, showed favourable compliance attitudes and behaviours toward prescribed regimens and fostered better relationships with staff (Zrinyi et al., 2003).

In addition, self-efficacy was found to mediate the relationship between depressive symptoms and medication adherence among hypertensive African Americans (Warren-Findlow, et al., 2012). Besides, depression has recently been added to the list of factors associated with non-adherence to anti-hypertensive medication and Wang et al. demonstrated a significant association between depression and non-adherence (Wang et al., 2002). Thus, it was believed that complex treatment threatened the patient's adherence. However, compliance does not seem to correlate with the number of drugs prescribed, but the number of daily dosing times for all prescribed medications (Claxton, Cramer, & Pierce, 2001; Grant, Devita, Singer, & Meigs, 2003; Iihara et al., 2004; Iskedjian et al., 2002; Patel & Taylor, 2002). Furthermore, a study showed that the use of medications combined in a single daily dose, rather than free combination of the medication taken at different times, was shown to be associated with a significant increase in treatment adherence (Gupta, Arshad, & Poulter, 2010).

Longer duration of the disease had been shown to adversely affect compliance (Farmer, Jacobs, & Phillips, 1993; Frazier, Davis-Ali, & Dahl, 1994). Long duration of treatment period and medication side effects might compromise patient's beliefs about medication effectiveness (Jin, Sklar, Oh, & Li, 2008). Similarly, a longer duration of treatment period might also compromise patient'scompliance (Dhanireddy, Maniscalco, & Kirk, 2005; Ghods & Nasrollahzadeh, 2003).

In a trial that compared 6-month and 9-month treatment of tuberculosis, compliance rates were 60% and 50% for the two regimens, respectively (Combs, O'Brien, Geiter, & Snider, 1987). In another study comparing preventive regimens of 3, 6 and 12 months, compliance rates were 87%,78% and 68% for the three regimens, respectively (International Union Against Tuberculosis Committee on Prophylaxis, 1982).However, some studies about chronic diseases found that longer duration of the disease resulted in good compliance (Garay-Sevilla et al., 1995; Sharkness & Snow, 1991), and newly diagnosed patients had poor compliance (Caro, et al., 1999). This may indicate that compliance is improved because patient's attitude of denying the disease is reduced and they accepted treatment after years of suffering from the disease. A number of studies found that patients who had no insurance cover (Choi-Kwon, Kwon, & Kim, 2006; Kaplan, Bhalodkar, Brown Jr, White, & Brown, 2004), or who had low income (Benner et al., 2002; Berghofer, Schmidl, Rudas, Steiner, & Schmitz, 2002; Ghods & Nasrollahzadeh, 2003; Hernández-Ronquillo, Téllez-Zenteno, Garduño-Espinosa, & González-Acevez, 2003; Mishra, Hansen, Sabroe, & Kafle, 2005) were more likely to be noncompliant to treatment. It was found that the factors that had the strongest positive effect on adherence included duration of hypertension (better adherence in patients with shorter duration and the use of newer agents, calcium antagonists, and angiotensin-converting enzyme (ACE) inhibitors (Rizzo & Robert Simons, 1997).

Newly diagnosed hypertensive patients are usually lesspersistent in medicine taking than are established hypertensives. Problems with perseverance with treatment often occur in the first 6 months of starting hypertensive therapy and can persist over the next 4 years (Caro, et al., 1999). A study in Malaysia reported that, patients were mainly "established" hypertensives, with a mean average of 8.5 years since being diagnosed as having hypertension and the predictor variable "duration of hypertension" was not shown to affect medication adherence or blood pressure control (Ramli, et al., 2012).

In addition, other study showed that duration of hypertension and age of patients affected medication adherence. Patients younger than 65 years and those with duration of hypertension less than 10 years were found to be more compliant to their medication regime, compared to elderly patients. A statistically significant lower level of adherence was identified in elderly patients with longer durationof anti-hypertensive therapy and with reported side effects of drugs. The reason for the lower adherence in elderly patients is the fact that they usually have more associated chronic diseases (Lalić et al., 2013). However, age was is not a significant factor in the current study. Studies have also shown that, patients with longer duration of anti-hypertensive medications used (over 10 years) reported better adherence than patients with shorter duration (5 years or less) (Hyre, Krousel-Wood, Muntner, Kawasaki, & DeSalvo, 2007; Lee, et al., 2013). One explanation for this could be that patients taking anti-hypertensive agents for a longer duration could have gained more experience with hypertension; had established a better patient-physician relationship and had greater faith on physicians' advice. In addition, they might have more knowledge about their own health condition and the appropriate management for their disease control (Svensson, et al., 2000). In terms of occupation, patients who were unemployed or retired were more likely to be adherent to medication. Few studies have reported the relationship between occupation and adherence. Some studies have shown that unemployed patients and the lack of health care coverage tended to be associated with poorer adherence (Zyczynski & Coyne, 2000).

Participants with presence of more than three medical conditions tend to have more risk of developing poor blood pressure control. Non-adherence was also found to be more pronounced in those taking two or more drugs(Aziz & Ibrahim, 1999). Presence of other comorbidities, reported to have significant reductions in anti-hypertensive use (Wang et al., 2005). Taking more total number of medications had increased risk of having poor blood pressure control. Patients with comorbid depression were approximately half as likely to be adherent to their medication relative to patients without depression (Tarrants, Oleen-Burkey, Castelli-Haley, & Lage, 2011).

Healthcare systems may create barriers to medication adherence by limiting access to medications through the use of a restrictive formulary (D'Amato, 2008). For example, a retrospective cohort study found that in the year after a state implemented a preferred drug list for its Medicaid program, patients with hypertension were 39 percent more likely to stop taking their medications than in the year prior to the implementation (Wilson, Axelsen, & Tang, 2005). Thus, health system related factors determine good adherence to anti-hypertensive medications. However, provision of free medication and regular check-up were found to be significantly associated with good adherence, but on multivariate analysis none of the factors was found to be statistically associated with adherence (Kumar, et al., 2014). Although many correlations were weak, the possibility of a causal relationship was often suggested. However, it was found that, the features of a disease, the referral process, the clinical setting and the therapeutic regimen did not seem to influence adherence (Vermeire, et al., 2001).

As evidenced from the literature, numerous factors were found to affect medication non-adherence and demographic variables were less helpful in identifying medication non-adherence. The most typical barriers to drug adherence are under the patient's control, including patient's knowledge and attitudes towards medications (Osterberg &Blaschke, 2005). Therefore, attention to these barriers is essential necessary and an important step to improve adherence.

2.4 Theories and models developed to predict medication non-adherence

There are various theoretical models that have been adapted for health behaviour in predicting the non-adherence phenomenon. The theories used to predict medication non-adherence were classified by Leventhal and his colleagues as biomedical, behavioural learning, communicative, cognitive and self-regulation (Leventhal & Cameron, 1987; Midence & Myers, 1998; Munro, Lewin, Swart, & Volmink, 2007; World Health Organization, 2003a).

The biomedical theory assumes that patients are passive recipients of doctors' instructions (Ross, Deverell, A, 2004). Health or disease has been traced back to biomedical causes such as bacteria or viruses and treatment is focused on the patient's body (Ross, Deverell, A, 2004). In view of the mechanism of the illness, mechanical solutions such as prescribed pills are preferred and non-adherence is understood to be caused by patients' characteristics, such as age and gender (Blackwell, 1992). The limitation of this theory is that it does not take into account the other factors that influence medication adherence, including illness perceptions of patients, psychological and socioeconomic factors (Munro, et al., 2007). Besides, patients are generally *active* decision makers and do not merely receive and follow instructions passively. Therefore, this theory is unlikely to contribute significantly to medication adherence.

Meanwhile, the behavioural learning theories such as Bandura's Social Learning Theory, is characterized by the use of the principles of antecedents and consequences and their influence on behaviour. Antecedents are either internal (thoughts) or external (environmental cues) while the consequences may be punishments or rewards for a behaviour (Leventhal & Cameron, 1987). The probability of a patient following a specific behaviour will partially depend on these variables (Leventhal & Cameron, 1987). In this theory, adherence is considered as a behaviour that can be learned. However, this theory lacks individualized approach and does not consider less conscious influences, such as past behaviour, habits, or lack of acceptance of a diagnosis on behaviour that is not linked to immediate rewards (Blackwell, 1992).

The communicative theories, on the other hand, focus on the importance of communication skills of the health care providers with the patients. According to this perspective, improvement between health care provider and patient can be achieved through patient education and good health care worker communication skills (Ross, Deverell, 2004; World Health Organization, 2003a). However this theory does not guarantee changes of patient behaviour as it ignores attitudinal, motivational and interpersonal factors that may interfere with the reception of the message and the translation of knowledge into behaviour change(Blackwell, 1992).

Furthermore, the cognitive theories are the most widely used theory in studying medication adherence. This theory focuses on cognitive variables as part of behaviour change and it is based on the assumption that attitudes and beliefs, along with expectations of future events and outcomes are the major determinants of health related behaviour (Gebhardt & Maes, 2001). In the face of various alternatives, these theories propose, that individuals will choose the action that will lead most likely to positive outcomes (Gebhardt & Maes, 2001).The major theories in this classification are the Health Belief Model, Social Cognitive Theory, Theory of Planned Behaviourand Protection Motivation Theory.

The Health Belief Model considers health behaviour change as based on a rational appraisal of the balance between the barriers to and the benefits of action. This model suggests that people's beliefs about health problems, perceived benefits of action and barriers to action, and self-efficacy explain engagement (or lack of engagement) in health-promoting behaviour (Janz & Becker, 1984; Rosenstock, 1974). A stimulus, or cue to action, must also be present in order to trigger the health-promoting behaviour (Rosenstock, 1974).However, this model has failed to take into account the influence of social relationships, inability to address behavioural coping skills, and it is capable of predicting only 10% of the variance in the behaviour (Harrison, Mullen, & Green, 1992; World Health Organization, 2003a).

The Social Cognitive Theory was developed by Bandura and evolved from social learning theory (Redding, Rossi, Rossi, Velicer, & Prochaska, 2000). Based on this theory, the basic organizing principle of behaviour change is reciprocal determinism, in which there is a continuous, and a dynamic interaction between the individual, the environment and behaviour (Armitage & Conner, 2000). This theory states that, when people observe a model performing a behaviour and the consequences of that behaviour, they remember the sequence of events and use this information to guide subsequent behaviours (Bandura, 1986). Observing a model can also prompt the viewer to engage in behaviour they already learned (Bandura, 1986; Bandura & Bryant, 2002).

Next, the theory of Planned Behaviour suggests that a person's behaviour is determined by intention to perform the behaviour and that this intention is, in turn, a function of attitude towards the behaviour and subjective norm(Ajzen, 1991). Thus, the behavioural intention is considered as the strongest predictor for the behaviour (Ajzen, 1991). The limitation of this theory is that it assumes that individuals behave rationally and do not consider the impacts of affective beliefs in medication adherence (Mullen, Hersey, & Iverson, 1987).

Meanwhile, the Protection Motivation Theory states that behaviour change may beachieved by appealing to an individual's fears (Rogers, 1975). Three components of fear are the magnitude of harm, probability of that event's occurrence, and the efficacy of the protective response, which are used in this model to explain medication adherence (Rogers, 1975). The advantage of this theory is that it is the only theory within the broader cognitive perspective that uses costs and benefits of the existing and the recommended behaviour to predict the likelihood of change (Gebhardt & Maes, 2001). However, a limitation of this theory is that the various environmental and cognitive variables other than fear are not considered in the theory (Rogers, 1975). The recent version of the theory assumes that the motivation to protect one self from danger is a positive linear function of beliefs (Maddux & Rogers, 1983). In addition, a meta-analysis examining this theory found that, this theory only has moderate effects on behaviour (Floyd, Prentice-Dunn, & Rogers, 2000).

Therefore, there was no single theory that can explain medication non-adherence adequately. Each theory has its own limitations. Thus, a conceptual framework developed by Unni et al. was adapted in this study based on Andersen’s Behavioral and Leventhal’s Common Sense Models developed by Unni et al (Unni & Farris, 2011) with adjustment.

2.5 Classification of medication non-adherence

Two classifications of medication non-adherence were identified, namely, intentional and unintentional medication non-adherences (Atkins & Fallowfield, 2006; Horne & Weinman, 1999; Lehane & McCarthy, 2007b; Lowry, Dudley, Oddone, & Bosworth, 2005; Morisky, et al., 1986; Unni & Farris, 2011; Wroe, 2002). The definition of these two types of non-adherence need to be differentiated in order to comprehend the underlying causes of patients' medication-taking behaviours. Intentional non-adherence happens when patients have issues in motivation to take their medications or how they perceive their medications (Barber, Parsons, Clifford, Darracott, & Horne, 2004). Meanwhile, Wroe et al. stated that patients' with intentional non-adherence will miss or alter their doses to suit their needs(Wroe, 2002). Intentional non-adherence is an active decision on thepart of patients not to adhere to their prescribed therapy(Lehane & McCarthy, 2007a, 2007b). Intentional non-adherence is caused by patients' beliefs about their treatment, disease, prognosis and their experiences with medications (Benson & Britten, 2002; Elliott, Ross-Degnan, Adams, Safran, & Soumerai, 2007; McHorney, 2008; McHorney & Gadkari, 2010).Besides, intentional non-adherence may be demonstrated through non-fulfilment of a new prescription or through discontinuation of an existing medication therapy without the advice of the provider (Gadkari & McHorney, 2010). Elderly people were found to be intentionally non-adherent patients (Lowe, Raynor, Purvis, Farrin, & Hudson, 2000). This was due to their consideration of weighing the perceived costs and benefits of taking a medication, and it was not always due to confusion resulting from old age(Lowe, et al., 2000).

In contrast, unintentional medication non-adherence is a passive process, whereby patients fail to adhere to prescribing instructions through forgetfulness, carelessness, or circumstances out of their control such as health literacy (Lowry, et al., 2005; Wroe, 2002). The common reasons for unintentional non-adherence were forgetfulness, unavailability of medication due to running out of prescription, and being unclear about the proper administration of the drug (Vik, et al., 2004). In addition, concern beliefs in medications were found to be a significant factor of forgetfulness and carelessness in taking medications (Unni & Farris, 2011).

Nevertheless, Gadkari et al, 2012, found that unintentional non-adherence does not appear to be random, but it is predicted by medication beliefs, chronic disease, and socio-demographics. The data suggested that the importance of unintentional non-adherence may lie in its potential prognostic significance for future intentional non-adherence. Health care providers may consider to routinely inquire about unintentional non-adherence in order to proactively address patients' suboptimal medication beliefs before they choose to discontinue the therapy all together (Gadkari & McHorney, 2012). However, patients were able or often exhibit both types of intentional and unintentional non-adherent behaviours (Eliasson, Clifford, Barber, & Marin, 2011; Rees, Leong, Crowston, & Lamoureux, 2010; Sewitch et al., 2003).

Another classification of non-adherence had been suggested by La Greca et al which was based on self-reporting of adherence and drug levels(La Greca, Bearman, & Roberts, 2003). The patients were classified as genuinely adherent, which referred to those who reported excellent adherence but with questionable drug levels, while deniers or medically complicated for those who report excellent adherence and have concerning drug levels, patients at risk for those who report non-adherence and have acceptabledrug levels, and last, genuinely non-adherent for those who reported non-adherence but with concerning drug levels (La Greca and Bearman 2003).

Besides, non-adherence has also been classified as primary and secondary non-adherence (Wamala, et al., 2007). Primary non-adherence takes place when the patient fails to refill the prescribed medication, while secondary non-adherence happens when the patient fails to take the medication as prescribed (Wamala, et al., 2007). Socioeconomic disadvantage was also considered as the reason for primary non-adherence (Wamala, Merlo et al. 2007). Meanwhile, Tomaszewski et al., classified totally non-adherent for those who have complete absence of any prescribed anti-hypertensive medications (or their metabolites where appropriate) in a spot urine sample on screening and partially non-adherent in patients whose urine analysis confirmed the presence of fewer medications than prescribed (Tomaszewski et al., 2014).

As evidenced from the above, classifications that were based on the reasons of non-adherence just focused only on few reasons of non-adherence. On the other hand, the classifications that were based on intentional and unintentional non-adherence only focused on forgetfulness, carelessness, and stopping medications when feeling better or worse reasons. In addition, non-adherent behaviour can also be classified into the following broad categories, namely, erratic non-adherence (doses are missed because of forgetfulness, changing schedules or busy lifestyles), unwitting non-adherence (some patients may be in advertently non-adherent because they have failed to understand fully the specifics of therapy or necessity for adherence) and intelligent non-adherence (sometimes patients alter, discontinue or even fail to initiate treatment). Patients who feel better may decide that they no longer need to take the prescribed medications) (Singh & Kansra, 2006).

However, the literature has indicated several other important reasons why individuals are non-adherent to medications and these classifications fail to capture these other reasons of non-adherence. Most of these classifications consider forgetfulness as unintentional non-adherence. However, researchers have discovered the belief component in forgetfulness, thus makingthese typologies inaccurate. Besides, the literature on interventions to improve adherence suggests the need to have tailored interventions, which in turn require a typology basedon the reasons of non-adherence so that appropriate interventions can be developed. If more reasons for non-adherence were included in the new typology of medication non-adherence, health care providers could develop more tailored interventions. Furthermore, most studies have considered medication non-adherence as a single entity in identifying the factors in predicting non-adherence, as well as in identifying the predictors and developing interventions to improve medication non-adherence (Murray, et al., 2004).

2.6 Interventions to improve medication non-adherence

Various interventions either alone or in combination have been utilized to improve medication adherence. These include providing education to patients and caregivers through increased communication via counselling and health education, simplification of dosage regimens, involvement of allied health professionals such as nurses and pharmacists, special monitoring such as blood pressure self-measurement and motivation strategies such as financial incentives, reminder packages and reminder aids including diaries or follow-up appointments (McDonald, Garg, & Haynes, 2002; Schroeder, Fahey, & Ebrahim, 2004; Vermeire, et al., 2001; Vik, et al., 2004). A variety of interventions to improve adherence to anti-hypertensive medication have been evaluated in randomized trials, but they have failed to identify the effective interventions (Viswanathan et al., 2012). There were also systematic reviews done to identify the evidence in this field. However none of these reviews could recommend any single approach that increased adherence to blood pressure lowering medication (Dunbar-Jacob, Dwyer, & Dunning, 1991; Ebrahim, 1998; McDonald, et al., 2002; Morrison, Wertheimer, & Berger, 2000; Roter et al., 1998).

Moreover, most interventions that were used to improve adherence focused on providing education to increase knowledge; simplifying medication regimen (fewer drugs or fewer doses); or making it easier to remember (adherence aids, refill reminders). However, simplifying a dosage regimen is unlikely to affect a person who does not believe that taking medications is important or that the therapy will improve his or her health, and the available evidence shows that knowledge alone is not enough for creating or maintaining good adherence habits (World Health Organization, 2003a).

Furthermore, interventions based on overcoming patient barriers, such as memory, dexterity, and vision by using pill boxes and calendars were also discussed in the literature (Porter, Taylor, Yabut, & Al-Achi, 2014; Vermeire, et al., 2001; Vik, et al., 2004). Besides, Martin et al., 2013, reported that communication skills training programs targeting emotion-handling and rapport-building behaviours were promising strategies to reduce disparities in healthcare and to enhance trust among ethnic minority patients (Martin, Roter, Beach, Carson, & Cooper, 2013). On the other hand, Polinski et al., 2014, advocated that developing decision support interventions that strengthen the patient-provider relationship by enhancing provider credibility and patient trust prior to prescribing may provide more effective approaches for improving primary adherence to anti-hypertensive medication (Polinski et al., 2014).Meanwhile, a meta-analysis suggested that across acute and chronic disease states, and reducing dosage frequency from multiple dosing to once daily dosing may improve adherence to therapies among patients (Srivastava et al., 2013). Besides, the training of community health workers could potentially have a significant impact on chronic conditions in South Africa and other middle-income countries leading to improved blood pressure control and reduced strokes and myocardial infarctions (Gaziano, 2014). Health care professionals, other than physicians, pharmacists and nurses, have a significant role in their daily practice to improve patient medication adherence (Jimmy & Jose, 2011).

A systematic review by Cutrona et al.,2010, found that adherence interventions utilizing non-physician healthcare professionals are effective in improving cardiovascular medication adherence, but further study is needed to identify the optimal role of physicians (Cutrona et al., 2010). On the other hand, a pharmacy care program led to an increased in medication adherence from 61.2% to 96.9% using an intervention consisting of pharmacist counselling and reminder medication packaging, whereas discontinuation of the program was associated with a decreased medication adherence and persistence (Lee, et al., 2006). However, generalization of the study was uncertain due to the mean age of the participants, which was 78 years old and they were taking an average of nine medications for chronic diseases (Lee, et al., 2006).

In addition, pharmacists also have a role to enhance adherence to long-term treatment (Van Wijk, Klungel, Heerdink, & de Boer, 2005). Besides, pharmacist intervention can significantly increase disease-related knowledge, blood pressure control, and medication adherence among patients with hypertension (Fahad Saleem et al., 2013)

It was found that greater adherence to the Dietary Approaches to Stop *Hypertension (*DASH) was associated with larger blood pressure reductions and independent weight loss (Epstein et al., 2012). Registered dietitians, can positively have an impact to the public health, as well as health outcomes for the individuals that they counsel (Slawson, Fitzgerald, & Morgan, 2013). Dietitian interventions such as dietary advice are necessary for chronic disease patients in helping them to adhere to healthy diet and to reduce their blood pressure (Slawson, et al., 2013).

A systematic literature review of interventions to improve medication adherence reported that drug reminder packaging, such as weekly pillboxes or multidrug punch cards, were widely used in everyday practice (Boeni, Spinatsch, Suter, Hersberger, & Arnet, 2014). Meanwhile, Rajpura and Nayak, 2014, concluded that interventions and programs aimed at building adherence among elderly hypertensive patients need to recognize the value and the importance of their perceptions towards illness and medications in shaping their adherence behaviour (Rajpura & Nayak, 2014). In the study, they found that threatening views of illnesses and stronger beliefs of the necessity of medications contribute substantially to positive medication adherence (Rajpura & Nayak, 2014). A systematic review in elderly population by Higgins and Reggan, 2004, noted that the majority of the interventions considered the patients to be passive recipients while designing interventions (Higgins & Regan, 2004).

Boulwareet al., 2001, suggested that counselling offered blood pressure improvement over usual care, and adding structured training courses to counselling may further improve blood pressure. These interventions may act as an adjunct to pharmacologic therapy (Boulware et al., 2001).However, there is insufficient evidence to conclude if self-monitoring of blood pressure or training courses alone offer consistent improvement in BP over counselling or usual care (Boulware, et al., 2001). Besides, adherence increased most consistently with behavioural interventions that reduced dosing demands (Kripalani, Yao, & Haynes, 2007). Haynes et al., 2005, classified interventions based on the duration of treatment as short term and long term treatments (Haynes et al., 2005). Almost all interventions that were effective for longtermcare were complex, including combinations of more convenient care, information, reminders, self-monitoring, reinforcement, counselling, family therapy, psychological therapy, crisis intervention, manual telephone follow-up, and supportive care. However, even the most effective interventions did not lead to large improvements in adherence and treatment outcomes (Haynes, et al., 2005). Besides, the characteristics and the effects of interventions to improve medicine adherence are varied among studies. It is uncertain how medicine adherence can be consistently improved so that the full health benefits of medicines can be realized. We need more advanced methods for finding ways to improve medicine adherence, including better interventions, better ways of measuring adherence, and studies that include sufficient patients to draw conclusions on clinically important effects (Haynes, Ackloo, Sahota, McDonald, & Yao, 2008). While, reminder packing may represent a simple method for improving adherence among patients with selected conditions, this issue warrants further research to improve the design and the target of these devices (Mahtani, Heneghan, Glasziou, & Perera, 2011).

The addition of a structured physician-nurse approach supported by remote telemonitoring of blood pressure is likely to improve outcome in patients with uncontrolled hypertension (Bernocchi, Scalvini, Bertacchini, Rivadossi, & Muiesan, 2014)

Nonetheless, no single strategy appeared to be the best method (Peterson, Takiya, & Finley, 2003). Besides, a systematic review by van Eijken et al., 2003, reported that, multifaceted interventions and tailored interventions seemed to result more often in differences in compliance rates in older adults in favour of the intervention group compared to a control group with single and generalized interventions (van Eijken, Tsang, Wensing, de Smet, & Grol, 2003).

Although a vast number of studies focussing on developing interventions to improve medication adherence had been conducted, the success rates of these interventions still remained low. This might be due to the complexity and the ineffectiveness of the current interventions in improving medication adherence with chronic medications (Van Wijk, et al., 2005). A review of literature also revealed the importance of providing multifaceted and tailored interventions in improving medication non-adherence (McDonald, et al., 2002; Van Wijk, et al., 2005). Therefore, understanding the typology for each type of non-adherence and factors affecting non-adherence are vital before designing any intervention program to improve adherence.

2.7 Measurement of medication adherence

There are different methods for assessing adherence to medications. Although several methods are available for the assessment of adherence, identifying the accurate measurement is challenging (Vik, et al., 2004). These methods can be classified as direct and indirect (Osterberg & Blaschke, 2005). Directly observed therapy are measurement of concentrations of a medicine or its metabolite in blood or urine, and detection or measurement in blood of a biologic marker added to the drug formulation (Osterberg & Blaschke, 2005). Meanwhile, indirect methods of measurement of adherence include asking the patient about how easy it is for him or her to take the prescribed medication, assessing clinical response, performing pill counts, ascertaining rates of refilling prescriptions, collecting patient questionnaires, using electronic medication monitors, measuring physiologic markers, asking the patient to keep a medication diary, and assessing children's adherence by asking the help of a caregiver, school nurse, or teacher (Osterberg & Blaschke, 2005). The selection of a measurement approach depends on the type of intervention being evaluated, the resources of the organization, and ethical and legal considerations related to patient intervention and confidentiality (Fairman & Matheral, 2000). Each of these methods has its advantages and disadvantages, and the use of a specific method to measure adherence depends on the clinical scenario and the availability of the relevant data.

Without doubt, direct approaches are expensive, burdensome to the health care provider, and susceptible to distortion by the patient. However, for some drugs, measuring these levels is good and it has been commonly used as a means for assessing adherence. For example, high rates of non-adherence to anti-hypertensive treatment were revealed by high-performance liquid chromatography-tandem mass spectrometry urine analysis (Tomaszewski, et al., 2014).

On the contrary, indirect methods, such as questioning thepatient (or using a questionnaire), looking into patient diaries, and assessing clinical responses, are all methods that are relatively easy to use, but questioning the patient can be susceptible to misrepresentation and tends to result in the health care provider overestimating the patient's adherence (Osterberg & Blaschke, 2005). The most commonly and widely used self-reporting measures of medication adherence scale for hypertension are the Morisky Medication Adherence Scale (MMAS) and the Hill-Bone Compliance to Medication Scale (Kim, et al., 2000; Morisky, et al., 1986). The MMAS classifies non-adherence as intentional and unintentional related to forgetfulness, carelessness and stopping medications when feeling better or worse (Morisky, et al., 1986). Meanwhile, the Hill-Bone Compliance to Medication Scale addresses barriers and self-efficacy of patients' in taking their medications (Kim, et al., 2000). Besides, some measurement such as pill counts, do not accurately capture the exact timing of medication taking, and the data can be manipulated by patients, such as pill dumping (Ho, Bryson, & Rumsfeld, 2009). This method appeared to underestimate medication adherence (Grymonpre, Didur, Montgomery, & Sitar, 1998). However, pill counts may offer a simple and a cost-effective intervention to improve patient outcomes in resource limited setting (Achieng et al., 2013). In addition, electronic pharmacy data are becoming more widely available, and this is one of the more frequently used methods. The most commonly used measures of medication adherence based on pharmacy data are the medication possession ratio and the proportion of days covered methods, which essentially are defined by the number of doses dispensed in relation to a dispensing period (Beinan Zhao & Wong; Ho, et al., 2009). The use of pharmacy prescription refill data, however, requires patients to obtain their medications within a closed pharmacy system. Furthermore, the medication possession ratio and proportion of days covered measures of medication adherence correlate well with the quantity of doses taken, but not the timing of the doses. The assessment of adherence with these measures become more difficult when the length of follow-up varies between patients (Choo et al., 1999). The use of medication event monitoring system (MEMS), in estimating the number of tablets missed will help the health care provider to understand the frequency and time of opening medication bottle (Vermeire, et al., 2001; Vik, et al., 2004). The disadvantage of this method are the difficulty in establishing the actual consumption of medication and it is expensive (Vermeire, et al., 2001; Vik, et al., 2004).

Guidelines for improving patient adherence must be tailored to the cultural backgrounds of the individual patients. Although some research had shown positive correlates and outcomes of partnerships when patients and physicians were of the same ethnic background (Cooper-Patrick et al., 1999; Cooper et al., 2003) other studies have failed to demonstrate this effect and suggested that matching physicians and patients according to their ethnicity is not necessary(Jahng, Martin, Golin, & DiMatteo, 2005).

Clinical outcomes, such as blood pressure level is the reasonable measures of adherence. However, this outcome may be the result of a combination of factors, including other medications, medical care received, socioeconomic and cultural factors (Haynes & Sackett, 1979). A systematic review by Hodgkinson et al., reported that neither clinic nor home measurement had sufficient sensitivity or specificity to be recommended as a single diagnostic test (Hodgkinson et al., 2011). In conclusion, there is no gold standard for measuring medication non-adherence and the methods as reported in the literature depend on the objective of the study.

CHAPTER 3 : RESEARCH METHODOLOGY

This chapter describes and explains the mixed methods used in the study, which involves the collection, analyses and the combination of both quantitative and qualitative data within the context of a single study. The sub-topics describe the study area, rationale for applying a mixed methods research design, research paradigm, and philosophical assumptions underlying the qualitative study. The research design and the research procedures are described accordingly for the quantitative and the qualitative phases. The individual phases of the study which are; Part I is the quantitative study (pilot study); Part II is the qualitative study; Part III is also a quantitative study (major survey). This chapter also describes the appropriate sampling methods, study instruments, and the statistical methods used. The purpose of this chapter is to provide the readers with detailed explanation regarding the methods used to collect data and how the findings were derived. Figure 3.1, Figure 3.2 and Figure 3.3, provides a visual flow of the exploratory sequential mixed methods approach that was employed that shows the phases involved in this study.

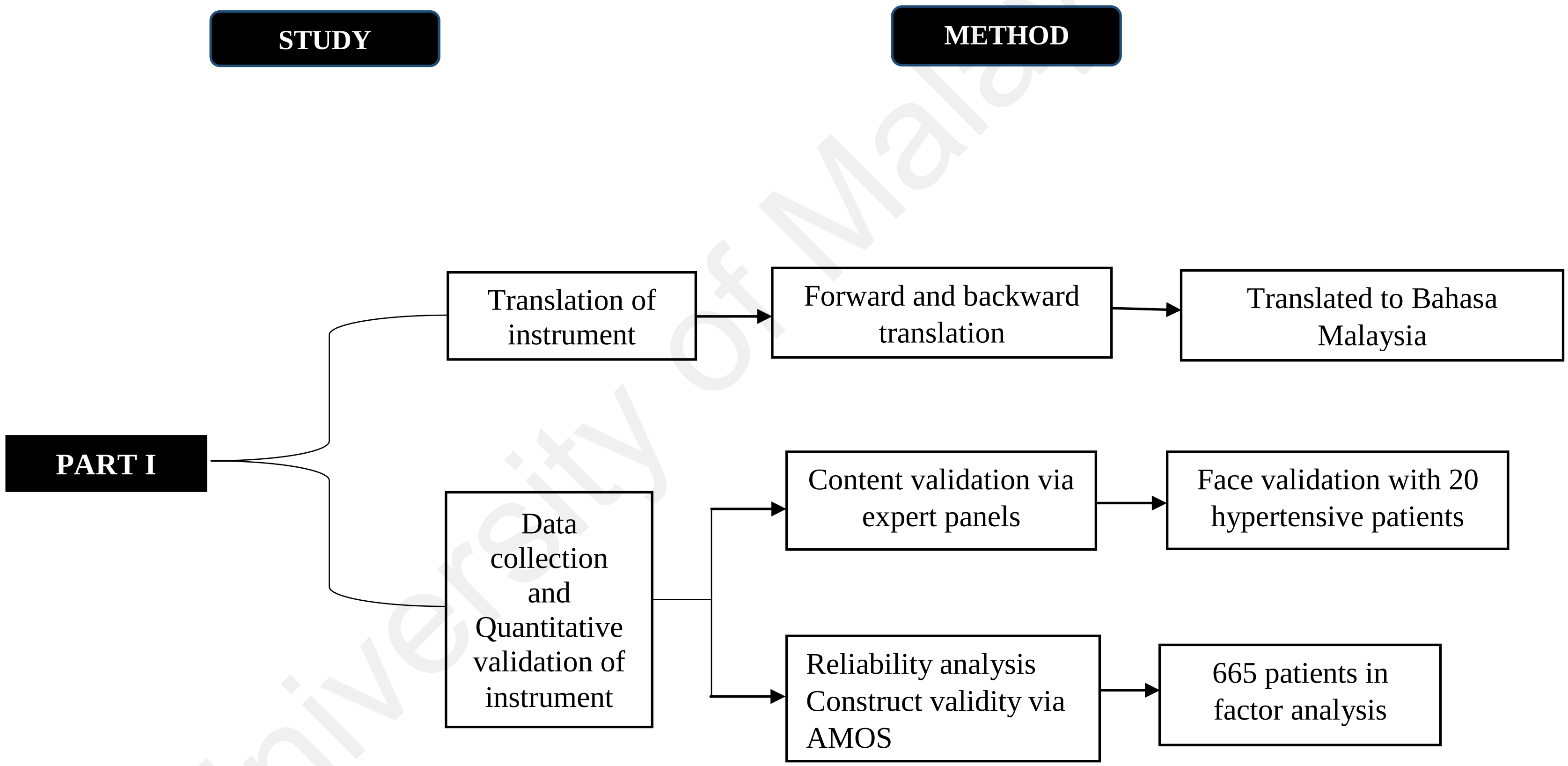


Figure 3.1: Visual Flow of the Quantitative Study in Part I

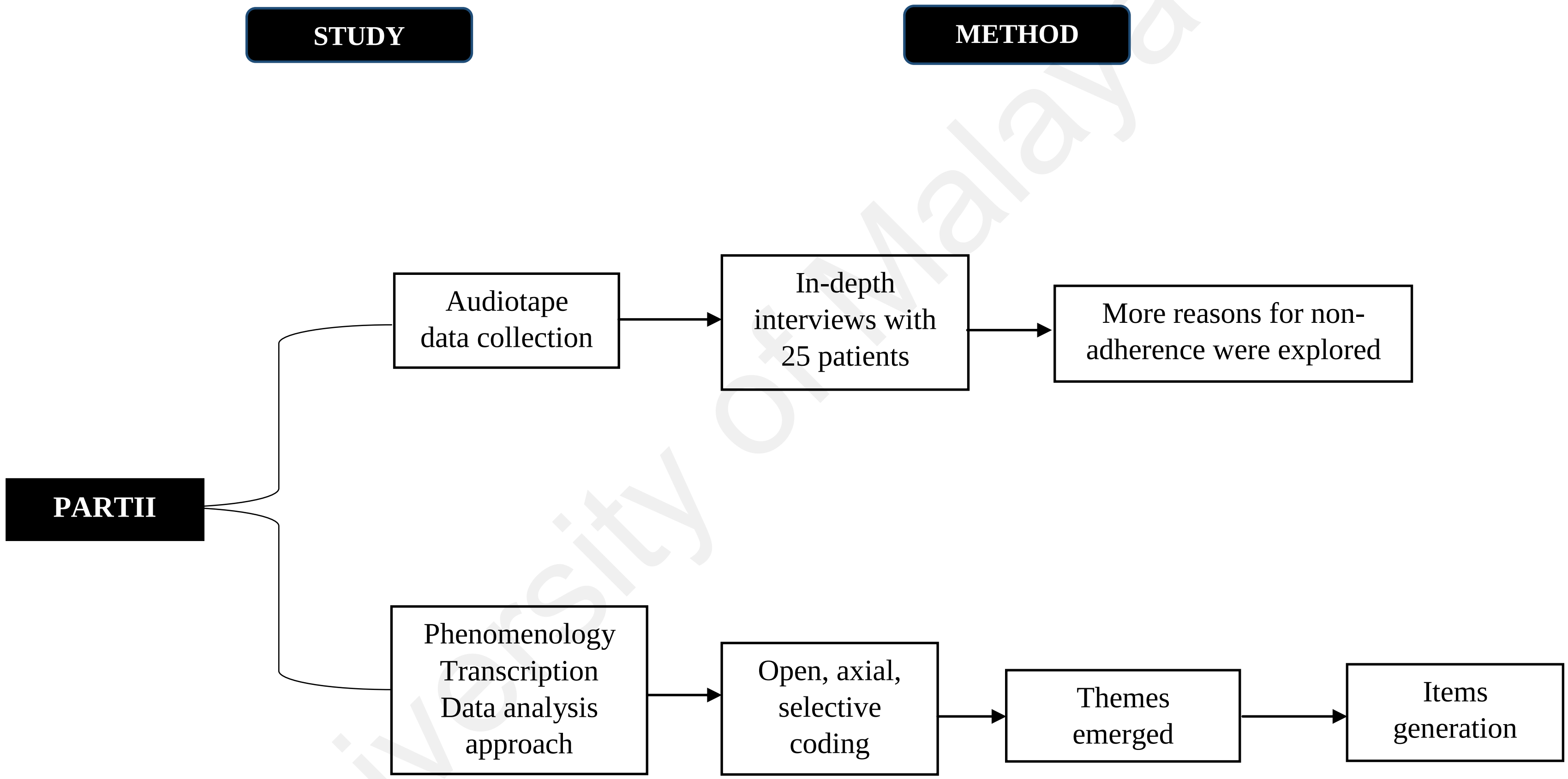


Figure 3.2: Visual Flow of the Qualitative Study in Part II

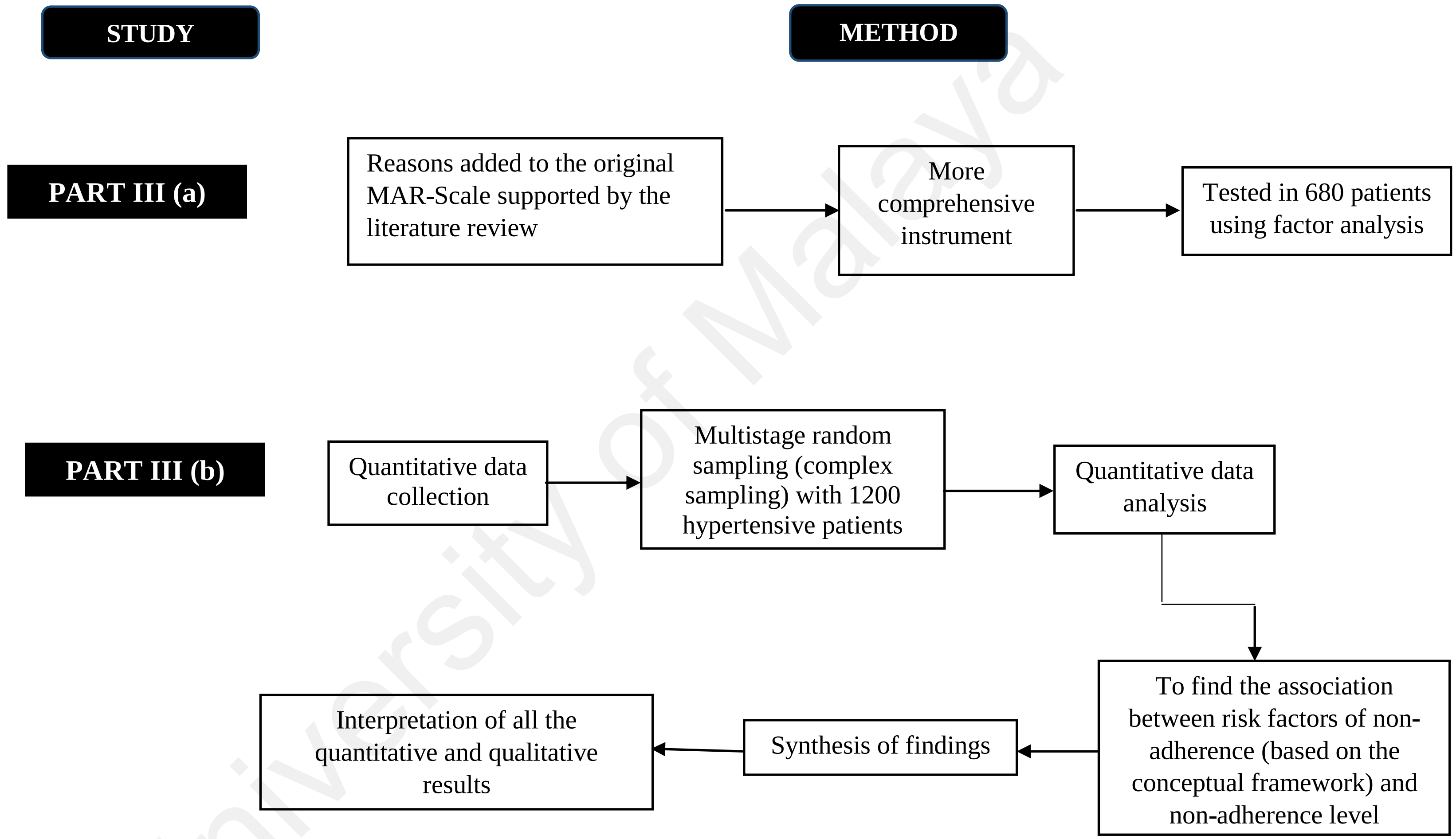


Figure 3.3: Visual Flow of the Quantitative Study in Part III

3.1 Ethical Consideration

The ethical approval for this study was obtained from both the Malaysian Ministry of Health, National Medical Research Registration (NMRR) number 12-625-12500 and the University of Malaya Medical Centre (UMMC) Medical Ethics Committee number 914.5. Documents related to the approval of this study are as attached in Appendix F and G.   .

3.2 Study Area and population

The study area was Hulu Langat and Klang districts in the state of Selangor, Malaysia. Selangor consists of nine districts as depicted in Figure 3.4.

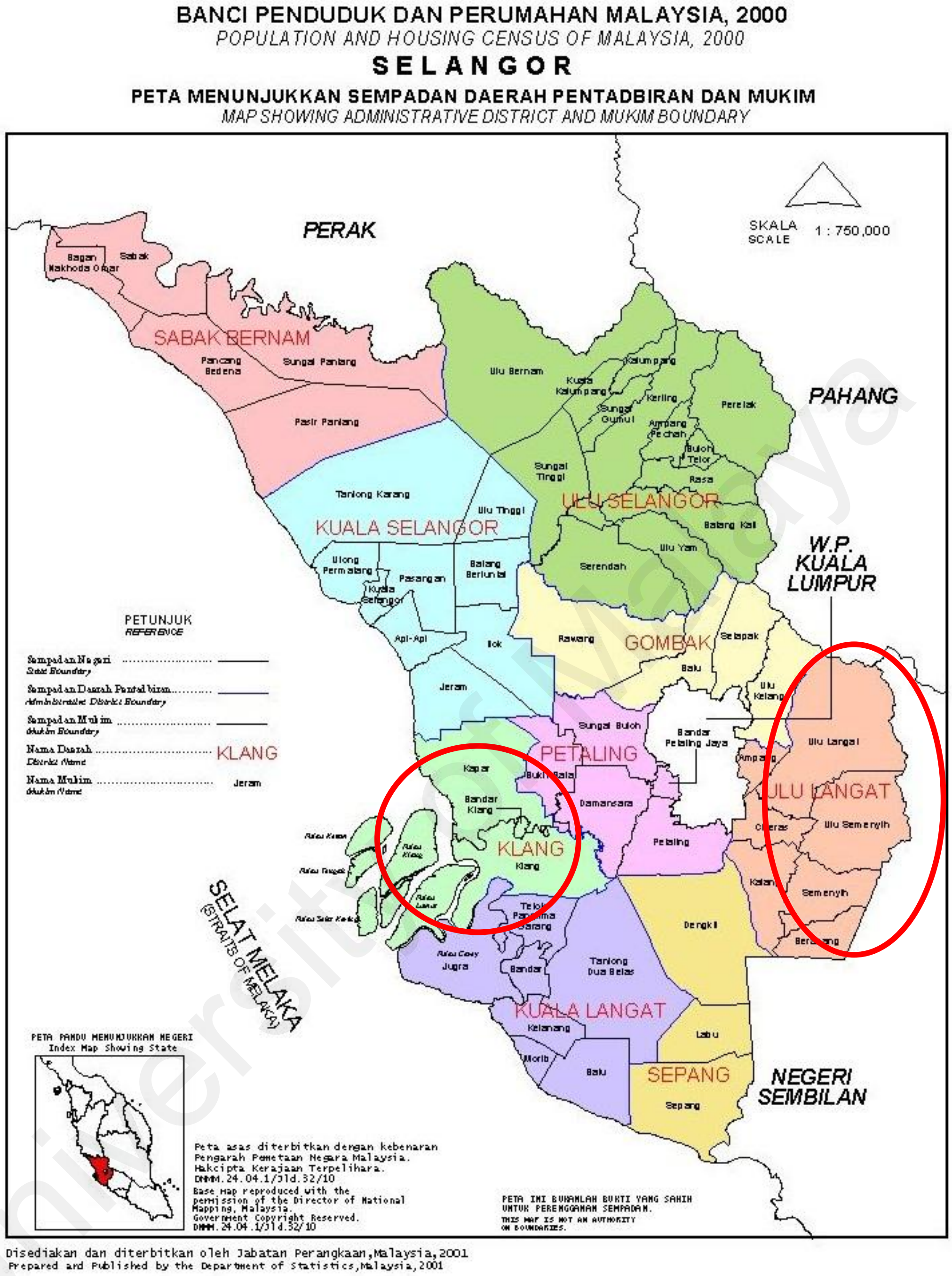


Figure 3.4: Map of Selangor State According to the Districts

Selangor state has the highest population density in Malaysia (5,345,454)(Department of Statistics, 2010). In August 2005, the state of Selangor gained the recognition of a developed state and is the first state to receive such award in Malaysia. The Petaling district is an area of rapid development and has the highest population followed by Hulu Langat and Klang districts. The study population was a group of hypertensive patients attending government health clinics for follow-up in Hulu Langat and Klang districts. These clinics serve patients that come from lower socioeconomic status to the affluent. The population in Hulu Langat District had been 1,156,600 populations which was the second highest population after the Petaling district in Selangor, 1,812,633 populations, and then followed by the Klang district (842,146) ((Department of Statistics, 2010).

The population in Hulu Langat district consisted of 575,485 Malays; 355,741 Chinese and 113,808 Indians (Department Of Statistics, 2010). It has nine health clinics namely Klinik Kesihatan Batu 9, Klinik Kesihatan Batu 14, Klinik Kesihatan Semenyih, Klinik Kesihatan Beranang, Klinik Kesihatan Kajang, Klinik Kesihatan BandarBaru Bangi, Klinik Kesihatan Bandar Seri Putra, Klinik Kesihatan Ampang and Klinik Kesihatan Sungai Chua.

The population in the Klang district (784,212) consisted of 376,606 Malays, 225,425 Chinese, and 165,382 Indians(Department Of Statistics, 2010). There are nine Health Clinics under the Klang district, namelyKlinik Kesihatan Pelabuhan Klang, Klinik Kesihatan Anika, Klinik Kesihatan Pandamaran, Klinik Kesihatan Meru, Klinik Kesihatan Botanik, Klinik Kesihatan Kapar, Klinik Kesihatan Pulau Ketam, Klinik Kesihatan Pulau Indah and Klinik Kesihatan Bukit Kuda.

3.3 The Study Design

This study addressed the reasons for non-adherence to anti-hypertensive medication among hypertensive patients attending primary health clinics. The purpose of this three-parts, exploratory sequential mixed methods study was to explore the participants' views with the intent of using this information to develop and test an instrument among Malaysian sample from two districts in the state of Selangor, Malaysia. The first part was the quantitative study (pilot study) to examine the construct validity and reliability of the 15- item Medication Adherence Reasons Scale (MAR-Scale). However, the results in Part I showed that although the final model was valid, it could only suitable to be used across gender but not across the major ethnic groups in the Malaysian population. Therefore, a qualitative study (Part II) was carried out to explore patients' experiences regarding their illnesses and reasons, which influenced them for not following the hypertensive care recommendations (anti-hypertensive medication intake) among the different ethnicities of hypertensive patients attending government primary health clinics in Selangor, Malaysia. Statements and/or quotes from the qualitative study data were then developed and added to the original MAR-Scale (supported with literature), so that it could be tested and a comprehensive scale could be applied across the major ethnic groups.

The third part (major survey) was a quantitative study which was divided into two sections namely, Phase III (a) and III (b). Phase III (a), was to develop the Medication Adherence Reasons Scale (myMAR-Scale), and tested among thehypertensive patients attending government primary health clinics in Selangor, Malaysia. The original version of MAR-Scale was used, and incorporating the reasons identified in PartII, that is sensitive to the three major ethnic groups (Malay, Chinese and Indian) in the Malaysian population.

This was followed by examination of the construct validity and reliability of the modified MAR-Scale for Malaysians (myMAR-Scale). Phase III (b) was the examination of the association between the level of blood pressure control (poor and well) to anti-hypertensive medication, and the variables in the theoretical framework of medication non-adherence used in this study based on Andersen's Behavioural Model and Leventhal's Common Sense Model were done.

3.4 Rationale for Mixed-Methods Study

This study design was chosen for two reasons:

i. The results of the first part showed that although the final model was valid, it is only suitable to be used across gender but not across ethnicity in the Malaysian population. Therefore, a qualitative study (Part II) was carried out to explore patients' experiences with their illnesses and reasons for non-adherence to anti-hypertensive treatment. A qualitative study need to be done as a follow-up of validation study in Part I. This was followed by quantitative study (Part III) which was the correlational research methodology to examine between factors affecting non-adherence to anti-hypertensive medication and non-adherence level. Therefore, this study design was chosen when one methodology does not provide all the information required. It provides better understanding of a research problem or issue than either research approach alone.

ii. Although literature review had identified some reasons pertaining to non-adherence to anti-hypertensive medications, other reasons need to be explored since the Medication Adherence Reasons scale (MAR-scale) validated in study Part I only suitable to be used across gender among multi-ethnic population of hypertensive patients in Malaysia. Therefore, there is a need to explore further (by doing Study Part II-qualitative study) to explore if there is any more reasons affecting non-adherence to anti-hypertensive medication among this group of patients.

iii. Although literature review had identified some reasons pertaining to non-adherence to antih-hypertensive medications, other reasons need to be explored, particularly in the multi-ethnic Malaysian population.

iv. Multiple reasons of anti-hypertensive medication non-adherence identified in the study required specific statistical analysis to confirm the relationships among the variables. For example, the identified reasons were developed and identified through items development using the NVivo Software (for analyzing the qualitative study in Part I). The items were further validated through factor analysis using Amos Software [for analyzing the Part III(b) study]. Therefore the combination of multiple statistical software are needed to analyze the results in each Part of the study process.

3.5 Methods of the Part I (quantitative study)

Following the research procedures discussed earlier, the first part involved quantitative data collection and analysis. The existence of an instrument developed in the Western region raised the researcher's interest regarding the applicability of the instrument to identify reasons for non-adherence to anti-hypertensive medication among hypertensive patients in the Malaysian population, within the environment of government primary health clinics.

This part focused on the validation process of the MAR-Scale among the hypertensive patients attending government primary health clinics at the Hulu Langat and Klang districts in the state of Selangor, Malaysia. This study is a cross-sectional study, which involved the examination of the reliability and construct validity of the original 15 item MAR-Scale and represented the first validation study of this instrument in Malaysia. The methodology, data collection, and data analysis of the study are explained in this section.

3.5.1 Instrument

Medication Adherence Reasons Scale (MAR-Scale)

A major disadvantage in the existing medication adherence literature is the non-existence of a gold standard for measuring medication non-adherence. The objective assessments of non-adherence are, biological assays, pill counts, and prescription claims, while quantifying non-adherence does not provide the reasons for non-adherence, thus making it tough to evolve intervention strategies. Self-reported measures,such as self-administered questionnaires, are helpful to determine reasons for non-adherence because it is fast and cheap. However, the widely used self-reported measures such as the Morisky Medication Adherence Scale (MMAS)(Morisky, et al., 2008; Morisky, et al., 1986) and the Hill-Bone Compliance to Medication Scale (Kim, et al., 2000) are restricted to only a few potential reasons for non-adherence. Therefore, if more reasons of non-adherence can be identified, it is likely to explain medication non-adherence to a greater extent.

A review of medication adherence from 1996 to 2002 by Vik et al. has identified the ten most frequently reported reasons for non-adherence such as forgetfulness, side effects, asymptomatic/thinking that the medication is not needed/feeling well without medication, running out of prescription, medication is ineffective, taking too many medications, unclear about proper administration, difficulty in swallowing, problems opening containers, and stopping medication to see whether if it is still needed (Vik, et al., 2004). Unni et al., have further identified five other frequently reported reasons for non-adherence and these were added to become the 15 items (Unni & Farris, 2009). The reasons found were cost of medications, concern about long-term effects of medication, embarrassment in taking medications in a public place, and inconvenience in taking medications as prescribed (Horne & Weinman, 2002; Piette, Heisler, & Wagner, 2004; Sirey et al., 2001; Soumerai et al., 2006; Svensson & Kjellgren, 2003).

In this scale, the participants were asked to indicate how often they had been non-adherent with their anti-hypertensive medications for each of the reasons using a five point Likert scale ranging from '*None of the time*' to '*All of the time'* (1= *None of the time*and 5= *All of the time*) (Wroe, 2002). The domains and items in the 15 items MAR-Scale are as listed in Table 3.1.

Table 3.1: A Description of the Five Domains and 15 items in the Medication Adherence Reasons Scale (MAR-Scale)
(Unni & Farris, 2009)

Domain	Number of items	Example of items	Scoring[a]
MI (Managing issues)	4	K2=Difficulty swallowing medication K4=Unclear about proper administration K15=Problems opening containers K9=Embarrassment in taking medication	(1= None of the time and, 5= All of the time).
MM (Multiple medication issues)	3	K14=Concern about long term effects of medications K7=Taking too many medications K3=Cost of medications	(1= None of the time and, 5= All of the time).
BI (Belief issues with medications)	4	K10=Medication is ineffective K11=Side effects/Fear of side effects K12=Medication is not needed K13=Stop medication to see whether it still needed	(1= None of the time and, 5= All of the time).
AI (Availability issues)	2	K1=Medication not available in the pharmacy K6=Ran out of prescription due to busy schedule	(1= None of the time and,5= All of the time).
FC (Forgetfulness and convenience issues)	2	K5=Forgot due to busy schedule K8=Inconvenience in taking medications as prescribed	(1= None of the time and, 5= All of the time).

[a]None of the items were reversely coded, so all the items are scored in the same direction; higher numbers indicate more to non-adherence to antihypertensive medication

Translation

Forward and backward translations were implemented. The original English version of the MAR-Scale was translated into Bahasa Malaysia, which is the official language in Malaysia by a graduate school teacher and a public health specialist. Both of them were bilingual and they undertook the translation independently. Backward translation from the Bahasa Malaysia version into English was undertaken by a two bilingual public health specialists. These translators were blinded to the original English version for the purpose of cross-cultural harmonization (Wild et al., 2005).

Content validity

Content validity was assessed from the opinion of three experts (one internal medicine specialist, one family medical specialist and one public health specialist) to ensure that each domain and item in the scale represents reasons for non-adherence to anti-hypertensive medication. The Bahasa Malaysia version of the questionnaire was ensured thus, retaining the same meaning as the original version.

Face validity

A small scale preliminary test was conducted using a convenience sample of twenty hypertensive patients who did not have a medical or research background to assess the face validity in terms of the language, clarity and time to complete the questionnaire. Face validity is the extent to which a test is subjectively viewed as relevant to the test participants (Gravetter & Forzano, 2010; Holden, 2010). Any discrepancies were rectified. Following all the mentioned approaches, all fifteen items were found to be suitable, relevant and important to ask.

This validation study was conducted to evaluate the psychometric properties of the instruments among hypertensive patients in local population. This section reports on test-retest reliability, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

3.5.2 Participants and Settings

The translated questionnaire was administered to patients attending four randomly selected government primary health clinics in Hulu Langat (Bangi and Semenyih Health Clinics) and Klang (Meru and Health Clinics) districts in the state of Selangor, Malaysia. These primary health clinics serve patients ranging from lower socioeconomic status to middle socioeconomic status.

Data collection was conducted between December 2012 until end of March 2013. Hypertensive patients while awaiting for their appointments at Chronic Disease clinics were approached. They were given an information sheet and informed consent forms for participation in the study. The inclusion for selecting the respondents were patients diagnosed with essential hypertension for at least six months, Malaysian Nationality, age above 18 years old and able to read and understand English and Bahasa Malaysia. Self-administered questionnaires which took 15 minutes to complete were given for those who consented to participate in the study.

3.5.3 Sample size and sampling method

The sample size of this study was based on Comrey and Lee's very good to excellent category which stated that there must be at least 10 to 15 subjects per items (Comrey & Lee, 2013). Systematic random sampling was applied where every third hypertensive patients were selected. A total of 220 eligible hypertensive patients were approached and 185 patients participated in EFA. In CFA, a total of 580 hypertensive patients were approached and 480 hypertensive patients participated. The overall response rate of this pilot study was 83% (665/800).

The developed questionnaire was divided into two sections; Section A: Socio-demographic. The Section B included the original 15 item Medication Adherence Reasons Scale (MAR-Scale).

Procedures

Participants completed surveys on two separate occasions, separated by an interval of two weeks to evaluate the test-retest reliability. After the participants were selected, their blood pressure were recorded while they were waiting in front of the consultation room. The developed questionnaires were administered to the participants while they wait in the pharmacy waiting area after they had completed consultation with the doctor. This is to avoid any interruption and discomfort to the doctors managing the patients.

Test-retest Reliability Analysis

Test-retest reliability was designed to re-administer the questionnaire after two weeks to the same subjects to measure its stability over time. This is to ensure that consistent results will be produced when the same entities are measured under different conditions (Field, 2009). The two weeks interval was selected so that reliability estimates were not due to memory effects (Garson, 2012). Cohen Kappa (*k*) was used for reliability analysis for this survey because it is a common technique for estimating paired inter-rater agreement for nominal and ordinal-level data (Fleiss, Levin, & Paik, 1981). Whereas, the intra-class correlation coefficient (ICC) ignores orders and treats as a random sample from a population (Bland & Altman, 1990). Hence, weighted kappa is appropriate for this study as the scale used was ordinal scale. The criteria for test-retest reliability according to Landis and Koch (Landis & Koch, 1977) are as shown in Table 3.2.

Table 3.2: Criteria for Test-Retest Reliability according to Landis and Koch (Landis & Koch, 1977)

Test-retest reliability	**Cohen's Kappa (*k*)**
Poor agreement	Less than 0
Slight agreement	0.01 to 0.20
Fair agreement	0.21 to 0.40
Moderate agreement	0.41 to 0.60
Substantial agreement	0.61 to 0.80
Almost perfect agreement	0.81 to 1.00

Internal Consistency Reliability

Reliability is defined as the "consistency of measurement, the extent to which similar results are obtained through different forms of the same instruments or occasions of data collection" (McMillan & Schumacher, 1997). The internal consistency reliability measures how well the items in the test measure the same construct or idea and ensure that the construct is truly measuring the intended dimensions (Hair, 2009). Therefore it is necessary for examining the validity of the measurement and must be established before construct validity (Hair, 2009).

The internal consistency of the items in the scale was estimated withCronbach's alpha as it has been widely accepted for estimation of internal consistency reliability of a scale (Hair, 2009). The Cronbach's alpha value was calculated for each domain and the value ranged from 0 to 1. A cut off point at 0.70 or higher is widely accepted for a set of items in a scale. Some researchers use 0.75 or 0.80; and some use 0.60 for studies using large sample size (Garson, 2012; Robinson, Shaver, & Wrightsman, 1991).

3.5.4 Statistical Analysis

Statistical analyses were done using the SPSS software for Windows (Version 19.0, Chicago, IL, US) (IBM) and SPSS Amos (Version 21, Chicago. IL, US) (IBM). Multivariate outliers were checked using Roderick Little's chi-square statistic for testing whether values are missing completely at random (MCAR) and this test revealed a non-significant p-value completely missing at random, that is, the missing values do not depend on the values of variables in the data set subject to analysis (Donders, van der Heijden, Stijnen, & Moons, 2006; Hair, 2009; IBM). The assumption of univariate normality was assessed through variable skewness and kurtosis. Descriptive analyses were undertaken to obtain frequencies, proportions, means and standard deviations.

Factor Analysis

The construct validity was assessed via factor analysis. Construct validity is "the extent to which a set of measured items actually reflects the theoretical latent construct those items were designed to measure" (Hair, 2009). Factor analysis is "an interdependence technique whose primary purpose is to define the underlying structure among the variables in the analysis" (Hair, 2009). Factor analysis can be used to verify and confirm the number of dimensions or psychological constructs in a model (Churchill, 1979). Exploratory factor analysis and confirmatory factor analysis were done in this study. Exploratory factor analysis is used to determine how many factors are necessary to explain the interrelationships among a set of characteristics, indicators, or items (Tabachnick & Fidell, 2001). It provides key information of the underlying factor structure necessaryto test the replication of the factor structure with a confirmatory factor analysis (Worthington & Whittaker, 2006). Whereas confirmatory factor analysis is “a way of testing how well measured variables represent a smaller number of constructs” (Hair, 2009).

Exploratory factor analysis involves six stages: (1) assessing the characteristics of the correlation matrix, (2) extracting the initial factors (3) rotating the factors (4) evaluating and refining the factors (5) interpreting factors and generating factor scores and (6) reporting the results. Justification for undertaking factor analysis were determined via Barlett’s test of sphericity and Kaiser-Meyer-Olkin Test (KMO) procedure (Worthington & Whittaker, 2006). This procedure is to determine whether there are sufficient numbers of significant correlations among the items (Pett, Lackey, & Sullivan, 2003) and the satisfactory value should be more than 0.6 (Gray & Kinnear, 2012). Measures of sampling adequacy (MSA) was done to ensure that there are no problems with multicollinearity (that is values of $r \geq 0.80$), which indicates that the correlations among the individual items are strong enough to suggest that the correlation matrix is factorable (Pett, et al., 2003).

The number of initial factors was determined via principal axis factoring (PAF) with direct oblimin rotation, examining the communalities, eigenanalysis and examination of the scree plot. The factor extraction process begins with an initial estimation of total variance in each individual item that is explained by the extracted factors and this explained variance is referred to as the communality of an item (Pett, et al., 2003). These communality estimates range from 0 to 1.00. A value of 0 indicate that none of the variance in a particular item is explained by the extracted factors, a higher values indicating that the extracted factors explain more of the variance of an individual item and a value of 1.00 indicates that all the variance in a given item is explained by the extracted factors (Pett, et al., 2003).

The estimation of the initial communalities were examined via principal component analysis (PCA) which had been described as eigenanalysis or “the seeking of the solution to the characteristic equation of the correlation matrix (Nunnally, & Bernstein, 1994). Eigenvalue, λis a single value which represents the amount of variance in all of the items that can be explained by a given factor. All factors with eigenvalues (EVs) greater than 1 were selected according to Kaiser-Guttman’s rulein order for the matrix to be positive-definite and factorable(Comrey & Lee, 2013; Guttman, 1954; Kaiser, 1960). Eigenvector which is linear combination of variables to consolidate the variance in a matrix (the eigenvalue) (Tabachnick & Fidell, 2001) was inspected. Principal axis factoring (PAF) was used because it provides a better estimate of the correlations as it includes errors of measurement (Nunnally, 1994). Rotation of the factors were undertaken “to achieve a simple structure and theoretically more meaningful factor solution” (Hair, 2009; Tabachnick & Fidell, 2001). There are two broad classes of rotation namely orthogonal and oblique which have different underlying assumptions (Pett, et al., 2003). Orthogonal rotation assumed that the generated factors are independent of each other (uncorrelated) (Pett, et al., 2003). Oblique rotation namely direct oblimin was used as the rotation method because this method assumes that the factor are correlated. Although orthogonal rotations often produce simple solutions, these rotations rest on the critical assumption that the factors, or subscales of interest, are uncorrelated with oneanother; this is an assumption that is rarely met in health care research. Pedhazur et al.,1991, argued that orthogonal solutions are unrealistic portrayals of socio-behavioural phenomena and that the assumption that factors might be correlated is a reasonable one in the health sciences(Pedhazur, & Schmelkin, 1991). This is because although the dimensions that are dealt with in the health sciences are often conceptually different, they are nevertheless correlated dimensions of a construct (Pett, Lackey, & Sullivan, 2003).

The item communalities or the total amount of variance in the item that can be explained by the extracted factors were inspected. Item communalities between 0.40 and 0.70 are adequate for most social science research, so items with communalities below 0.40 were closely scrutinized for possible deletion (Costello & Osborne, 2011). There is no fixed threshold to determine the range of cumulative percentage extracted, although certain percentages have been suggested because the terms do not usually readily apply in social sciences (Williams, Onsman, & Brown, 2010).

The examination of the scree plot was done to examine the number of factors to be retained using Cattell criteria (Cattell & Vogelmann, 1977). A straight line was drawn through the smaller eigenvalues where a departure from this line occurred and this point highlights where the debris or break occurs. The point above this debris or break (not including the break itself) indicates the number of factors to be retained (Gorsuch, 1990). Further examination of the items' loadings in pattern matrix was undertaken in order to increase the percentage of explained variance. Factor loadings in the range of ±0.30 to ±0.40 are considered to meet the minimal criteria for interpretation of the structure and loadings ±0.50 or greater is considered as practically significant (Hair, 2009). For this study, factor loadings less than 0.50 were removed. A comparison with Monte-Carlo based simulation method was done to compare the observed eigenvalues from PAF. A factor or component is retained if the associated eigenvalue is bigger than the 95thof the distribution of eigenvalues derived from the random data (Ledesma & Valero-Mora, 2007).

A confirmatory factor analysis (CFA) was undertaken to identify models that could provide statistically acceptable fit and theoretically meaningful interpretations of the data. A combination of several fits were used as no agreement on a single standard exists (Hair, 2009). As recommended, various fit indices including relative Chi-square to degrees of freedom ratio (x^2/df), CFI (comparative fit index), GFI (goodness-of-fit index), AGFI(adjusted goodness-of-fit-index), TLI(Tucker-Lewis index), root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) were used. It is generally accepted that Chi-square/degree of freedom (df) ratio value less than 3; CFI,GFI, AGFI and TLI values greater than 0.90; and RMSEA $\leq$ 0.07 indicate adequate model fitness (Hair, 2009). Cross-loadings between items were checked using the modification index coefficients (Byrne, 2013). Model modifications were based on the values of the Akaike's Information Criterion (CAIC) for comparing different models (Hu, Bentler, 1999).

3.6 Methods of the Part II (qualitative study)

Non-adherent patients are a challenge to healthcare providers. While treating hypertensive patients, the researcher experienced ethical dilemma between respecting patients' autonomy and the benefits of clinical management as well as lifestyle management. This experience aroused the researcher's interest in this important subject. Most of adherence studies had focused on the measurement of determinants of non-adherence quantitatively. However, there is still lack of understanding in the ways patients think and feel about their medications and their behaviour (Khuan, Chin, Abdul Rahman, &

Loong, 2008). Therefore, a qualitative research approach is needed to understand theexperiences of a particular group or community as it allows a flexible exploration of the respondents' experience (Berg & Lune, 2004).

3.6.1 Paradigm: Research Perspective and Philosophy

A paradigm is defined as a set of basic beliefs representing the holders' or researchers' worldview (Guba, Lincoln, 1994). The beliefs can only be accepted based on faith but difficult to prove. It is an overarching philosophical or ideological stance, a system of beliefs about the nature of the world, and ultimately, when appliedin the research setting, the assumptive base from which we go about producingknowledge(Rubin & Rubin, 2012). It defines the relationship between individuals and their surrounding world. Ontological and epistemological assumptions make up a paradigm. Simply put, one's view of reality and being, is called ontology and the view of how one acquires knowledge is termed epistemology. Health research is dominated by positivist theories. It also has dominated research on compliance but unable to focus on the lived experience of people causing a paradigm shift in compliance research in order to enhance our understanding of the concept (Playle, 1998). For this study, the social constructivist paradigm was chosen as a guiding philosophy.

The constructivist paradigm is based on experiential learning through real life experience to construct and to understand human social reality (Crotty, 1998). The social constructivists hold assumptions that individuals seek understanding of the world in which they live and work (Creswell, 2008). Individuals will develop subjective meanings of their experiences and so the goal of this study was to rely as much as possible on the participants' views of the situation being studied. This qualitative part was predominantly inductive with the researcher generating meaning from the data collection.

The ontology of constructivism is based on the assumption that is relative and constructed realities are apprehendablein the form of multiple, intangible mental constructions, socially and experientially based, local and specific in nature and dependent for their form and content on the individual persons or groups holding the constructions(Guba, Lincoln YS, 1994). The constructivist epistemology is based on assumptions that truth or meaning comes into existence in and from the engagement with the realities of our world (Crotty, 1998).

Open-ended questions were usedin the interviews so that the participants can construct the meaning of a situation, typically involved in discussions or interactions with the researcher/interviewer. The researcher listened carefully to what the participants said or did in their life settings. The researcheraddressed the processes of interaction among the participants and focused on the specific contexts in which people live and work, in order to understand the historical and cultural settings of the participants. Theresearcher's intent to make sense of (or interpret) the meanings that others have about the world, lead the participants to interpret rather than start with a theory (as in postpostivism).

3.6.2 Methodology and Philosophical Underpinnings

3.6.2.1 Phenomenology

Edmund Gustav Albrecht Husserl was a German philosopher who established the school of phenomenology (Fjelland, 1994). It is a philosophy and research approach within the constructivist paradigm (Guba, Lincoln, 1994). Phenomenology is essentially the study of lived experience or the life world(Manen, 2007). There are two schools of thought that exist within the methodology of phenomenology namely the interpretivist/descriptive (Husserlian) and the constructivist/hermeneutic (Heideggerian) phenomenology (Guba, Lincoln, 1994). Their common aim is to understand the complex world of lived experience from the point of view of those living it and the understanding is gained through interpretation of the experience. The two schools differ in terms of ontological and epistemological issues.

3.6.2.2 Study design

The qualitative phase employed the constructivist/hermeneutic (Heideggerian) phenomenology approach as its study design. This phenomenological study explored the lived experienced of hypertensive patients attending government primary health care clinics focusing on non-adherence to antihypertensive medication, physical activity and diet.

This approach was utilized by looking at people's everyday experiencing a phenomenon and how these experiences are structured and focusing the analysis on the perspective of the individual experiencing the phenomenon (Meriam, 2002).

3.6.2.3 Material and Methods

The methodological schema of description-reduction-interpretation was adopted (Miles, 1994) in which initial data collection were through in-depth interviews (description), followed by finding emerging themes (reduction) and hermeneutic reflection (interpretation of results). The purpose of the interviews was to learn patient's experiences with antihypertensive medication and to elucidate reasons affecting their adherence to hypertensive care (anti-hypertensive medication, physical activity and diet) after being diagnosed with hypertension. In-depth interview was chosen as this yielded more and richer information regarding individuals complex beliefs than focus group discussions with the same participants (Kuper, Reeves, & Levinson; Priscilla Ulin, 2005). The data collection consisted of participants' description of their experience with anti-hypertensive medication and reasons for not adhering to their anti-hypertensive medication, physical activity and diet.

3.6.2.4 Study Area

The setting of the qualitative phase was similar to the quantitative phase except more health clinics located in Hulu Langat and Klang districts were included.

3.6.2.5 Study Participants

The selection of the participants for the qualitative phase was based on the eligibility principles of phenomenology, which were to have experienced the phenomenon, and willingness to talk about that experience to an interviewer (Thomas, 2001). The sample was chosen through purposeful participant selection which is based on the study's need to ensure authentic, useful and rich data which represent the phenomenon (Morse, 2000). The sample was heterogeneous. It included individuals with both typical and atypical experiences of the phenomenon (had been adherent and/or non-adherent to the treatment regimen). It resembled the study population and it was preferable to include only those who were not in the middle of the experience under study (Hardon, 2004).

The participants were both men and women who were diagnosed with essential hypertension who had undergone follow-up at Chronic Disease clinic in government primary health clinics in Hulu Langat (Bangi, Semenyih, Beranang, Kajang, Batu 9, Bandar Seri Putra and Sungai Chua health clinics) and Klang (Bandar Botanik, Bukit Kuda, Meru, Pandamaran, Port Klang and Kapar health clinics) districts in Selangor, Malaysia. Between March 2013and the end of June 2013, hypertensive patients waiting for their appointments at the Chronic Disease clinics were approached. They were given information sheet and informed consent forms for the study. All patients were introduced to the nature of the research prior to the beginning of the interviews. Written informed consent was obtained from the participants prior to the interviews.

Purposive sampling was adopted and data were collected until saturation was reached and no new themes emerged. The inclusion criteria were patients diagnosed with essential hypertension for at least six month, of Malaysian Nationality, aged above 18 years old and were able to read and understand English or Bahasa Malaysia without physical inability which limits them to adhere to physical activity.

3.6.2.6 Study Instruments

An interview guide was developed based on the literature review as a reminder of areas to be covered during the interviews. The interview guide was developed in English and was translated to Bahasa Malaysia. This interviewer guide was discussed amongst members of the research team, and the content was evaluated by the experts (three family medicine specialists, one internal medicine specialist and two public health specialists). The interview guide wasalso pre-tested on eight hypertensive patients for relevance, suitability and ease of administration in primary health care setting.

The resulting questions were designed into open-ended questions, probes and prompts, which were used throughout the interview to encourage the interviewee to converse. The interview was open, unstructured and the researcher encouraged the participants to talk freely in their own words. Each interview began with the same opening question: "*How did you first discover you had hypertension*?" This gave the participants the opportunity to narrate their flow of thoughts on the topic.

3.6.2.7 Study Procedures

Participants were selected from thirteen government primary health clinics situated in Hulu Langat (Bangi, Semenyih, Beranang, Kajang, Batu 9, Bandar Seri Putra, Sungai Chua) and Klang (Bandar Botanik, Bukit Kuda, Meru, Pandamaran, Port Klang and Kapar) districts in the state of Selangor, Malaysia. These clinics served patients ranging from the affluent middle class patients to those from lower socioeconomic status. Data collection was carried out between Marchto June 2013. A total of 60 potential participants were identified from the Chronic Disease clinics, and 25 agreed to be interviewed. All the in-depth interviews were conducted in privacy in a room at the respective health clinics and patient confidentiality was ensured. Face to face interviews were conducted in an isolated room in which only the interviewer and interviewee were present to ensure that the participant's answers were not influenced by others. All the interviews were conducted in both English and Bahasa Malaysia by the primary investigator and each interview lasted for 45 to 90 minutes. All the interviews were audiotaped.

3.6.2.8 Methods used for sampling, data collection and analysis

Data Examination

The methods for sampling, data collection and analysis in this study were guided by the 'Vancouver School of Doing Phenomenology' (Halldórsdóttir) and further analyzed bythe NVivo Software. 'Vancouver School of Doing Phenomenology' is an interpretation of phenomenological philosophy and used as a research methodology for the human sciences. This method is essentially an interpretivist/constructivist school of doing phenomenology and it is not a linear phenomenon. The research process involves the cyclic movement between seven stages (Figure 3.5), and the hermeneutic circle (Figure 3.6) to grasp the meaning of a phenomenon. Every basic stage was entered into again and again throughout the research process via seven basic stages: silence, reflection, identification, selection, interpretation, construction and verification. It is portrayed as a symbolic circle (Refer to Figure 3.5).

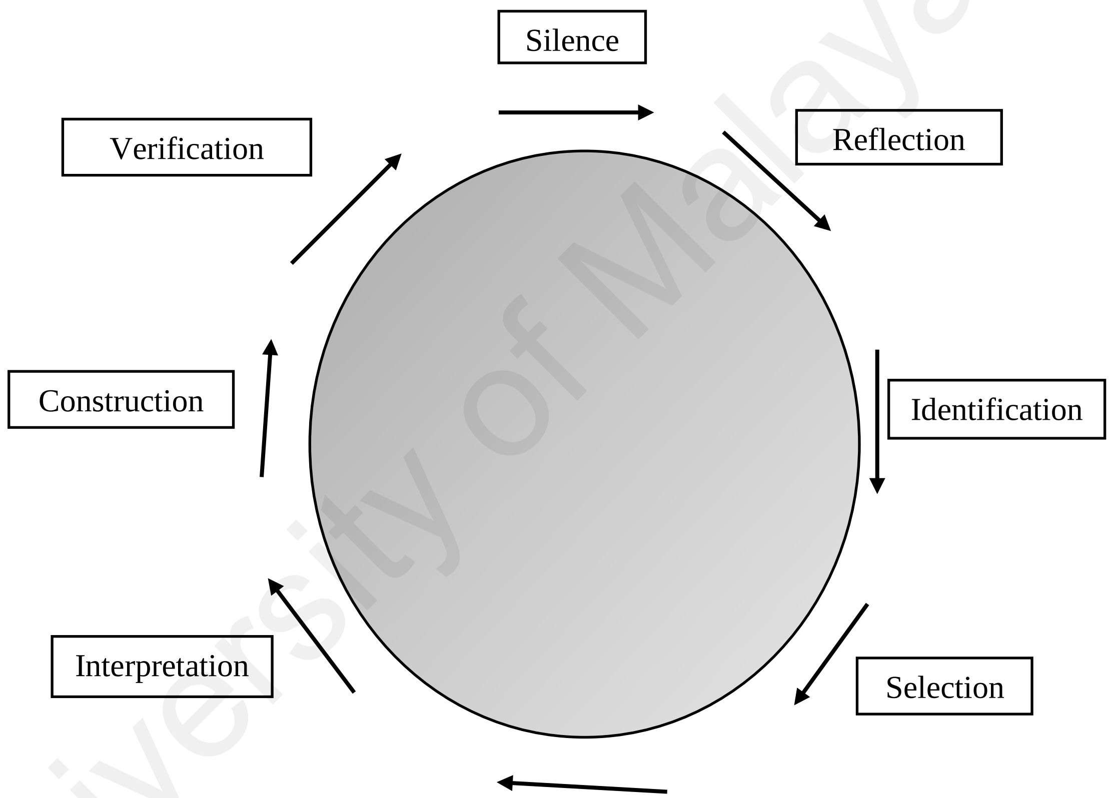


Figure 3.5: The Process of Phenomenology in the Vancouver School
(Halldorsdottir, 2000)

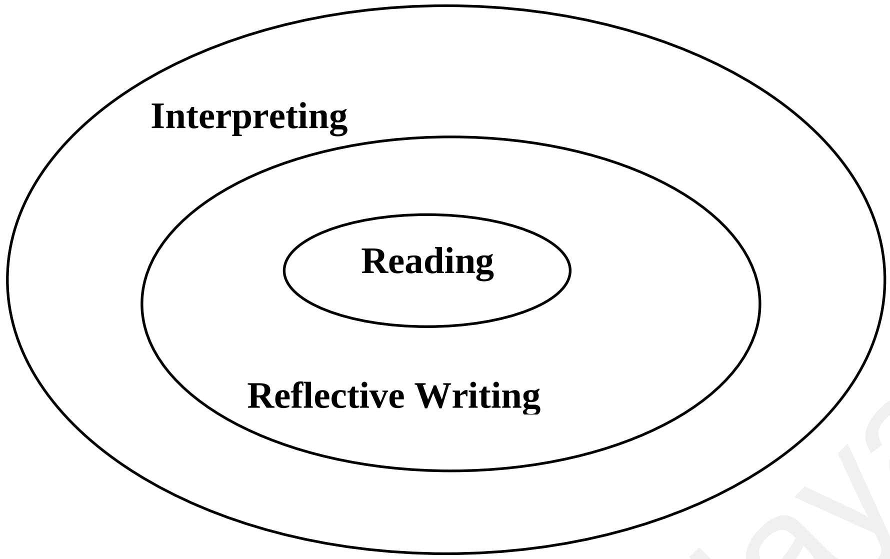


Figure 3.6: Hermeneutic Circle
(Kafle, 2013)

3.6.3 Data Analysis

Data gathering and data analysis were done simultaneously. However the emerging themes were only determined when enough data were gathered. When new themes ceased to appear, saturation was achieved and additional data are not required. The first step in data analysis was data interpretation using hermeneutic circle and the second step involved coding processes and thematic analysis using NVivo Version 9 software (QSR International).

Hermeneutic circle consists of reading, reflective writing and interpretation as depicted in Figure 3.6 which describes the process of understanding a text hermeneutically. The hermeneutic circle suggests that we understand a complex whole from preconceptions about the meanings of its parts. Human understanding is achieved by iterating between the parts and the whole which they form (Kafli, 2011). In the hermeneutic circle, parts are considered within a whole and the whole is only understandable with respect to its constituent parts. The interpretation occurs through their fusion and takes place throughout the research process (Koch, 1996). The researcher analysed the text hermeneutically in the circular, threefold movement of whole/parts/whole. The text was read, to gain a sense of it as a whole (overall theme of the experience) and the parts of the whole were identified.The unique experience for each person was 'sameness' to the experience of others and these shared experiences constructed the themes. Then the final step was to gain meaningas a whole which was the sum of its parts and the researcher's task was to convey the story in writing in such a way that readers could understand it.

After completing all the above mentioned processes above, the data from the in-depth interviews were transcribed verbatim. Verbatim transcripts were analyzed by the primary investigator using thematic analysis. The transcriptions were stored and managed accordingly to ensure confidentiality.

The Nvivo software application was used to assist and facilitate the coding processes. In this study, as with all qualitative data, phenomenological data analysis involves such processes as coding namely as open coding, axial coding and selective coding). Further categorization was done to make sense of the essential meanings of the phenomenon and to allow the emergence of the common themes (Kleiman, 2004). "A code is an abstract representation of an object or phenomenon" (Corbin & Strauss, 2008), or more prosaically, "a mnemonic device used to identify themes in a text" (Ryan & Bernard, 2000). Whereas, coding in qualitative research "is a way of classifying and 'tagging' text with codes, or of indexing it, in order to facilitate later retrieval (Coffey & Atkinson, 1996). Coding is "a systematic way in which to condense extensive data sets into smaller analyzable units through the creation of categories and concepts derived from the data"(Lockyer, 2004).

Open coding is a process of reducing the data to a small set of themes that appear to describe the phenomenon under investigation. The open coding process commenced as soon as the data began coming in. In the open coding, the data was divide into segments and they were arranged into groups that could reflect the categories (Bazeley & Jackson, 2013). Open coding in the present study generated 142 codes from the participants. The end point of the open coding is the production of an initial list of categories. The process of assigning codes to categories from the transcript was scrutinized by another researcher to check its reproducibility. Axial coding is a process of interconnecting the categories and the subcategories. It follows directly and iteratively from open coding. The selective coding is the process of selecting the main category and relating it to the other categories (Kleiman, 2004). The results of the analysis were checked against the audio recordings and transcripts by the second researcher.The example of open, axial and selective coding procedures from in-depth interviews are depicted in the Table 3.3 as following (on the next page, 101).

Table 3.3: Example of open, axial and selective coding procedures from in-depth interview with hypertensive patients

Open Coding	Properties	Examples of participants' words
Afraid of familys' perception towards medication taking. Family discourage to take anti-hypertensive medication. Spousedid not allow patient taking their anti-hypertensive medication taking. No encouragement from the family members in terms of anti-hypertensive medication taking.	No motivation in anti-hypertensive medication taking from family and peers.	Afraid mother in law and husband know that I'm taking anti-hypertensive medication at young age. My mother in-law said I'm still young to take anti-hypertensive medication. My husband did not allow me to take anti-hypertensive medication as I'm still young and it will cause damage to my body soon. Nobody encourage me to take medication.
	Axial codes and selective code based on the open codes	
	Axial codes	**Selective code**
	Negative influence from spouse regarding anti-hypertensive medication taking. Negative influence from other family members besides spouse regarding anti-hypertensive medication taking.	Influence from spouse/family members.

3.6.4 Dealing with validity and reliability in qualitative study

The quality of the qualitative study has been a cause for ongoing debate. Initial conceptualizations of validity and reliability were derived directly from quantitative or experimental research based on a positivistic philosophy (LeCompte, 1984). Reliability is consistency of measurement (Bollen, 1989), or stability of measurement over a variety of conditions in which basically the same results should be obtained (Nunnally, 1978). Validity in qualitative research is concerned with the meaningfulness of research components the degree to which a finding is judged to have been interpreted in a correct way (Cho & Trent, 2006). It refers to whether the findings of a study are "true" and "certain". "True" in the sense that research findings accurately reflect the situation, and "certain" in the sense that research findings are supported by the evidence (Cho & Trent, 2006).

All research must have "truth value","applicability", "consistency", and "neutrality" in order to be considered worthwhile(Guba, 1981). Therationalistic (or quantitative) paradigm is different from the naturalistic (qualitative) paradigm because each paradigmrequires paradigm-specific criteria for addressing "rigor". Rigor is the term most often used in the rationalistic paradigm. The parallel term for the qualitative "rigor" is "trustworthiness"(Guba, 1981). The criteria to reach the goal of rigor within the rationalistic paradigm are internal validity, external validity, reliability, and objectivity. On the other hand, the criteria in the qualitative paradigm to ensure "trustworthiness" are credibility (which corresponds roughly with the positivist concept of internal validity), transferability (in preference to external validity/generalizability), dependability (in preference to reliability), and confirmability (a degree of neutrality or the extent to which the findings of a study are shaped by the respondents and not researcher bias, motivation, or interest) and these have been widely used in evaluation of qualitative research (Graneheim, 2004; Lincoln, 1985).A trustworthy study is truthful and consistent as well as useful to other people. Trustworthiness depends on how the research process was conducted and how closely the findings represent the experiences of the participants (Clayton, 2000). These series of techniques can be used to conduct qualitative research that achieves the outlined criteria. The credibility of this study was assessed through triangulation and member checking.

Triangulation refers to the use of more than one approach in the investigation of a research question in order to enhance confidence in the findings(Bryman, 2003). Member checking is when data, analytic categories, interpretations and conclusions are tested with members of those groups from whom the data were originally obtained. The member checking was done as respondent's validation in order to check the authenticity of the work (Morse, Barrett, Mayan, Olson, Spiers, 2002). Each participant received a copy of the interview transcript for them to review and to amend the transcript, if they wished. Any alterations and/or additions were seen as retrospective clarifications of the interview data and subject to subsequent analysis. The finalized transcripts were then translated back into English by another independent translator.The first author then analyzed the transcripts line by line, which were read repeatedly and subsequently thematically analyzed for their contents. Re-analysis of the themes and contents was done by the co-authors. To draw in-depth views, the patients were given the freedom to express additional reviews and comments. Interviews mainly focused on the patients' experiences with anti-hypertensive medication and reasons for non-adherence to hypertensive care (anti-hypertensive medication, physical activity and diet).

The transferability was achieved by detailed description to ensure thatexternal validity would be achieved. Phenomenon was described in sufficient detail to evaluate the extent to which the conclusions were drawn to ensure that it was transferable to other times, settings, situations, and people. Confirmability was achieved via audit trail in which a transparent description of the research steps taken from the start of the research project from the development until reporting of the findings. These are records that are kept regarding what was done in theresearch which includes raw data and process notes.

3.6.5 Ethical consideration

Privacy and confidentiality concerns can easily arise in phenomenological inquiry, when participants reveal their personal experiences (Guba, Lincoln, 1994). Protecting research participants' right to privacy requires respect for their autonomy, their right to self-determination, as well as their general welfare(Orb, 2000). Information sheet was given to provide information to the patients regarding the study and informed consent was taken to ensure agreement of the participants to participate. Confidentiality in this study implied that any personal data that could lead to the identification of the participant will not be reported (Kvale, 1996).

The philosophy and methodology of phenomenology used in this qualitative study and the guiding method, the Vancouver School of Doing Phenomenology(Halldórsdóttir) was described in this chapter.Issues regarding the trustworthiness of qualitative studies and important ethical concerns to be addressed in this study were also explained. The description of how the qualitative analysis was conducted will be discussed further in the next chapter.

3.7 Methods of the Part III (quantitative study)

This study phase represents the explicit relation of the qualitative and quantitative data or the 'mixing' of the qualitative and quantitative phases (Creswell, Plano Clark, 2011). This section presents the process of the development of the modified Medication Adherence Reasons Scale (MAR-Scale).

3.7.1 Item development

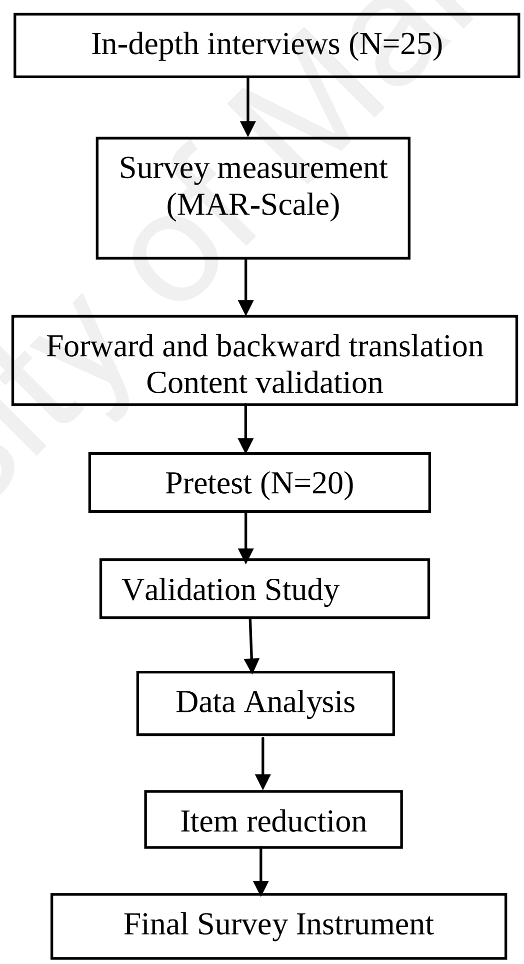


Figure 3.7: Production of the survey instrument

The survey items were developed and generated from qualitative findings (in-depth interviews) and identification of potential measures to match with the constructs derived from the qualitative study that were searched from the existing literatures. Overall, four existing self-reported questionnaires were selected from the published literature to measure constructs identified in the qualitative study. For the purpose of this study, the researcher only selected the constructs and items that emerged from the qualitative phase. The selected items are 'Influence from spouse/family', 'Influence from peers', 'Influence from community/social organizations', 'Lack of care from the doctor', 'Lack of information of what patients' need from doctor and health care staff' and 'Long waiting time'. Table 3.4 show the summary of selected instruments, items and their psychometric properties.

Table 3.4: Summary of selected instruments and their psychometric properties

Items	Instrument	Psychometric properties
Influence from spouse/ family	Chinese Family Support Scale (CFSS) (Gang, 2013)	Cronbach's alpha >0.80
Influence from peers	Multidimensional Scale of Perceived Social Support (MSPSS-M) (Ng, Amer Siddiq, Aida, Zainal, & Koh, 2010)	Cronbach's alpha > 0.80
Influence from community/ social organization		Cronbach's alpha > 0.80
Lack of care from doctor	Multidimensional Trust in Health Systems Scale (MTHCSS) (Leonard, 2008)	Cronbach's alpha > 0.80
Lack of information of what patients' need from doctor and health care staff		Cronbach's alpha > 0.8
Long waiting time	Scale to Measure Patient Perceptions of Quality (Rao, Peters, & Bandeen-Roche, 2006)	Conbach's alpha > 0.7

As depicted in the Table 3.4, the qualitative findings suggested six items to be added to the original MAR-Scale. The item 'Using of alternative/ traditional medication' was added because this item was an important finding in the qualitative study. A total of seven new items were added to the original 15 items MAR-Scale resulting in a total of 22 items to be examined for their reliability and construct validity. A public health specialist, a physician and a family medical specialist verified the content validity of the new items.

3.7.2 Instrument

Translation and Pre-test of the Questionnaire

Once the initial items for anti-hypertensive medication were identified for measuring non-adherence, the instrument was translated using forward and backward translation as recommended (Wild, et al., 2005). The instrument was first translated into Bahasa Malaysia and then translated back into the English version. This was done to ensure cross cultural harmony.

The questionnaire was assessed for their content validity by a panel of experts. A small scale preliminary test (pre-test) was conducted using a convenience sample of twenty hypertensive patients to assess the face validity in terms of the language, understanding and time to complete the questionnaire. Any discrepancies were rectified. The qualitative findings indicated that the participants tend to misinterpret the items 'Side effects or fear of side effects' and 'Concerned about long term effects of medication' as synonymous which were not detected earlier during Phase I. Thus, to avoid misinterpretation, for each of the two items were given examples to ensure participants understand that the two items have different meaning. Following these approaches, all the twenty two items were found to be suitable, relevant and important to ask.

Table 3.5: Proposed constructs and items in the Malaysian Medication Adherence Reasons Scale for (myMAR-Scale)

Construct	Item	Responses
MI (Managing issues)	M15=Problems opening containers M9=Embarrassment in taking medication M2=Difficulty swallowing medication M4=Unclear about proper administration	1= None of the time 2= A little of the time 3=Some of the time 4=Most of the time 5= All of the time
MM (Multiple medication issues)	M14=Concern about long term effects of medications M7=Taking too many medications M3=Cost of medications	1= None of the time 2= A little of the time 3=Some of the time 4=Most of the time 5= All of the time
BI (Belief issues with medications)	M10=Medication is ineffective M11=Side effects/Fear of side effects M12=Medication is not needed M13=Stop medication to see whether it still needed	1= None of the time 2= A little of the time 3=Some of the time 4=Most of the time 5= All of the time
AI (Availability issues)	M1=Medication not available in the pharmacy M6=Ran out of prescription due to busy schedule	1= None of the time 2= A little of the time 3=Some of the time 4=Most of the time 5= All of the time).
FC (Forgetfulness and convenience issues)	M5=Forgot due to busy schedule M8=Inconvenience in taking medications as prescribed	1= None of the time 2= A little of the time 3=Some of the time 4=Most of the time 5= All of the time).
Note: Items found in qualitative study and supported with literatures. Need verification of the construct later in factor analysis.	M16=Influence from spouse/ family M17=Influence from peers M18=Influence from community/ social organization M19=Lack of care from the doctor M20=Lack of information of what patients' need from the doctor and health care staff M21=Long waiting time M22= Using of alternative/ traditional medication	1= None of the time 2= A little of the time 3=Some of the time 4=Most of the time 5= All of the time).

A validation study was conducted to examine the construct validity and reliability of the Malaysian Medication Adherence Reasons Scale (myMAR-Scale). The aim was to improve the newly developed myMAR-Scale among hypertensive population in Malaysia. Therefore, this section describes the reliability, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

3.7.3 Participants and Setting

This validation study was conducted from the middle of August to November 2013. The areas selected for the study were the same as in validation study in Phase I, but in different health clinics. The government primary health clinics were conveniently selected in the two districts: Hulu Langat (Sungai Chua and Beranang Health Clinics) and Klang (Pelabuhan Klang and Pulau Indah Health Clinics) districts. A visit to the respective health clinics was done and briefing to the health staff in charge were given to ensure that understanding and full commitment will be given during the data collection phase. The hypertensive patients waiting for their follow-up appointments at the chronic diseases clinics in the health clinics were approached with information sheets and informed consent forms for the study. The inclusion criteria were patients diagnosed with essential hypertension for at least six month, of Malaysian Nationality, aged above 18 years old, and are able to read and understand English or Bahasa Malaysia. Those who consented were given the self-administered questionnaire that took 15 minutes to complete. A total of 800 hypertensive patients were approached and 680 patients participated in this survey. The response rate was 85% (680/800).

Measures

The newly developed questionnaire was divided into two sections; Section A: Socio-demographic and Section B: The 22 items of the Modified Medication Adherence Reasons Scale (myMAR-Scale).

Procedures

The procedures in this validation study was as the same as for the first validation study.

3.7.4 Statistical analysis

The analyses were done using SPSS version 19 and SPSS AMOS (Analysis of Moment Structures) (IBM).

Sample size calculation

The sample size for this survey was based on Comrey and Lee's very good to excellent category which stated that there must be at least 10 to 15 subjects per items(Comrey & Lee, 2013). The sample size of 100 or larger was preferred although the researcher should obtain the highest cases-per-variable ratio (e.g. 10:1 ratio) to avoid over fitting of the data (Hair, 2009). In this survey, the data was split into two for EFA (N=250) and CFA (N=430).

Descriptive analyses were undertaken to elucidate the frequencies, proportions, means and standard deviations. Estimation maximization (EM) was employed to determine the missing values. The data was split into two for EFA (N=250) and CFA (N=430). Multivariate outliers were checked using Roderick's Little's chi-square statistics for testing whether the values were missing at random. This test revealed that the values were missing completely at random (MCAR) (Hair, 2009). Multivariate outliers were removed using Mahalanobis distance prior to the analysis (Hair, 2009).

Test-retest reliability analysis

The test-retest reliability was designed to re-administer the questionnaire after 14 days to the same participants which measure the stability of the questionnaire over time. This interval was selected so that the reliability estimates will not be inflated due to memory effects (Garson, 2012). Cohen's Kappa (*k*) was used for reliability analysis for this survey because it is a common technique for estimating paired interrater agreement for nominal and ordinal-level data (Fleiss, et al., 1981). Whereas, the intraclass correlation coefficient (ICC) ignores orders and treats as a random sample from a population (Bland & Altman, 1990). Hence, weighted kappa was appropriate for this study as the scale used was ordinal scale. The criteria for test-retest reliability according to Landis and Koch (Landis & Koch, 1977) (Refer to Table 3.2).

Internal Consistency Reliability (Reliability Coefficient)

The internal consistency of the items in a scale was estimated with Cronbach's alpha because for quantitative methods, it has been widely accepted for the estimation of internal consistency and reliability of the scale (Cronbach, 1951). The Cronbach's alpha values were calculated for each factor (domain). It measured the extent ofhow closely related a set of items are as a group. A "high" value of alpha is often used (along with substantive arguments and possibly other statistical measures) as evidence so that the items measure an underlying (or latent) construct. The widely-accepted social science cut off is that the Cronbach's alpha should be 0.70 or higher for a set of items to be considered a scale, but some researchers use 0.75 or 0.80 while some use as low as 0.60 for a large sample size (Garson, 2012). The reliability of an instrument is a necessary condition before the establishment of construct validity (Hair, 2009).

Factor Analysis

Factor analysis is the oldest and best-known statistical procedure for examining the relationship between sets of observed and latent variables in order to gather information on their underlying latent constructs or factors (Byrne, 2013). The two basic types of factor analysis; namely, the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were employed. Basically, the factor analytic models (EFA and CFA) examine how and the extent the observed variables are linked to their underlying latent factors. “Factor analytic model is concerned with the extent to which the observed variables are generated by the underlying latent constructs, and thus, strengthen of the regression paths from the factors to the observed variables (the factor loadings)” (Byrne, 2013). The EFA is designed to determine how, and to what extent the observed variables are linked to their underlying factors for the situation where links between observed and latent variables are unknown or uncertain (Byrne, 2013). The conduct of EFA and CFA were similar as in Phase I.

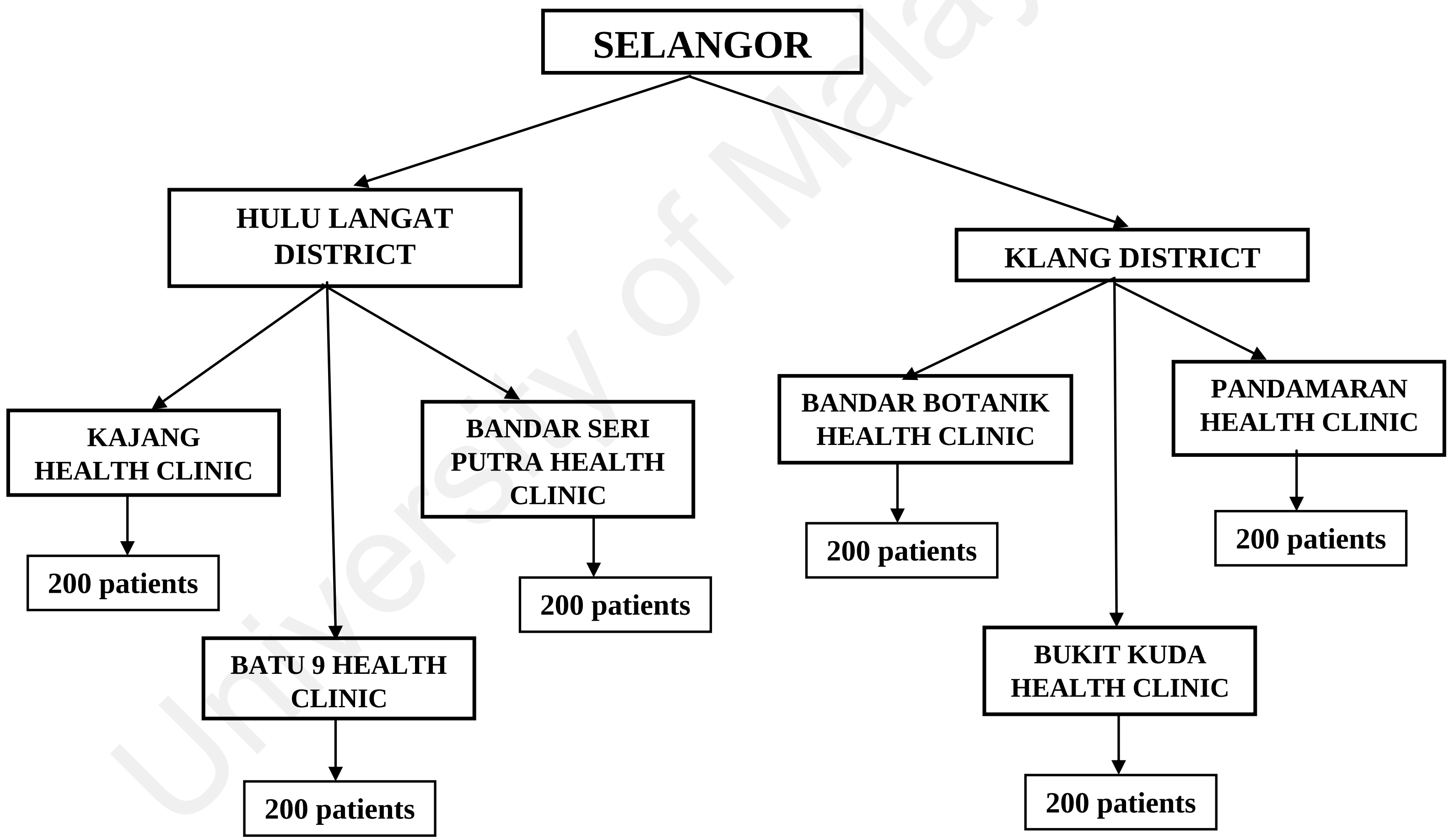
3.8 Part III (b)

This section is the quantitative-correlational research methodology conducted to examine the relationships between the level of blood pressure control (poor and well) to antihypertensive medication. The variables in the theoretical framework of medication non-adherence used in this study based on Andersen's Behavioural Model and Leventhal's Common Sense Model. This section describes the research design, methods and variables measured along with medication non-adherence level.

3.8.1 Study population

The study population was the hypertensive patients attending the government primary health clinics for follow-up in Hulu Langat and Klang districts in the state of Selangor, Malaysia. The health clinics that were previously involved in the pilot study and the validation study were excluded. Figure 3.8 shows the flow chart of the study methodology.

Figure 3.8: Flow Chart of Study Methodology



3.8.2 Inclusion criteria

1. Hypertensive patients aged 18 years and above, therefore self-consent could be taken
2. Patients diagnosed with ‘essential’ hypertension for more than six months
3. Taking at least one anti-hypertensive medication for treatment
4. Malaysian Nationality
5. Hypertensive patients who were able to read and understand Bahasa Malaysia (official language of Malaysia) or English.

3.8.3 Exclusion criteria

1. Hypertensive patients who were pregnant
2. Hypertensive patients who were on haemodialysis

3.8.4 Case definition

The case definition was patient diagnosed with ‘essential’ hypertension for more than six month. The diagnosis of hypertension is according to Clinical Practice Guidelines for Management of Hypertension, Ministry of Health, Malaysia which is “Persistent elevation of blood pressure; systolic blood pressure of 140 mmHg or greater and/or diastolic blood pressure of 90 mmHg or greater based on the average of two or more readings taken at two or more visits to the doctor” (CPG, 2013). Hypertensive patients with at least one anti-hypertensive regime were selected.

3.8.5 Study duration

The data collection of this major survey was done between in the middle of December 2013 and April 2014.

3.8.6 Sample size estimation

The sample was calculated using EPI-INFO Version 7.0 Software. It is available in the domain. This statistical software for epidemiology was developed by Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, United States of America. It has been in existence for over 20 years and is currently available for Microsoft Windows. This free software is in the public domain and can be downloaded from http://www.cdc.gov/epiinfo.

The sample size estimation was calculated for non-adherence to anti-hypertensive medication related to this study, whereby the expected frequency for non-adherence to anti-hypertensive medication was 47.6% (Ramli, et al., 2012).

Calculation of design effect

Since this study adopted multistage sampling method (complex sampling), a design effect which is an adjustment method, should be used to determine the survey sample size needed to be calculated.

$$DEFF = 1 + \delta\ (n - 1), \text{ where}$$

DEFF is the design effect, δ is the intraclass correlation for the statistic in question, and, n is the average size of the cluster.

Using the average ICC (intraclass correlation coefficient) of 0.721 from the pilot study, and the average size of a cluster as 3, the design effect for this study is 2.4.

$DEFF = 1 + \delta\ (n - 1)$

$DEFF = 1 + 0.721\ (3 - 1)$

$DEFF = 1 + 1.442$

$DEFF = 2.442$

$DEFF = 2.4$

The following design effect that looks into the sample size was calculated using the EPI-INFO Version 7.0 Software. The expected frequency of 47.6% was based on recent literature of non-adherence to antihypertensive medication among patients attending government primary health clinics in Malaysia from recent literature (Ramli, et al., 2012). Since there was no database in the Ministry of Health regarding total population of hypertensive patients undergoing follow-up treatment at government primary health clinics, the population size was calculated based on the latest Malaysian National Health and Morbidity Survey estimate of known hypertensive population in Selangor which was 422,918 (NHMS, 2011).

The following are the details of the drop down menu for sample size calculation as depicted in the EPI-INFO Version 7.0 Software:

- Population size = 422,918
- Expected frequency = 47.6%
- Confidence limits = 5%
- Design effect = 2.4
- Clusters = 3

Therefore, with 95% confidence level, the total sample size given was 920 participants. Accounting for 20% of non-response rate, the acceptable number of participants was 1104. In this study, a total of 1200 participants were recruited.

3.8.7 Sampling procedure

The sampling procedure of multistage random sampling (complex sampling) was adopted in this study. Two districts (Hulu Langat and Klang districts) were selected randomly from the nine districts in Selangor. Three primary health clinics were selected in each district. A total of six health clinics and 1200 hypertensive patients were selected with 200 hypertensive patients in each clinic (Refer to Figure 3.4).

This is a multistage sample with three levels as the study tried to generalize the findings to the whole hypertensive population in Selangor. The districts (first stage) were selected from the state and the health clinics (second stage) were chosen randomly from each district. The participants (third stage) were selected randomly from each of the health clinics via systematic random sampling. Every third hypertensive patients were attending follow-up at Chronic Disease clinic at the respective health clinic, and who fulfilled the inclusion criteria were selected as a participants.

3.8.8 Study variables

Demographic variables and social structure

The demographic variables measured were age and gender. The social structure variables were ethnicity, marital status, educational level, occupation and family history of hypertension. Ethnicity was assessed with the question: "What is your ethnicity/race?". The participants were given options to choose from: 1= Malay; 2= Chinese; 3= Indian; or, 4= Others; as the population of Malaysia is largely composed of these three ethnic group.

Personal enabling factors

The personal enabling factor construct was measured by asking the household income and was assessed with the question: "What is your estimated household income per month?" The participants were given option of choosing 1= <RM400; 2= RM400-RM699; 3= RM700-RM999; 4= RM1000-RM1999; 5= RM2000-RM2999; 6= RM3000-RM3999; 7= RM4000-RM4999; 8= RM5000 and above; based on Malaysian National Health and Morbidity Survey III (NHMS, 2011).

Table 3.6: Variables in the Demographic, Social Structure and Personal Enabling Factors

Variables	Measurement scale	Scale items	Scale characteristics
Age	Self-reported	What year were you born?	Continuous
Gender	Self-reported	What is your sex	Categorical 1= Male; 2= Female
Ethnic group	Self-reported	What is your ethnicity/race?	Categorical 1= Malay; 2= Chinese 3= Indian; 4= Others
Marital status	Self-reported	What is your marital status?	Categorical 1= Never married 2= Married 3= Divorced 4= Separated 5= Widowed
Educational level	Self-reported	What is the highest educational level that you have attained?	Categorical 1= No formal education 2= Primary school or Secondary school 4=Tertiary (Certificate or other qualification after secondary school e.g. college or University
Occupation	Self-reported	What is your current occupation?	Categorical 1= Self-employed 2= Unemployed 3= Housewife 4= Retiree 5= Professionals 6= Housewife 7= Non-professionals
Income	Self-reported	What is your estimated household income per month?	Categorical 1= <RM400 2= RM400-RM699 3= RM700-RM999 4= RM1000-RM1999 5= RM2000-RM2999 6= RM3000-RM3999 7= RM4000-RM4999 8= RM5000 and above
Family history of hypertension	Self-reported	Does anyone else in your family have high blood pressure?	Categorical 1= Yes 2= No 3= Not sure
Smoking status	Self-reported	Are you a smoker?	Categorical 1= Never smoke 2= Smoker 3= Ex-smoker 4= Occasional smoker

Table 3.7: Variables in Information Regarding Diagnosis of Hypertension

Variables	Measurement scale	Scale items	Scale characteristics
Place of diagnosis	Self-reported	Where wereyou first diagnosed as having hypertension?	Categorical 1= Government primary health clinic 2= In private practitioner clinic 3= Government hospital 4= Private hospital 5= Pharmacy 6= Others
Duration of hypertension	Self-reported	When were you first told that you have hypertension?	Categorical 1= <1 year 2= 1 to 5 3= more than 5 years
First discover hypertension	Self-reported	How did you come to know that you are having hypertension	Categorical 1= In medical follow-up for other conditions 2= In screening programme 3= In emergency service 4= Others
Place where blood pressure usually measured	Self-reported	Where do you get your blood pressure measured (checked) usually?	Categorical 1= Self-monitoring at home 2= Family or neighbour 3= Private clinic 4= Pharmacy 5= Others
Presence of other chronic disease	Self-reported	How many medical condition that you have other than hypertension?	Categorical 1= None/one 2= 2 to 3 3= >3

Anthropometric measurement

Anthropometric measurements of height and weightwere recorded utilizing calibrated standard equipments and methodology. The participants' height were recorded using the anthropometric height board to the nearest 0.1 cm, and their weight was recorded using Seca electronic weighing scale (Seca GmBH and Co Kg, Hamburg, Germany) to the nearest 100 g. Next, their Body mass index (BMI) was calculated as a measure of body mass relative to height (kg/m^2).

Blood pressure was taken in a sitting position in the right arm via auscultatory method using a standard mercury sphygmomanometer with the subject seated and the arm extended over the table at the level of heart. A set of different-sized cuffs was used covering about 2/3 of the upper arm and encircling it completely without overlapping. Blood pressure readings were noted as per the recommendations of American Heart Association (Pickering et al., 2005). The first and the fifth Korotkoff sounds were for the SBP and DBP levels respectively. Two measurements were taken at intervals of five minutes each and the mean of the two readings was taken for SBP and DBP. Well controlled blood pressure was defined as a mean blood pressure of 140/90 mmHg and, poor blood pressure control as ≥140/90mmHg.

Table 3.8: Classification of hypertension

Classification	Systolic pressure	Diastolic pressure
Normal	mmHg	mmHg
	90-119	60-79
High normal or prehypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	≥160	≥100
Isolated hypertension	≥140	<90

Source: "Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure" (Chobian, Bakris, & Black, 2003) and "2013 ESH/ESC Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Hypertension (ESC) and of the European Society of Cardiology (ESC)"(Giuseppe Mancia et al., 2007; Ministry of Health Malaysia, 2013).

Medication non-adherence

Medication non-adherence was measured using the modified Medication Adherence Scale which was developed in Phase III (myMAR-Scale). After examination of construct validity and reliability, the scale resulted with four factors structure, and 20 items (Refer to Table 3.9).

Using this scale, participants were asked to indicate how often they had been non-adherent with their anti-hypertensive medications for each of the reasons mentioned using a 5 point Likert scale ranging from none of the time to all of the time (1= none of the time; 2 = a little of the time; 3 = some of the time; 4 = most ofthe time; and 5 = all of the time). This technique was developed by Wroe et al., 2002, (Wroe, 2002) where the participants were asked to state all the reasons for-non-adherence and write a number for each of the reasons indicating how relevant that reason was to the participants. In the study, the participants were provided with the most frequently reported reasons for non-adherence and were asked to indicate how often they had been non-adherent due to that reason.

Table 3.9: The 20 items Modified Medication Adherence Reasons Scale (myMAR-Scale) to measure medication non-adherence developed from frequently reported reasons of medication non-adherence supported by literature review.

"If you have ever missed taking your antihypertensive medication (s), please indicate how often you have missed taking your medication due to the various reasons listed below."
(1 = none of the time; 2 = a little of the time; 3 = some of the time; 4 = most of the time ; and 5 = all of the time)

1	Difficulty in swallowing medications
2	Unclear about proper administration of medication
3	Embarrassment in taking medications (e.g. you are with your friends, you are in a public place, etc)
4	Problems opening containers
5	Cost of medications
6	Taking too many medications
7	Concern about long term effects of medications (e.g. kidney disease) or dependency on medications
8	Use of alternative/ traditional medication
9	Medication is ineffective
10	Side effects or fear of side effects (e.g. developed dizziness after taking medication)
11	Think medication is not needed because you are not showing any indications of the disease or you feel well without medication
12	Stop medication to see whether it is still needed
13	Forgetting due to busy schedule
14	Inconvenience in taking medications as prescribed (e.g. you are away from home, the medication makes you urinate more frequently, etc)
15	Influence from spouse/ family (e.g. children, relatives)
16	Influence from peers
17	Influence from the community/ social organization
18	Lack of care from doctor (e.g. the doctor does not have concern for your illness and does not put your health as his highest priority in the consultation)
19	Lack of information of patients' need from the doctor and healthcare staff (e.g. the doctor/ healthcare staff does not inform you regarding the possible side effects of the medication and how to handle it or how to control your blood pressure thru your lifestyle and diet)
20	Long waiting time in the health clinic

Disease characteristics

The variables measured for the characteristics of the disease were depression, anxiety and stress, as they were associated with medication non-adherence (Vermeire, et al., 2001; Vik, et al., 2004). In this study, the focus was more on the association of depression and anxiety with medication non-adherence. Therefore, single items asking the subjects if they were currently prescribed with any medication for depression or anxiety were used. Studies on medication adherence to identify depression and anxiety that used pharmacy records often ask questions related to drugs of depression and anxiety to identify those diagnoses(Siegel, et al., 2007). Therefore, the participants were asked to self-report if they had been prescribed with medications for depression and anxiety.

Are you currently prescribed with any medication for depression?	Yes/ No
Are you currently prescribed with any medication for anxiety	Yes/ No

Health Beliefs

The participants' health beliefs were measured in this study, which were related to the beliefs in medication and knowledge about medication. The beliefs in medication were measured using the Beliefs in Medication Questionnaire (BMQ) developed by Horne et al (Horne & Weinman, 1999). This questionnaire was developed specifically to explore individuals or patients' beliefs about the necessity and concerns with regard to medications. This questionnaire has been proven to be predictive of adherence to medication among patients with chronic diseasesincluding asthmatic, cardiac, renal and oncology patients. It has been shown to correlate with self-reported adherence(Horne & Weinman, 1999)(Horne, Weinman, & Hankins, 1999; Menckeberg et al., 2008). It contains two domains of medication beliefs: necessity beliefs domain (internal consistency of 0.86) and concern beliefs in medications domain (internal consistency of

0.65) (Horne, et al., 1999). Both domains were measured using a 5 point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The total score for the necessity and concern scales range from 5 to 25 with higher scores indicating stronger beliefs. The BMQ domains and items are as shown in the Table 3.10.

Table 3.10: Variables in Health Beliefs

Response options: 1= Strongly disagree; 2= Disagree; 3= Uncertain; 4= Agree; 5= Strongly agree
Necessity Beliefs
My health, at present, depends on my medicines My life would be impossible without my medicines My health in the future will depends on my medicines My medicines protect me from becoming worse Without my medicines, I will very ill
Concern Beliefs
Having to take medicines worries me I sometimes worry about the long-term effects of my medicines My medicines are a mystery to me My medicines disrupt my life I sometimes worry about becoming too dependent on my medicines

<u>Treatment Characteristics</u>

The treatment characteristics that were measured were the duration of hypertension and the complexity of regimen.

Duration of hypertension

Duration of hypertension was measured using a single item by asking the participants how long they had been diagnosed with hypertension. It was a continuous variable.How long since have you been diagnosed with hypertension?

Complexity of regimen

This variable was measured by a single item which described the total number of anti-hypertensive medication taken on daily basis. The total number of medications taken on daily basis is one of the factors of non-adherence and can be considered to measure the regimen complexity (Bartlett, 2002; Muir, Sanders, Wilkinson, & Schmader, 2001; Phatak & Thomas, 2006). A few scales have been developed to measure the index of regimen complexity. The regimen complexity index was developed by George et al has the correlation of 0.9 with the number of medication (George, Phun, Bailey, Kong, & Stewart, 2004). Therefore, it allows the total number of medications for measuring the regimen complexity.

Self-efficacy

In this study, self-efficacy was measured using the Medication Adherence Self-Efficacy Scale (MASES)(Ogedegbe, Mancuso, Allegrante, & Charlson, 2003). This scale comprised 26 items and has excellent reliability (Cronbach's alpha coefficient of 0.95). It was developed and evaluated among ambulatory hypertensive African-American patients via interviews to explore the patients' experiences and challenges in taking their antihypertensive medication. It can be used by clinicians and researchers to identify situations in which patients have low self-efficacy in adhering to the prescribed medications. The scale is used in a three point Likert scale ranging from 1 (not at all sure) to 3 (very sure) and the total score of the scales ranges from 26 to 78. Higher score indicates higher self-efficacy in managing medications (Refer to Table 3.11).

Table 3.11: Variables in the Medication Adherence Self-Efficacy Scale (MASES)(Ogedegbe, et al., 2003).

Please rate how sure you are that you can take your medication all of the time as prescribed in the following situations. 1= Not at all sure; 2= Somewhat sure; 3= Very sure
When you are busy at home
When you are at work
When there is no one to remind you
When you worry about taking them for the rest of your life
When they cause some side effects
When they cost a lot of money
When you come home late from work
When you do not have symptoms
When you are with family members
When you are in a public place
When you are afraid of becoming dependent on them
When you are afraid they may affect your sexual performance
When the time to take them is between your meals
When you feel you do not need them
When you are traveling
When you take them more than once a day
If they sometimes make you tired
If they sometimes may you feel dizzy
When you have other medications to take
When you feel well
If they make you want to urinate while away from home
Get refills for your medications before you run out
Fill your prescriptions whatever they cost
Make taking your medications part of your routine
Always remember to take your antihypertensive medications
Take your medications for the rest of your life

Community enabling factors

The variable that was measured in this construct was social support. The Multidimensional Scale of Perceived Social Support (MSPSS) was used as a measuring tool for this construct. It is one of the many scales designed to assess social support. It was designed to assess the perception of social support adequacy from three different sources: Family, Friends and Significant Others. It contains 12 items with seven point Likert scale , therefore makes it easily and quickly administered.(Zimet, Dahlem, Zimet, & Farley, 1988). This scale had been validated in Malaysia with good internal consistency (Cronbach's alpha= 0.89) (Ng, et al., 2010). The variables in the Multidimensional Scale of Perceived Social Support for Malaysian (MPSS-M) are as shown in the Table 3.12.

Table 3.12: Variables in the Multidimensional Scale of Perceived Social Support (MPSS-M)(Ng, et al., 2010)

The Malay version of the Multidimensional Scale of Perceived Social Support, MPSS-M. Please read the following statements. Circle the number on the scale below.

1	2	3	4	5	6	7
Extremely disagree	Strongly disagree	Do not agree	Neutral	Agree	Strongly agree	Extremely agree

1. There was a special person with me when I'm in a state that requires help
2. There is someone special to share my joys and sorrows
3. My family have tried their very best to help me
4. I get emotional help and support I need from family
5. I have a special person who really makes me comfortable
6. My friends try their best to help me
7. I can count on my friends when something bad happens
8. I can talk about my problems with my family
9. I have friends whom I can share my joys and sorrows with
10. There is a special person in my life who cares about my feelings
11. My family is willing to help me make a decision
12. I can talk about my problems with my friends

Perceived need factors

The variable measured in this construct was perceptions and concerns about one's own health.

Perceptions and concerns about one's own health

The perceptions about one's own health was measured using two items which anchored on five point Likert scales (Refer to Table 3.13). The concerns about one's own health were measured using a single item and the total score is calculated by summing the scores of the individuals items (Eriksson, Undén, & Elofsson, 2001)(Fayers & Sprangers, 2002; John & Farris, 2006).

Table 3.13: Variables in Perceptions and Concerns about One's Own Health

Which of the following best describes your current overall health?				
Poor	Fair	Good	Very good	Excellent
Thinking about your own health, how would you say about it compared to other people's health of your own age?				
Much worse than others	Somewhat worse than others	About the same as others	Somewhat better than others	Much better than others
How concerned are you about your own personal health?				
Not at all concerned	Somewhat concerned	Concerned	Very concerned	Extremely concerned

Evaluated need factors

This construct was measured by the severity of illness. The severity for hypertensive control was measured by blood pressure level (Refer to Table 3.14).

Table 3.14: Level of Hypertensive Control

Blood pressure category	Blood pressure level
Well control	< 140/90 mmHg
Poor control	≥ 140/90 mmHg

Health outcomes

This variable was measured using the overall satisfaction domain of Treatment Satisfaction Questionnaire for Medication (TSMQ) (Atkinson, Kumar, Cappelleri, &Hass, 2005; Atkinson et al., 2004). This domains contain three items with good reliability (Cronbach's alpha of 0.85). The first item in the scale is anchored on a five point Likert scale ranging from 1 (not at all confident) to 5 (extremely confident). The second item is anchored on a five point Likert scale ranging from 1 (not all certain) to 5 (extremely certain); and the third item is anchored on a seven point Likert scale ranging from 1 (extremely dissatisfied) to 7 (extremely satisfied) (Refer Table 3.15). The scale scores ranged from 0 to 100, with the items summed and rescored on a 0-100 scale as described in the convenience items.

Table 3.15: Variables in the Health Outcomes

Response options: Item 1: 5 point Likert scale from not at all confident to extremely confident Item 2: 5 point Likert scale from not at all certain to extremely certain Item 3: 7 point Likert scale from extremely dissatisfied to extremely satisfied
Overall, how confident are you that taking this medication is a good thing for you? How certain are you that the good things about your medication outweigh the bad things? Taking all things into account, how satisfied or dissatisfied are you with this medication?

3.8.9 Study Instrument

A self-administered questionnaire was utilized and compiled for all the variables described.

Translation

The forward and backward translation of the questionnaire involved three phases. In phase one, two professionals who were fluent in Bahasa Malaysia and English translated the questionnaire to Bahasa Malaysia (Wild, et al., 2005). The researcher compared both versions and discussed with the translators if any discrepancies were found. Following these, the first Bahasa Malaysia version was formed. In the second phase, two English speaking persons who were blind to the study objectives translated the questions into English. Comparisons were done between the original and the translated version. Each of the questions was analyzed thoroughly. Finally, all the questions were reviewed and discussed among the researcher and two experts (one public health specialist and one family medical specialist). The two experts who had extensive experience in public health research worked at two different organizations. The questionnaire was reviewed to determine whether it appeared to be a good translation of the construct. The observations were reviewed and appropriate corrections were made as necessary. Consequently, a second Bahasa Malaysia version was produced.

Content validity

Content validity is a qualitative type of validity whereby the domain of the concept is made clear and the analyst judges if the measures fully represent the domain (Bollen, 1989). According to Bollen, for most concepts in the social sciences, no consensus exists on theoretical definitions, because the domain of content is ambiguous. The researcher does not only provide a theoretical definition (of the concept), but also select indicators that thoroughly cover its domain and dimensions. The content validity of the questionnaire was evaluated by three experts (one public health specialist and two family medical specialist).

Face validity

A small scale preliminary test (pre-test) was conducted using a convenience sample of twenty hypertensive patients who assessed the face validity in terms of the language, comprehension and time to complete the questionnaire. Any discrepancies were rectified.

3.8.10 Pilot study

A pilot study was conducted with 60 hypertensive patients in middle of December 2013 to evaluate the questionnaire before the major survey was undertaken.

Test-retest reliability

Test-retest reliability refers to the temporal stability of a test from one measurement session to another. The procedure is to administer the test to a group of participants and then administer the same test to the same participants at a later date. The correlation between scores on the identical tests given at different times operationally defines its test-retest reliability.

Test-retest reliability is designed to re-administer the questionnaire to the participants after two weeks in order to measure the stability over time. This is to ensure that consistent results will be produced when the same entities are measured under different condition (Field, 2009). The two weeks interval was selected so that reliability estimates are not due to memory effects (Garson, 2012). Cohen's Kappa (*k*) was used for reliability analysis for this survey because it is a common technique for estimating paired interrater agreement for nominal and ordinal-level data (Fleiss, et al., 1981). On the other hand, the intraclass correlation coefficient (ICC) ignores orders and treats as a random sample from a population (Bland & Altman, 1990). Hence, weighted kappa was appropriate for this study as the scale used was ordinal scale.

The criteria for test-retest reliability according to Landis and Koch (Landis & Koch, 1977) are in Table 3.16.

Table 3.16: Criteria for Test-Retest Reliability according to Landis and Koch
(Landis & Koch, 1977)

Test-retest reliability	Cohen's Kappa (*k*)
Poor agreement	Less than 0
Slight agreement	0.01 to 0.20
Fair agreement	0.21 to 0.40
Moderate agreement	0.41 to 0.60
Substantial agreement	0.61 to 0.80
Almost perfect agreement	0.81 to 1.00

3.8.11 Examination of the data

The data was collected and entered into SPSS version 21.0. Examination of data was done to evaluate the missing values, identification of the outliers and testing of the assumptions underlying the multivariate techniques. Missing data or values are primarily result from errors in data collection or data entry or from omission of answers by the participants.

Hence, in order to determine if subjects with missing values were different from the participants without missing values, the expectation-maximization (EM) estimation was checked. Examination of the missing value pattern indicated that the missing values were missing completely at random (MCAR) and revealed a non-significant p-value ($p>0.05$). Therefore, the researcher should indicatethe completely missing at random, in the sense that missing does not depend on the values of variables in the data set subject to analysis (Donders, et al., 2006; Hair, 2009). The assumption of univariate normality was assessed through variable skewness and kurtosis.

Outliers or extreme responses were identified by frequency tables and boxplot. The outliers were removed using descriptive analyses that were undertaken to obtain frequencies, proportions, means and standard deviations.

3.8.12 Data Analysis

As for data analysis, SPSS Version 21.0 (IBM) software was chosen because it is comprehensive, uncomplicated, and had the right analytical tools to obtain the results for the current study.

CHAPTER 4 : RESULTS

This chapter aims to present the results derived from the quantitative study (Phase I and III) and the qualitative study (Phase II). The chapter begins with Phase I, followed by the results from Phase II and III. The main results is the major survey which is the association of the risk factors in the Conceptual Framework of non-adherence to antihypertensive medication based on Anderson's Behavioral Model and Leventhal's Common Sense Model. Results are presented in the form of text, figures and tables, with data analysis. Following these, the findings are synthesized as a mixed-methods results.

4.1 Part I (quantitative study)

The main objective in Part I was to examine the construct validity and reliability of the 15 items MAR-Scale among hypertensive patients attending follow-up in government primary health clinics located in Hulu Langat (Bangi and Semenyih health clinics) and Klang (Meru and Kapar health clinics) districts in state of Selangor, Malaysia. This pilot study was important to determine whether the MAR-Scale can be used in multi-ethnic population in Malaysia.

4.1.1 Study population characteristics

A total of 800 hypertensive patients were approached in four randomly selected government primary health clinics in Hulu Langat (Bangi and Semenyih health clinics) and Klang (Meru and Kapar health clinics) districts in state of Selangor, Malaysia and a total of 665 hypertensive patients participated in this pilot study. A response rate of 83% was obtained. The survey data was keyed into the SPSS software. Statistical analyses were done using SPSS version 19.0 and SPSS Amos version 21. Examination of the data and data cleaning was carried out. This resulted in 622 participants to be analysed. The profile of these 622 participants is provided in Table 4.1.

Table 4.1: Description of the 15 items MAR-Scale (Medication Adherence Reasons Scale)

Characteristic	Number (%)[a] (N=622)
Age (in years)	
Mean age M=52.0, SD=8.73	
Gender	
Female	345 (55.5)
Male	277 (44.5)
Ethnic	
Malay	354 (57.0)
Chinese	121 (19.5)
Indian	139 (22.3)
Others	8 (1.3)
Marital status	
Married	516 (83.0)
Widowed	54 (8.7)
Divorced	29 (4.7)
Never married	19 (3.1)
Separated	4 (0.6)
Educational levels	
Primary school	147 (23.6)
Secondary school	267 (43.0)
Certificate or other qualifications after secondary school	91 (14.6)
No formal education	77 (12.4)
University	35 (5.6)
Others	5 (0.8)
Occupation	
Housewives	178 (28.6)
Private sector employee	172 (27.7)
Self-employed	101 (16.2)
Government retiree	61 (9.8)
Civil servant	48 (7.7)
Private retiree	45 (7.2)
Unemployed	16 (2.6)
Studying	1 (0.2)

**Data presented as a mean ± standard deviation*

[a]Categories may not total 100% due to rounding

As depicted in Table 4.1, the overall mean age of the participants was 52 year old (SD=8.73) and most of the participants were female (55.5%) compared to male (44.5%). Malays were the majority (57%) attending within these government primary health clinics. In terms of marital status, the majority were married (83.0%). Most of the participants had attended school, and 43.0% had attended secondary schools and 23.6% reported having received primary education. However, 12.4% received no formal education and only 5.6 % had attended university. Most of the participants were housewives (28.6), followed by private sector employee (27.7%), self-employed (16.2%), government retirees (9.8%), civil servants (7.7%), private sector retirees (7.2%) and 2.6% were unemployed.

4.1.2 Exploratory factor analysis

The MAR-Scale contains items for measuring reasons for medication adherence (15 items); ‘Managing issues’ (four items), ‘Multiple medication issues’ (three items), ‘Belief issues with medications’ (four items), ‘Availability issues’ (two items) and ‘Forgetfulness and Convenience issues’ (two items). As described in the previous chapter, these items were adapted from the original 15-items MAR-Scale developed by Unni et al., 2009, (Unni & Farris, 2009). All these constructs were measured on 5-point Likert scales, ranging from 1 (None of the time) to 5 (All of the time).

Exploratory factor analysis was carried out to provide a preliminary check on the number of factors and pattern loading before proceeding to confirmatory test for the measurement theory (Hair, 2009). Indicators with low factor loadings and communality would be deleted and the underlying dimensions revealed. Departures from normality, homoscedasticity, and linearity are not necessary for factor analysis (Hair, 2009). Hence, despite the suspected non-normal data distribution, factor analysis can be performed in this study.

The exploratory factor analysis conducted in three steps. Firstly, the underlying statistical assumptions of factor analysis were examined and the factorability of the correlation matrix was assessed. Secondly, factor analysis was carried out. Thirdly, the reliability of the derived factors were be verified using Cronbach's alpha.

A key requirement of factor analysis is to ensure that the variables are sufficiently inter-correlated to produce representative factors. Assessment of the degree of the inter-relatedness was made on the overall variable perspective. To assess the factorability of the correlation matrix, visual examination of correlations was done. Visual inspection of the inter-item matrix revealed that more than 80% inter-item correlations were significant at the 0.01 levels. This surpassed the 30% level recommended by Hair et al (Hair, 2009). A second measure to quantify the degree of inter-correlations between the variables and the appropriateness of factor analysis is the Measure of Sampling Adequacy (MSA).

Table 4.2 shows that Barlett's test of sphericity (Chi-square value) was highly significant ($p<0.001$), thus indicating that the 15-items correlation matrix was not an identity matrix. In addition, the KMO value of 0.637 met Kaiser's criteria (Kaiser, 1974) ''middling criteria" which is more than 0.6 (Pett, et al., 2003). Measures of sampling adequacy (MSA) range from 0.45 for item K8 to 0.72 for item K12. These findings show that the correlations between individuals' items were strong enough and that the correlation matrix was factorable. Table 4.3 displays the correlation matrix. Examination of the anti-image correlation matrix revealed that none of the inter-item correlation had values which exceeded 0.8 indicating that there was no problem with multicollinearity, that is, there is no values of $r \geq 0.80$ (Pett, et al., 2003). These findings show that the correlations between individuals' items were strong enough and that the correlation matrix was factorable.

Table 4.2: Kaiser-Meyer-Olkin (KMO) and Barlett's Test of Spericity for the 15 items CorrelationMatrix

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.637
Bartlett's Test of Sphericity	Approx. Chi-Square	682.717
	df	105
	Sig.	.000

Table 4.3: Correlation Matrix, Means, and Standard Deviations for the 15-Items for MAR-Scale

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Means	SD
1	1.0															3.2	1.1
2	-.22	1.0														3.1	1.1
3	-.42	-.24	1.0													2.8	1.2
4	-.06	-.09	-.34	1.0												3.2	1.3
5	-.08	-.12	.16	-.10	1.0											3.8	1.1
6	.16	.07	-.08	.09	-.59	1.0										3.2	1.2
7	-.06	.25	-.212	.08	-.20	-.20	1.0									2.4	1.1
8	.02	.02	-.227	.22	-.17	-.04	.27	1.0								3.3	1.3
9	.01	.19	-.291	-.00	.02	-.08	.12	-.09	1.0							3.2	1.1
10	.05	-.19	.248	-.19	.16	.05	-.33	-.59	-.41	1.0						3.6	1.2
11	.01	-.00	.013	-.05	.16	-.12	.04	-.12	.07	.05	1.0					3.5	1.1
12	.12	.05	-.080	.06	-.16	.10	-.08	-.12	-.12	.07	-.34	1.0				3.2	1.3
13	.02	.20	.063	.12	-.06	.05	-.03	.17	-.03	-.04	.08	-.17	1.0			3.1	1.2
14	.14	.05	-.141	-.05	.05	-.03	.02	-.18	.03	.13	-.06	.12	.61	1.0		3.1	1.4
15	.13	.04	-.159	-.05	.06	-.03	-.19	.02	.14	-.06	.16	-.60	.52	.24	1.0	3.7	1.2

The number of initial factors was determined via principal axis factoring (PAF), examining the communalities, eigenanalysis and examining the scree plot. PAF was used as an extraction method instead of principal component analysis (PCA) because the former provided a better estimate of the correlations as it included errors of measurement, while the latter did not separate the errors of measurement from shared variance (Nunnally & Bernstein, 1994). Therefore, PAF was a better solution than PCA. Rotation of the factors was carried out to obtain theoretically meaningful dimensions and ideally, the simplest factor structure. There are two types of rotation namely oblique and orthogonal. Although orthogonal rotations often produce simple solutions, these rotations rest on the critical assumption that the factors, or subscales of interest, are uncorrelated with one another. However, this assumption is rarely met in health care research as Pedhazur et al. (Pedhazur, Schmelkin, 1991) argue that orthogonal solutions are unrealistic portrayals in sociobehavioral phenomena. This is because the factors might be correlated in health sciences because we are often dealing with conceptually different but nevertheless correlated dimensions of a construct (Pett, et al., 2003).Therefore, the oblique rotation namely direct oblimin was used as the rotation method.

Eigenanalysis was done by examining the eigenvalues (EVs), which represents the amount of variance in all of the items that can be explained by a given factor as shown in Table 4.4. All factors with EVs greater than 1 were selected according to Kaiser-Guttman rule (Guttman, 1954) in order for the matrix to be positive-definite and factorable (Comrey & Lee, 2013).Based on eigenvalue greater than one, five factors were extracted accounting for cumulative percentage of 48.5% variance extracted by successive factors (Gorsuch, 1983). There is no fixed threshold to determine the range of cumulative percentage extracted, although certain percentages have been suggested because the terms do not usually readily apply in social sciences (Williams, Brown, & Onsman, 2012).

Table 4.4: Total Variance Explained by Principal Axis Factoring (PAF) of 15 items MAR-Scale

Total Variance Explained

	Initial Eigenvalues			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings[a]**
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.825	18.835	18.835	2.375	15.834	15.834	2.070
2	2.037	13.579	32.415	1.549	10.326	26.160	1.591
3	1.867	12.447	44.862	1.452	9.678	35.839	1.788
4	1.675	11.170	56.032	1.258	8.384	44.223	1.344
5	1.218	8.123	64.154	.645	4.300	48.523	.922
6	.944	6.294	70.448				
7	.793	5.285	75.732				
8	.720	4.800	80.532				
9	.670	4.464	84.996				
10	.573	3.821	88.817				
11	.472	3.145	91.962				
12	.429	2.863	94.824				
13	.300	2.001	96.826				
14	.276	1.840	98.665				
15	.200	1.335	100.000				

Extraction Method: Principal Axis Factoring.
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Examination of the scree plot was done and a straight line was drawn through the smaller eigenvalues where a departure from this line occurred as shown in Figure 4.1. This point highlights where the debris or break occurs. The point above this debris or break (not including the break itself) indicates the number of factors to be retained using the Cattell criteria (Cattell, 1966). The inspection of the scree plot produced a departure from linearity coinciding with the 5 factors.

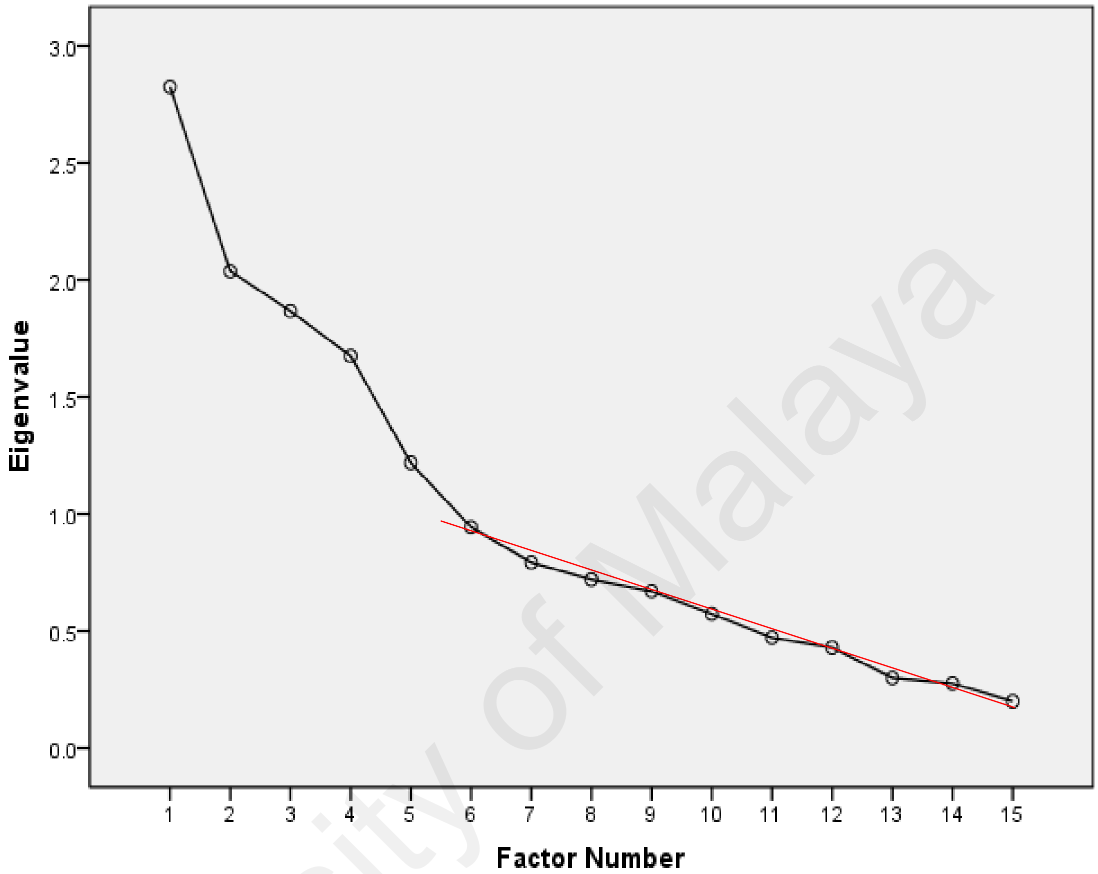


Figure 4.1: Scree Plot Generated for the Eigenvalues Plotted against their Principal Components

Further examination of the items' loadings in pattern matrix (Refer to Table 4.5) was undertaken in order to increase the percentage of explained variance.

Table 4.5: Pattern Matrix of 15 items MAR-Scale showing items with low loadings namely K11 and K14

Pattern Matrix[a]

	Factor				
	1	2	3	4	5
K2	-.097	-.003	.709	-.112	-.072
K4	-.009	.057	.504	.160	.054
K9	.113	.033	.797	.032	.078
K15	.040	-.046	.524	-.075	-.043
K3	-.098	.842	.041	.022	.040
K7	-.029	.771	-.025	-.002	.081
K14	.080	.445	.006	-.047	-.092
K10	.681	.002	.060	.016	.187
K11	.409	.050	-.108	-.003	.018
K12	.629	-.022	.167	-.009	.008
K13	.913	-.055	.001	-.026	-.123
K1	-.031	-.084	-.011	-.078	.655
K6	.088	.109	.006	.065	.497
K5	-.021	.008	-.033	.900	-.065
K8	.000	-.050	.011	.674	.007

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

Two items were then removed, namely, items ‘K11=side effects/fear of side effects’ and ‘K14=concern long term effects of medications’. The removal of items K11 and K14 produced 5 factors but increased the total percentage of cumulative variance to 53.6 % as shown in Table 4.6 and Table 4.7.

Comparison with Monte-Carlo based simulation method was done to compare the observed eigenvalues from PCA. A factor or component is retained if the associated eigenvalue is bigger than the 95^{th} of the distribution of eigenvalues derived from the random data (Ledesma & Valero-Mora, 2007). Five factors were retained from Horn’s Parallel Analysis (PA) as shown in Table 4.8. Therefore, the findings suggested that the data should be analysed further by CFA for five factors.

Table 4.6: Total variance explained with 15 items

Total Variance Explained							
Factor	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings[a]**
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.697	20.747	20.747	2.263	17.409	17.409	1.953
2	1.903	14.639	35.386	1.495	11.502	28.911	1.464
3	1.789	13.762	49.148	1.384	10.648	39.559	1.788
4	1.528	11.757	60.905	1.200	9.233	48.792	1.352
5	1.191	9.160	70.065	.624	4.804	53.596	.913
6	.760	5.848	75.913				
7	.700	5.382	81.296				
8	.669	5.150	86.445				
9	.472	3.633	90.079				
10	.444	3.417	93.496				
11	.320	2.458	95.954				
12	.291	2.238	98.191				
13	.235	1.809	100.000				

Extraction Method: Principal Axis Factoring.
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 4.7: Principle axis factoring followed by direct oblimin rotation factor loadings

Item	Variable	F1	F2	F3	F4	F5
				Factor loadings		
K2	Difficulty in swallowing	0.71				
K4	Unclear about proper administration of medication	0.54				
K9	Embarassment in taking medications (e.g.you are with friends, you are in a public place, etc.)	0.80				
K15	Problems opening container	0.52				
K3	Cost of medication		.842			
K7	Taking too many medication		.771			
K14	Concern about long term effects of medications or dependency on medications		.445			
K10	Medication is ineffective			0.68		
K11	Side effects or fear of side effects			0.41		
K12	Think medication is not needed because you are not showing any indications of the disease or you feel well without medication			0.63		
K13	Stop medication to see whether it still needed			0.91		
K5	Forgetting due to busy schedule				0.89	
K8	Inconvenience in taking medications as prescribed (e.g:You are away from home, the medication makes you urinate more frequently, others)				0.70	
K1	Medications not available in the pharmacy					0.70
K6	Prescription ran out due to busy schedule					0.51

Eigenvalues, cumulative eigenvalues and total variance (%) by 11 factors.

Eigenvalues	2.83	2.04	1.87	1.68	1.22
Total percentage and cumulative addition (%)	17.41	11.50	10.65	9.23	4.80
Total variance (%) by factors					**53.6**

Table 4.8: Distribution of Eigenvalues retained from Horn's Parallel Analysis

Factor	Random Eigenvalue	Standard Deviation
1	1.4571	.0625
2	1.3496	.0416
3	1.2567	.0397
4	1.1766	.0358
5	1.1055	.0333
6	1.0447	.0284
7	0.9865	.0286
8	0.9254	.0082
9	0.8631	.0297
10	0.8038	.0308
11	0.7447	.0316

4.1.3 Confirmatory Factor Analysis

In CFA, a combination of several fit indices were used to assess the model as no agreement on a single standard exists (Hair, 2009b). As recommended, various fit indices including relative Chi-square to degrees of freedom ratio (x^2/df), CFI (comparative fit index), GFI (goodness-of-fit index), AGFI(adjusted goodness-of-fit-index), TLI(Tucker-Lewis index), RMSEA (root mean square error of approximation) and SRMR (standardized root mean square residual) were used. It is generally accepted that Chi-square/degree of freedom (df) ratio value less than 3; CFI,GFI, AGFI and TLI values greater than 0.90; and RMSEA $\leq$ 0.07 indicate adequate model fitness (Hair, 2009b). Modification index coefficients were used to check any cross-loadings between items. Model modifications were based on the values of the Akaike's Information Criterion (CAIC) for comparing different models (Hu & Bentler, 1999). A preliminary model is as shown in Figure 4.2. Items which have loadings less than 0.5 were removed one by one (Hair, 2009b). Three items were removed namely ‘K1= Medications not available in the pharmacy’, ‘K11= Side effects or fear of side effects’, ‘K14= Concern about long term effects of medications or dependency on medications’. Domain/factor ‘AI= Availability issues’ was removed because after removal of item K1’, only one factor namely K6 was left in the domain/factor as it showed low reliability. The fit indices of the final four factor model with eleven items indicate good model fit (Chi-square df=2.244, CFI=0.952, TLI=0.933, GFI=0.969, RMSEA=0.050) as shown in Figure 4.3.

Cross-validation with 1000 bootstrap resample of the final model was done which yielded a Bollen-Stine p-value of 0.064 which was more than 0.05 indicating that the model was valid. Besides that, the model also demonstrated convergent validity with standardized loadings >0.5. The average variance extracted (AVE) for the four factors were nearing 0.5; the Composite Reliability (CR) was 0.7 and the AVE (Average Variance Extracted) values were more than the R-squared values between the respective constructs, indicating sufficient discriminant validity (Hair, 2009).

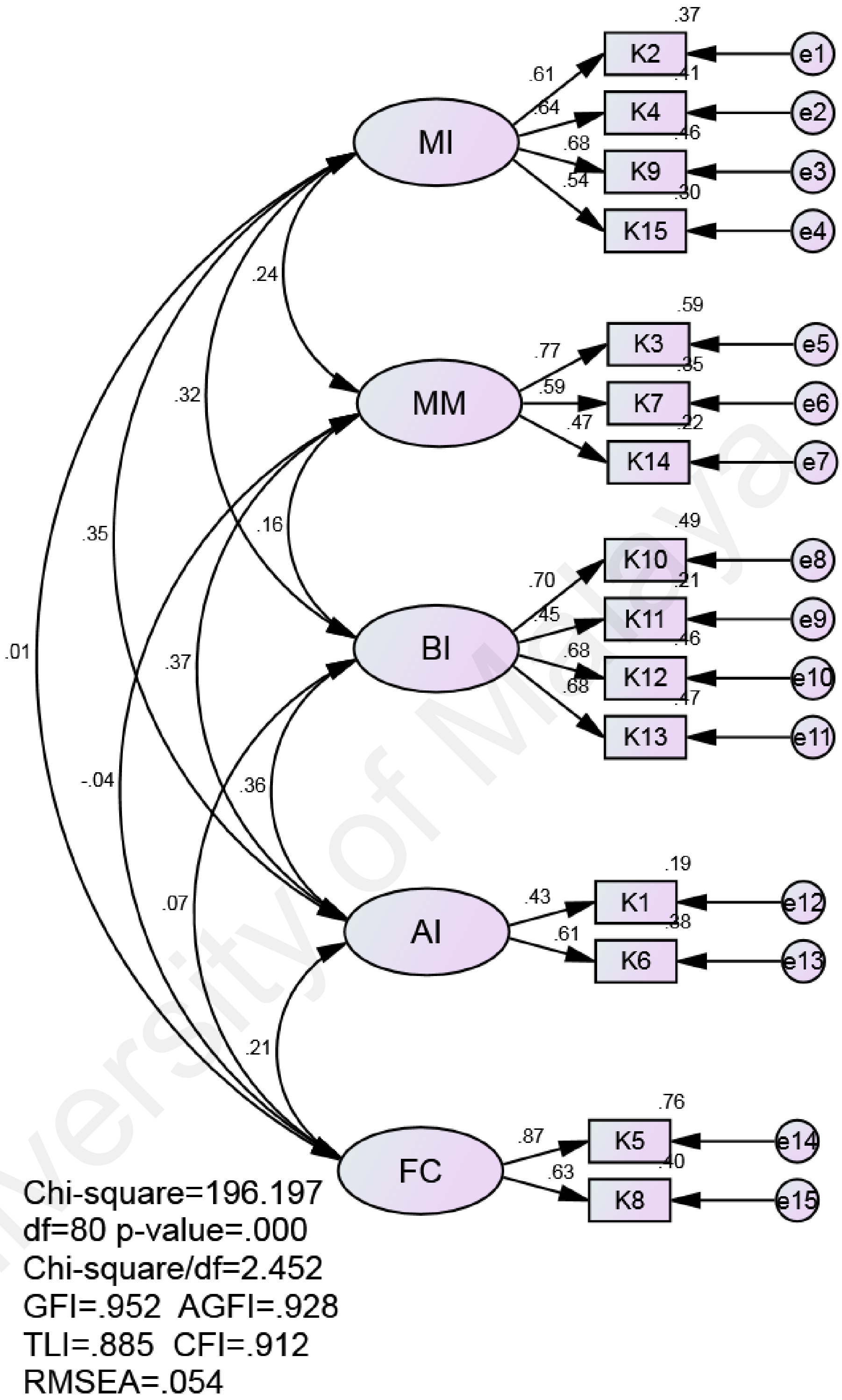


Figure 4.2: Factor structure of the Preliminary Model of the MedicationAdherence Reasons Scale (MARS) using Confirmatory Factor Analysis (CFA)

Note: AGFI: adjusted goodness-of-fit index; AI: availability issues; BI: belief issues with medications; CFI: comparative fit index; df: degrees of freedom; FC: forgetfulness and convenience issues; GFI: goodness-of-fit index; MI: managing issues; MM: multiple medication issues; RMSEA: root mean square error of approximation; TLI: Tucker-Lewis index

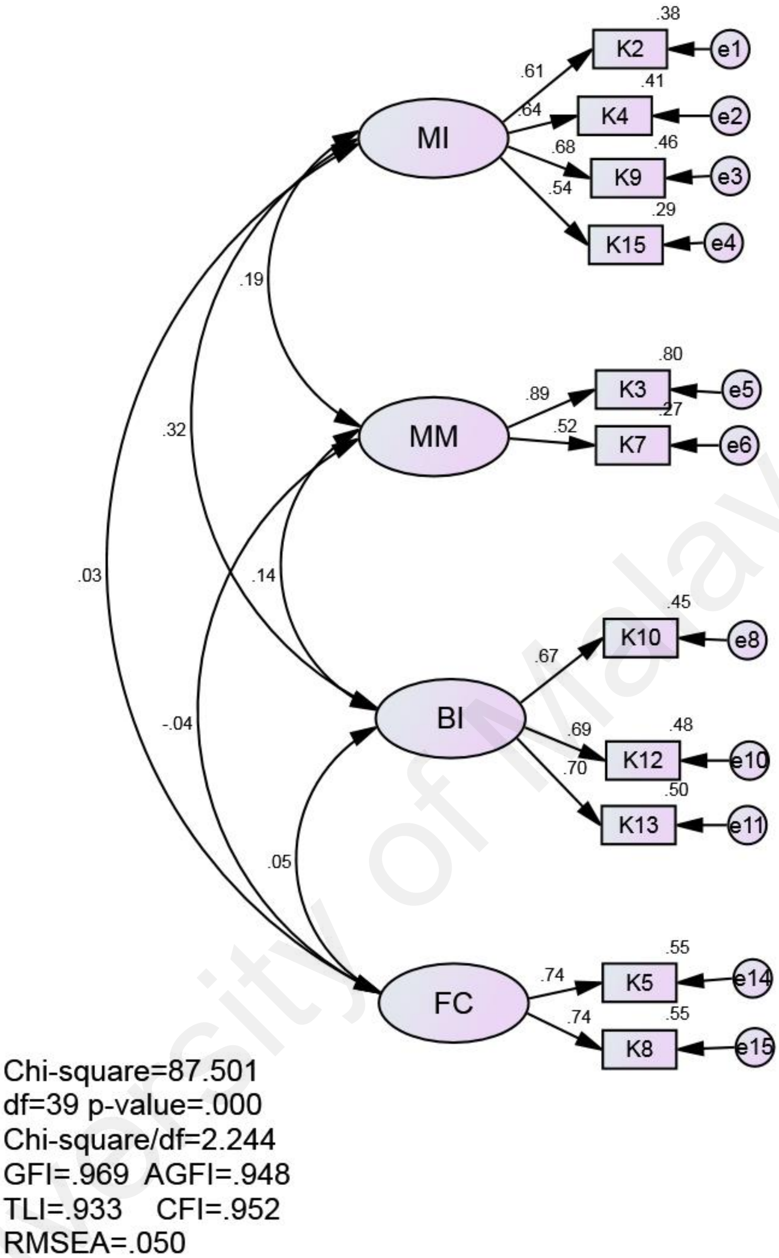


Figure 4.3: Factor Structure of Final Model of the Medication Adherence Reasons Scale (MARS) using Confirmatory Factor Analysis (CFA)

Note: AGFI: adjusted goodness-of-fit index; AI: availability issues; BI: belief issues with medications; CFI: comparative fit index; df: degrees of freedom; FC: forgetfulness and convenience issues; GFI: goodness-of-fit index; MI: managing issues; MM: multiple medication issues; RMSEA: root mean square error of approximation; TLI: Tucker-Lewis index

Multi-group analysis was done and factorial invariance was examined to test whether the items in the scalecould be used equivalently across different populations such as differences in gender and ethnicity. Factorial invariance is defined as the degree to which tests or inventories measure a construct in an equivalent fashion across different groups (Byrne, 2013). As proposed by Cheung and Rensvold, a difference in CFI (diff CFI) value of <0.01 and p-value >0.05, indicates factorial that invariance is present(Cheung & Rensvold, 2002). As depicted in Table 4.9, this model demonstrates sufficient factorial invariance across gender.

Table 4.9: Factorial Invariance across Gender among Hypertensive Patients Attending Primary Health Clinics Setting in Hulu Langat and Klang Districts

Model	**Chi-square**	**df**	**CFI**	**Diff. CFI**	**Diff. Chi-square**	**Diff. df**	**p-value**
I)Configural	199.102	78	0.986				
II)Weak factorial invariance	201.266	85	0.977	0.001 (<0.01)	2.164	7	0.632
III)Strong factorial invariance	221.879	95	0.968	0.001 (<0.01)	22.777	17	0.140
IV)Strict factorial invariance	393.423	122	0.944	0.042	194.321	26	<0.01

4.1.4 Reliability Analysis

Reliability testing to assess the consistency of the factors was carried out using Cronbach's alpha (Cronbach, 1951). Cronbach's alpha is the most widely used measure for reliability (Hair, 2009b). The Cronbach's alpha value for four extracted factors surpassed, 0.70 (MI, MM, BI, FC). The widely-accepted social science cutoff is that Cronbach's alpha should be 0.70 or higher for a set of items to be considered a scale (Garson, David, 2012). The overall Cronbach's alpha value for the five factors was 0.78 and average values of the five subscales ranged between 0.50 to 0.86. Only four factors namely MI, MM, BI and FC were internally consistent except factor AI. At this stage, it was noted that factor AI should be removed due to low internal consistencies reliabilities pending confirmation via CFA. The individual Cronbach's alpha values are listed in Table 4.10. However, factor AI had to be removed due to low loadings (<0.5), leaving only four factors in the final model (Refer Figure 4.2 and Figure 4.3).

Table 4.10: Cronbach's Alpha Values for Each Domain/Factor in MAR-Scale

Factors	Items	Cronbach's Alpha
MI (Managing issues)	K2= Difficulty in swallowing K4 = Unclear about proper administration of medication K9 = Embarassment in taking medications (e.g.you are with friends, you are in a public place, etc.) K15 = Difficulty in opening container	0.83
MM (Multiple medication issues)	K3= Cost of medication K7= Taking too many medication K14= Concern about long term effects of medications or dependency on medications	0.84
BI (Belief issues with medications)	K10= Medication is ineffective K11= Side effects or fear of side effects K12= Think medication is not needed because you are not showing any indications of the disease or you feel well without medication K13= Stop medication to see whether it still needed	0.87
AI (Availability issues)	K1= Medications not available in the pharmacy K6= Prescription ran out due to busy schedule	0.50
FC (Forgetfulness and convenience issues)	K5= Forgetting due to busy schedule K8= Inconvenience in taking medications as prescribed (e.g:You are away from home, the medication makes you urinate more frequently, others)	0.86

4.2 Part II (qualitative study)

This was a qualitative study to explore the reasons which influence hypertensive patients attending government primary health clinic settings for not following hypertensive care recommendations (anti-hypertensive medication intake, physical activity, and diet changes). The characteristics of the participants are shown in Table 4.11.

Table 4.11: Characteristics of the Participants Involved in the Qualitative Study

Characteristics	In-depth interview (N=25)
Age	
Mean (years) 49	
SD 9.3	
Gender	
Male	11
Female	14
Ethnicity	
Malay	8
Chinese	7
Indian	7
Others	3
Positive family history of hypertension	
Yes	6
No	19
Hypertension control	
Adequate control (<140/90 mmHg)	
Not adequate control (≥140/90 mmHg)	
Duration of hypertension	
Mean (years) 5.0	
SD 3.3	

There were range or reasons given by the participants for not adhering to their anti-hypertensive medication. It was noted that there were differences in reasons/barriers which influence the participants for non-adherence among the three major ethnicities. Malay patients tend to find alternative treatments other than the anti-hypertensive medications recommended by their doctors. The Indian participants were more influenced by people around them, especially their family members (spouse, mother-in-law) and peers (neighbours, friends), in their decision making toward medication adherence. Whereas, Chinese patients preferred simple medication dosage because they tend to forget their medication due to their busy schedule.From the analysis of responses, this study was able to identify six (6) themes, namely, a) managing issues, b) multiple medication issues, c) belief issues with medications, d) forgetfulness and convenience issues, e) motivational drives and, f) healthcare provider factors.

A) Managing issues

The participants in this qualitative interviews generally having difficulty in managing their anti-hypertensive medication and controlling their blood pressure to optimum level. Despite being unsuccessful, they believed that they could control their blood pressure through physical activity, diet, and stress management, hence, medication was not necessary. They were having symptoms of dizziness and headaches at early diagnosis due to poor blood pressure control. They also reported that they had difficulty in sleeping due to stress and overwork prior to the diagnosis of hypertension. Six participants expressed that they had stress due to workload at home. Most of the participants also seemed to regard stress and blood pressure as synonymous. They do not admit that they're unable to manage their anti-hypertensive medication control appropriately. Six of the 25 participants were first diagnosed during a routine medical screening or known as CVD screening in Malaysia, whereas others were diagnosedwhen they sought medical attention for their symptoms. Several patients' comments are as follows:

(i) "*I have to reason with my new boss. When I came back, I could not sleep and started having headaches and difficulty in sleeping. Then I had dizziness. When I went and checked, I still remember, the upper reading was 160. The doctor asked me to take medication but I don't want to, because I don't think I need this medication. I've tried controlling my stress, but my blood pressure is still high. I think it is a hereditary disease. I've got it from my parents*" (in-depth interview (IDI)/43 years-old/6 years diagnosed with hypertension).

(ii) "*At first, I've got headaches. But I don't know it was high blood pressure sign. I have to take care of my husband who is suffering from stroke. He's bedridden and I had no helper. I've overworked and can you imagine how stressful I am? That's why my blood pressure shot up. I know if I don't take my medication, I can be just like my husband*" (IDI/65 years-old/1 year diagnosed with hypertension).

(iii) "*I experienced dizziness on and off because I don't have enough rest and sleep. I work and continue working without sleeping. I have no time to rest and I feel so stressed. I don't know how to control my stress. That's why I'm suffering from high blood pressure*" (IDI/50 year old/8 years diagnosed with hypertension).

(iv) "*I have blood pressure set at home. My son bought it for me, but I don't check my blood pressure regularly until at one time I had a really bad headache and I noticed my pressure shot up* " (IDI/61 years-old/2 years diagnosed with hypertension).

(v) *"I experienced blackout after eating salted fish. I went to my company clinic and the doctor said I just had stomach wind. But I still have dizziness even with the medication. So, I went to the Emergency Department in government* *hospital. The doctor check my blood pressure few times and told that my blood pressure was high but I don't remember the readings. I was given medication and was observed for few hours. After that, I was discharged with anti-hypertensive medication with an appointment date to the government primary health clinics"* (IDI/63 years-old/4 years diagnosed with hypertension).

(B) Multiple medication issues

Thirteen participants admitted not taking their anti-hypertensive medication as prescribed. They had multiple medication issues. Fifteen participants expressed their nonchalant attitude, eventhough they were aware of the complications of hypertension, such as stroke and heart disease. Patients were concerned regarding long-term effects of the anti-hypertensive medications. Fourparticipants were also afraid of becoming too dependent on medication and believed that taking medication could damage their body. They were worried if the medication can cause kidney or liver damage. Moreover, two participants took alternative treatments, such as complementary alternative medication such as dietary supplements and herbal remedies. Dietary supplements taken by the participants include multivitamins and minerals. While, the herbal remedies taken were herbs and ginseng. Some of the herbs were taken as drink or sachet such as tea.

These concepts are described in the following patient comments:

(i) "*The doctor did asked my agreement before starting medication. But I didn't take my medication because I took alternative medication which is the herbal tea. I decided to stop the medication for a moment. I'm afraid that my husband and my mother in law know that I'm taking the antihypertensive medication. They said that I'm still young and need not take any medication yet. My friends and neighbours also told me that medication can cause* *damages to our body. It can cause kidney and liver problem* (IDI/31 years-old/5 years diagnosed with hypertension).

(ii) "*I did not take my anti-hypertensive medication everyday because I'm afraid of its' long-term side-effects. I'm looking for natural ways to control my blood pressure* (IDI/ 39 years-old/2 years diagnosed with hypertension).

C) Belief issues with medication

Three participants felt that there's no need to take their anti-hypertensive medication because they feel they can control their blood pressure through diet and they do not consider taking medication as a priority. With regard to information on dietary measures, thirteen participants claimed that they were referred once to a dietitian for diet counselling after being diagnosed with hypertension, but no follow-up or further management was done.Seventeen participants found it difficult to take their anti-hypertensive medication because of their perceive side-effects such as feeling dryness, lost sexual desire, feel heaty and easily get agry. Only five participants said that their doctor informed them that they might experience some side effects at the time of the initial diagnosis. Some patient comments regarding these reasons were as follows:

(i) "*I feel dry after taking my blood pressure medication. I find it is so difficult because I always have to remember to take it every day. I experienced few side-effects after taking the anti-hypertensive medication. I feel like I have lost sexual desire. Sometimes I feel heaty and easily get agry. All my children have advised me to seek alternative medicinefirst because they don't want me to be too dependent on medication. I've tried herbs and ginseng. Sometimes my children bought me multivitamins and minerals to take* (IDI/58 years-old/3 years diagnosed with hypertension).

(ii) *I can control my blood pressure through my diet and I think there's no need for me to take my anti-hypertensive medication at a moment* (IDI/44 years-old/5 years diagnosed with hypertension).

(iii) *My sexual life changed after I took the anti-hypertensive medication. I got tired easily and had no mood. I also experienced heatiness, palpitations, and sweating with the medication* (IDI/35 years-old/5 years diagnosed with hypertension).

D) Forgetfulness and convenience issues

Twenty one participants stated that their doctor did ask for their agreement to start the anti-hypertensive medication. However, they sometimes did not take the medication as prescribed without informing the doctor.Most of the reasons for non-adherence to antihypertensive medication were attitudes of the patients themselves, namely, forgetfulness. Two of them left their anti-hypertensive medication at workplace because

Some patient comments regarding these reasons were as follows:

(i) "*Isometimes miss my medication because I have to take it twice daily. I prefer daily dosage of medication. I always forget to take my medicine due to my busy schedule. I haven't discuss this matter with the doctor yet, but I will tell him during the next appointment*" (IDI/48 year-old/7 years diagnosed with hypertension).

(ii) *"I always forget to take my medication. I'm busy especially in the workplace. But my wife always reminds me to take high blood pressure medication. When at work I did not take my medication because no one reminds me"* (IDI/50 year old/8 years diagnosed with hypertension).

(i) *I left my medication at workplace because it's easy to remember. I have to take it twice a day, which is one tablet before and one tablet after working. I* *prefer daily dosing because it's easy for me to remember* (IDI/49 years-old/12 years diagnosed with hypertension).

E) Motivational drives

Eleven participants were encouraged or influenced not to take the medications by others namely by their family members, peers and neighbours. Ten participants, however, did get support and motivation to take their anti-hypertensive medication from family members, whereas four participants motivated themselves and were encouraged by their families. The positive and the negative influences or encouragement mostly came from the family members.

Only three participants said that they exercised regularly and changed their diet according to the doctor's advice. Eight participants felt that it was unsafe for them to exercise or to walk outside their houses. One of the participant even experience that her necklace had been snatched by a thief. The other reason given was due to the weather and infrastructure of the jogging track. Thirteen participants were not involved in any health-promoting activities, such as the healthy lifestyle campaign in their community, as they were unaware of such activities in their community. Participants claimed that they were busy with their work and daily life commitments, whereas the others were aware of the activities, but they claimed that they were too busy to get involved. Two participants had exercise facilities at home, but the patients neither had time nor self-motivation to use them. Most participants had difficulty in controlling their diet due to the widespread availability of food in Malaysia. While at work, eight participants expressed their preference to eat out rather than bring their own healthy meals. Salty and oily foods were still prepared at home and were served to the whole family, even though the family members were aware of the participant's high blood pressure. A common reason given for not following a low salt and low fat diet was the lack of support from family and peers to enable them to resist eating tasty foods high in salt and fats rather than less tasty low salt and low fat options.

(ii) "*I did not take my medication yesterday and today because I'm on leave. Nobody motivate me to take my medication. Actually, I have no motivation to take the medication. I have a lot of work to do. Therefore, taking medication is not a priority in my daily routine*" (IDI/49 years-old/12 years diagnosed with hypertension).

(iii) "*I've got no time to exercise although I have a treadmill at home. I just eat whatever I want to eat. I eat salted fish every day and if taken a lot, I notice my blood pressure will hike. My wife still cooks food high in salt and fats although she knows I have hypertension. We are so used to our daily food and it's difficult to change*" (IDI/63 year old/4 years diagnosed with hypertension).

(iv) *"It's difficult to do regular exercise and control my diet. I don't care and there's no point in controlling because I have already got the disease"* (IDI/31 year old/5 years diagnosed with hypertension).

(v) "*I go for exercise once a month but I find it so difficult to control my food because delicious food in Malaysia is everywhere and I want to eat everything. I just boughtfood outside although I know that food from outside is unhealthy* (IDI/49 years-old/12 years diagnosed with hypertension).

(vi) "*I am unaware of any activities going on in my neighbourhood. Nowadays is not like before because nobody talks to their neighbours. I just go to church and watch television at home. I'm afraid to go for a jog alone because I remembered last time my necklace had been snatches by a motorcyclist while jogging in the park* " (IDI/62 years-old/1 year diagnosed with hypertension).

(vii) *"I've joined the cycling club in my community area, but lately the club is not active. I had such a great time cycling round with my friends. Now, I have no motivation to exercise anymore."* (IDI/37 years-old/3 year diagnosed with hypertension).

(viii) *"I was unable to go for a brisk walk because it's raining almost every evening. I also noticed that the traffic near this housing area is heavy and some of the sewer drain was uncovered. These posed dangers to road users"* (IDI/38 years-old/8 years diagnosed with hypertension).

(ix) "*I was invited a few times by the staff nurse in charge to join aerobic class handled by the community but I've got no time. I know some of my friends with hypertension have joined theaerobicclass twice a week. They also have it once a week during the weekend outside the mosque in my neighbourhood*" (IDI/59 years-old/12 years diagnosed with hypertension).

Healthcare provider factor

Fifteen participants expressed their feelings that the doctor's consultation time with them was too short after hours of waiting in the queue. Nineteen felt that the doctor should spend more time to explain the side effects of the medication and how to exercise and control their diet. In terms of health care service delivery, they preferred the same doctors and nurses to routinely manage their hypertensive clinic follow-up. The participants also found that the nurses were friendlier and were able to spend more time with the patients compared to other members of the health care staff. Three participants were uncomfortable talking about the health care service and refused to give their comments. Finally, six participants were unsure if the resource centre was available for chronic diseases in their respective health clinics. Every health clinic has a resource centre, which provides counselling and educational materials for patients with chronic diseases attending follow-up. The counselling methods involve health educational class, discussion within a small group of patients, individual counselling, and healthy food cooking demonstrations. Some patient comments regarding the health care provider factors are:

(i) "*I do not quite understand what the doctor says every time I go for my follow-up. The doctor just says that I have high blood pressure. I have to take the medication and control my diet. He does not explain that high blood pressure is dangerous and what would happen in the future if I do not take my medication. My children are still small. So, if the doctor doesn't care about me, why must I care about myself*?" (IDI/31 years-old/5 years diagnosed with hypertension).

(ii) "*I don't share my problem regarding taking medication with the doctor. They usually say a few words "Okay, just take your medication and you can go now." It's not even five minutes compared to the long time spent for waiting. The nurses usually spend their time talking to the patients. I always talk to the nurse who usually takes my blood pressure outside the consultation room. She advises me a lot. She told me the correct way of taking meals* (IDI/43 years-old/6 years diagnosed with hypertension).

(iii) "*The doctor told me that I might experience some side effects with this antihypertensive medication, such as headaches, stomach upsets, and others. But he didn't tell me how to handle the side effects*" (IDI/49 years-old/7 years diagnosed with hypertension).

(iv) "*Pharmacist in this health clinic will explain regarding the dosage and frequency of the medication. Sometimes they also explain the side effects of the medication if I ask them. But I need more information from the doctor regarding the side effects and how to deal with it. If I have the time, I will surf the internet*" (IDI/56 years-old/10 years diagnosed with hypertension).

(v) "*I'm not sure about the resource centre. I've been referred to a dietitian once after the doctor discovered I have hypertension, but there's no follow-up*" (IDI/39 years-old/9 years diagnosed with hypertension).

(vi) *"If I waited for so long to see doctor, I just throw the number. I only can wait for half an hour. Otherwise, it's just wasting my time. Doctor just to see hypertensive patients must be allocated to make it faster"* (IDI/50 year old/8 years diagnosed with hypertension).

4.3 Part III (quantitative study)

Part III was divided into two sections, namely III (a) and III (b). The main objective of Part III (a) was to examine the construct validity and reliability of the 22 items in the newly developed scale namely myMAR-Scale (based on the original version of MAR-Scale added with reasons identified in Part II) among hypertensive patients attending follow-up in government primary health clinics under Hulu Langat (Sungai Chua and Beranang health clinics) Klang (Pelabuhan Klang and Pulau Indah Health Clinics) Hulu Langat districts in the state of Selangor, Malaysia. This validation study was important to determine whether the myMAR-Scale able to be used among multi-ethnic population in Malaysia, which is sensitive to the three major ethnic groups (Malay, Chinese and Indian) among Malaysians' population. The objective of Part III (b) was to examine the association between the level of blood pressure control (poor and well) to antihypertensive medication and the variables in the theoretical framework of medication non-adherence used in this study based on Andersen's Behavioural Model and Leventhal's Common Sense Model.

4.3.1 Part III (a)

4.3.1.1 Study population characteristics

A total of 800 hypertensive patients were approached in four randomly selected government primary health clinics in Hulu Langat (Sungai Chua and Beranang health clinics) and Klang (Pelabuhan Klang and Anika health clinics) districts in state of Selangor, Malaysia. A total of 680 hypertensive patients participated in this pilot study. The response rate of 85% was obtained. The survey data was entered into the SPSS software. Statistical analyses were done using SPSS version 19.0 and SPSS Amos version 21. Examination of the data and data cleaning was carried out. This resulted in 619 number of participants to be analysed. The characteristics of hypertensive patients involved in the validation study of myMAR-Scale is shown in Table 4.12.

Table 4.12: Characteristics of Hypertensive Patients Attending Primary Health Clinics Settings under Hulu Langat and Klang Districts

Characteristic	Number (%)[a] (N=619)
Age (in years)	
Mean age 49.0	
SD 6.71	
Gender	
Female	345 (55.7)
Male	274 (44.3)
Ethnic	
Malay	273 (44.1)
Chinese	135 (21.8)
Indian	204 (33.0)
Others	7 (1.1)
Marital status	
Married	498 (80.5)
Widowed	69 (11.1)
Divorced	34 (5.5)
Never married	15 (2.4)
Separated	3 (0.5)
Educational levels	
No formal education	55 (9.0)
Secondary school	223 (36.0)
Primary school	186 (30.0)
Certificate or other qualifications after secondary school	124 (20.0)
University	31 (5.0)
Occupation	
Housewives	158 (25.5)
Private sector employee	143 (23.1)
Self-employed	82 (13.3)
Government retiree	70 (11.3)
Civil servant	98 (15.9)
Private retiree	46 (7.4)
Unemployed	22 (3.5)

**Data presented as a mean ± standard deviation*
[a]Categories may not total100% due to rounding

4.3.1.2 Exploratory Factor Analysis

In EFA (N=250), to justify undertaking factor analysis, Barlett's test of sphericity and Kaiser-Meyer-Olkin Test (KMO) were done to determine whether there were sufficient numbers of significant correlations among the items. Table 4.13 shows that Barlett's test of sphericity (Chi-square value) was highly significant ($p<0.001$), thus indicating that the 22-item correlation matrix was not an identity matrix. In addition, the KMO value of 0.808 met Kaiser's criteria "meritorious criteria" (Kaiser, 1974) and this value was more than 0.6 (Pett, et al., 2003). Measures of sampling adequacy (MSA) range from 0.45 for item K8 to 0.72 for item K12, indicating that there is no problem with multicollinearity (no $r \geq 0.80$) in the correlation matrix (Pett, et al., 2003) (Refer Table 4.13 and Table 4.14). These findings show that the correlations between individuals' items were strong enough and that the correlation matrix was factorable.

Table 4.13: Kaiser-Meyer-Olkin and Barlett's Test of Spericity for the 22 Items CorrelationMatrix

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.808
Bartlett's Test of Sphericity	Approx. Chi-Square	6132.300
	df	231
	Sig.	.000

Table 4.14: CorrelationMatrix, Means, and Standard Deviations for the 22-Items for Malaysian Medication Adherence Reasons Scale (myMAR-Scale)

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Means	SD
1	1.0																						3.2	1.2
2	.07	1.0																					3.1	1.1
3	.42	.14	1.0																				2.8	1.2
4	.34	.09	.20	1.0																			3.2	1.1
5	-.08	.11	.36	.22	1.0																		3.8	1.3
6	-.06	.07	.08	.09	.59	1.0																	3.2	1.2
7	.41	.22	.12	.08	.20	.20	1.0																2.4	1.1
8	.02	.02	.27	.22	.17	.04	.27	1.0															3.3	1.3
9	.01	.29	.29	.08	-.02	.08	.12	.09	1.0														3.2	1.2
10	.05	.12	.22	.19	.16	.05	.33	.59	.41	1.0													3.6	1.2
11	.21	.10	.03	.05	.16	.12	.04	.12	.07	.05	1.0												3.5	1.1
12	.12	.25	.08	.16	.16	.10	.08	.12	.12	.07	.34	1.0											3.2	1.3
13	.02	.21	.06	.12	.06	.05	.03	.17	-.03	.04	-.08	.17	1.0										3.1	1.1
14	.44	.03	.14	.15	.05	.03	.02	.18	-.09	.13	.-06	.12	.61	1.0									3.1	1.1
15	.43	.42	.15	.24	.06	.14	.19	.02	.14	.06	.16	.60	.52	.24	1.0								3.7	1.2
16	.32	.64	.25	.02	.30	.19	.06	.35	.23	.14	.09	.48	.37	.21	.45	1.0							3.3	1.2
17	.33	.24	.42	.33	-.05	.24	.34	.32	.19	.34	.42	.14	.65	.03	.34	.17	1.0						2.9	1.3
18	.21	.32	.18	.21	.18	.32	.15	.20	.22	.28	.26	.08	.20	.44	.29	.04	.03	1.0					3.2	1.1
19	.07	.13	.60	.25	.23	.20	.18	.14	.42	.13	.16	.54	.08	.17	.34	.15	.25	.12	1.0				3.4	1.2
20	.17	.40	.35	.14	.34	.60	.21	.24	.48	.26	.51	.25	.22	.52	.21	.12	.09	.37	.08	1.0			2.7	1.4
21	.22	.31	.47	.35	.22	.47	.36	.36	.11	.61	.43	.52	.08	.62	.48	.27	-.01	.06	.51	.62	1.0		3.5	1.1
22	.41	.21	.30	.40	29	.32	.47	.45	.08	.15	.37	.40	.30	.49	.31	.56	.56	.08	.30	.43	.51	1.0	3.2	1.2

In EFA, oblique rotation namely promax was used as the rotation method and eigenanalysis was done by examining the eigenvalues (EVs) (as shown in Table 4.15) which represents the amount of variance in all of the items that can be explained by a given factor(Guttman, 1954). All factors with EVs greater than 1 were selected according to Kaiser-Guttman rulein order for the matrix to be positive-definite and factorable (Comrey & Lee, 2013; Guttman, 1954; Kaiser, 1974). As shown in Table 4.15, seven extracted factors met the eigenvalues (EVs) criterionthat is greater than 1 with a cumulative percentage of 83.2% variance extracted by successive factors (Gorsuch, 1983).

The scree plot was examined (as shown in Figure 4.4). A straight line was drawn through the smaller eigenvalues where a departure from this line occurred. This point highlights where the debris or break occurs. The point above this debris or break (not including the break itself) indicates the number of factors to be retained using the Cattell criteria (Cattell, 1966). The inspection of the scree plot produced a departure from linearity coinciding with the seven factors.

Table 4.15: Total Variance Explained with 22 items

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6.314	28.699	28.699	6.125	27.841	27.841	4.537
2	3.612	16.418	45.116	3.543	16.105	43.946	3.832
3	2.624	11.926	57.042	2.421	11.003	54.949	4.366
4	2.399	10.906	67.948	2.293	10.422	65.372	3.167
5	2.120	9.637	77.586	1.979	8.994	74.366	3.194
6	1.335	6.069	83.655	1.131	5.141	79.506	2.697
7	1.077	4.897	88.552	.807	3.668	83.174	2.608
8	.414	1.884	90.436				
9	.357	1.622	92.058				
10	.303	1.378	93.435				
11	.264	1.198	94.634				
12	.218	.989	95.623				
13	.177	.807	96.429				
14	.165	.752	97.181				
15	.149	.679	97.860				
16	.134	.610	98.470				
17	.093	.421	98.892				
18	.072	.328	99.220				
19	.062	.283	99.503				
20	.059	.269	99.772				
21	.035	.158	99.930				
22	.015	.070	100.000				

Extraction Method: Principal Axis Factoring

When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

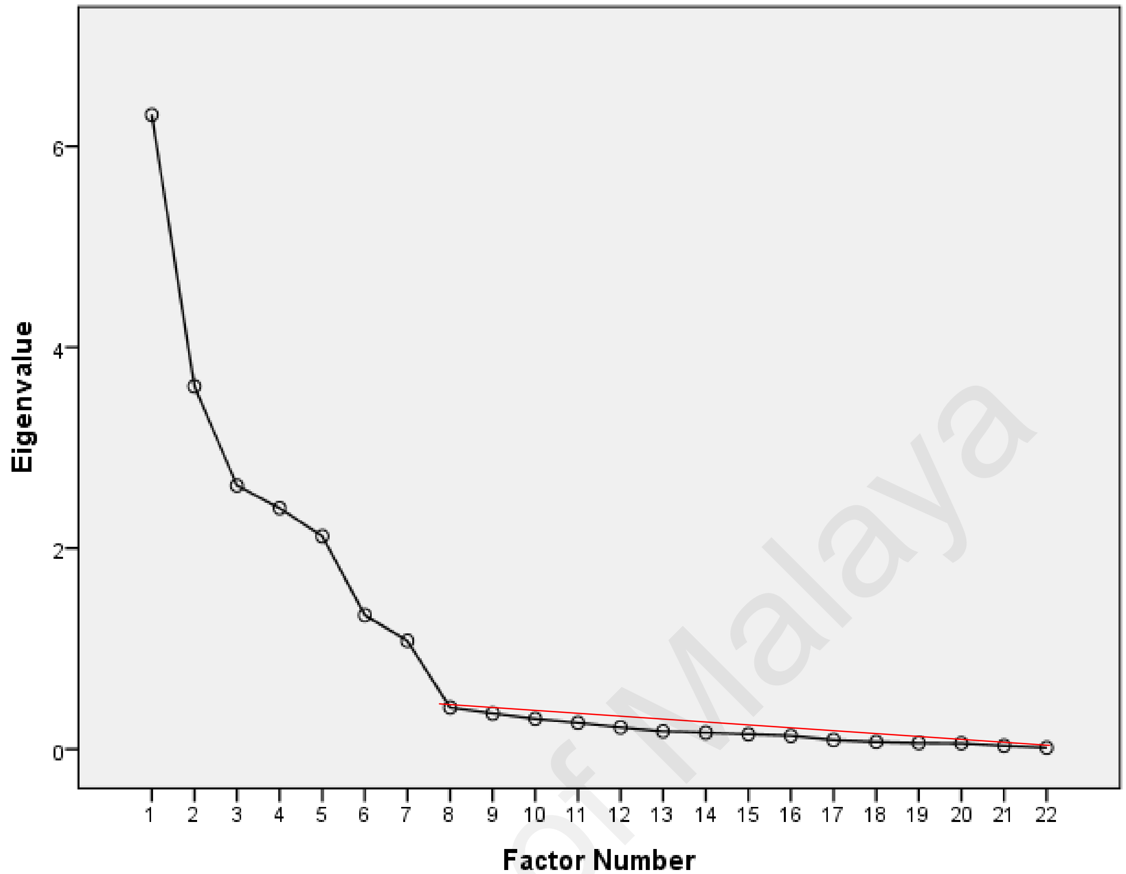


Figure 4.4: Scree Plot Generated for the Eigenvalues Plotted against their Principal Components

4.3.1.3 Confirmatory Factor Analysis

For the CFA, a separate sample of 430 patients completed the questionnaire and factor analysis was performed to assess model fitness. A combination of several fit indices were used to assess the model as no agreement on a single standard exists (Hair, 2009). As recommended, various fit indices including relative Chi-square to degree of freedom ratio (x^2/df), CFI (comparative fit index), GFI (goodness-of-fit index), AGFI (adjusted goodness-of-fit-index), TLI (Tucker-Lewis index), root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) were used. It is generally accepted that Chi-square/degree of freedom (df) ratio value less than 3; CFI,GFI, AGFI and TLI values greater than 0.90; and RMSEA $\leq$ 0.07 indicate adequate model fitness (Hair, 2009). Modification index coefficients were used to check any cross-loadings between items. Model modifications were based on the values of the Akaike's Information Criterion (CAIC) for comparing different models (Hu & Bentler, 1999). A preliminary model is as shown in Figure 4.5. Items which have loadings less than 0.5 were removed one by one (Hair, 2009). The two items were removed namely 'M1= Medications not available in the pharmacy' (loading=0.31), and 'M6=Ran out of prescription due to busy schedule' (loading=0.45). The fit indices of the final six factor model with twenty items indicate good model fit (Chi-square/df=1.250, CFI= .930, TLI= .992, GFI= .948, RMSEA= .027) as shown in Figure 4.6.

The model was cross-validated with 1000 bootstrap resample which yielded a Bollen-Stine p-value of 0.072 which is more than 0.05 indicating that the model was valid. The model also demonstrated convergent validity with standardized loadings >0.5. The average variance extracted (AVE) for the six factors were more than 0.5; the CR (composite reliability) were more than 0.7 and the AVE (average variance extracted) values were more than the R-squared values between the respective constructs, indicating sufficient discriminant validity of the final model (Hair, 2009).

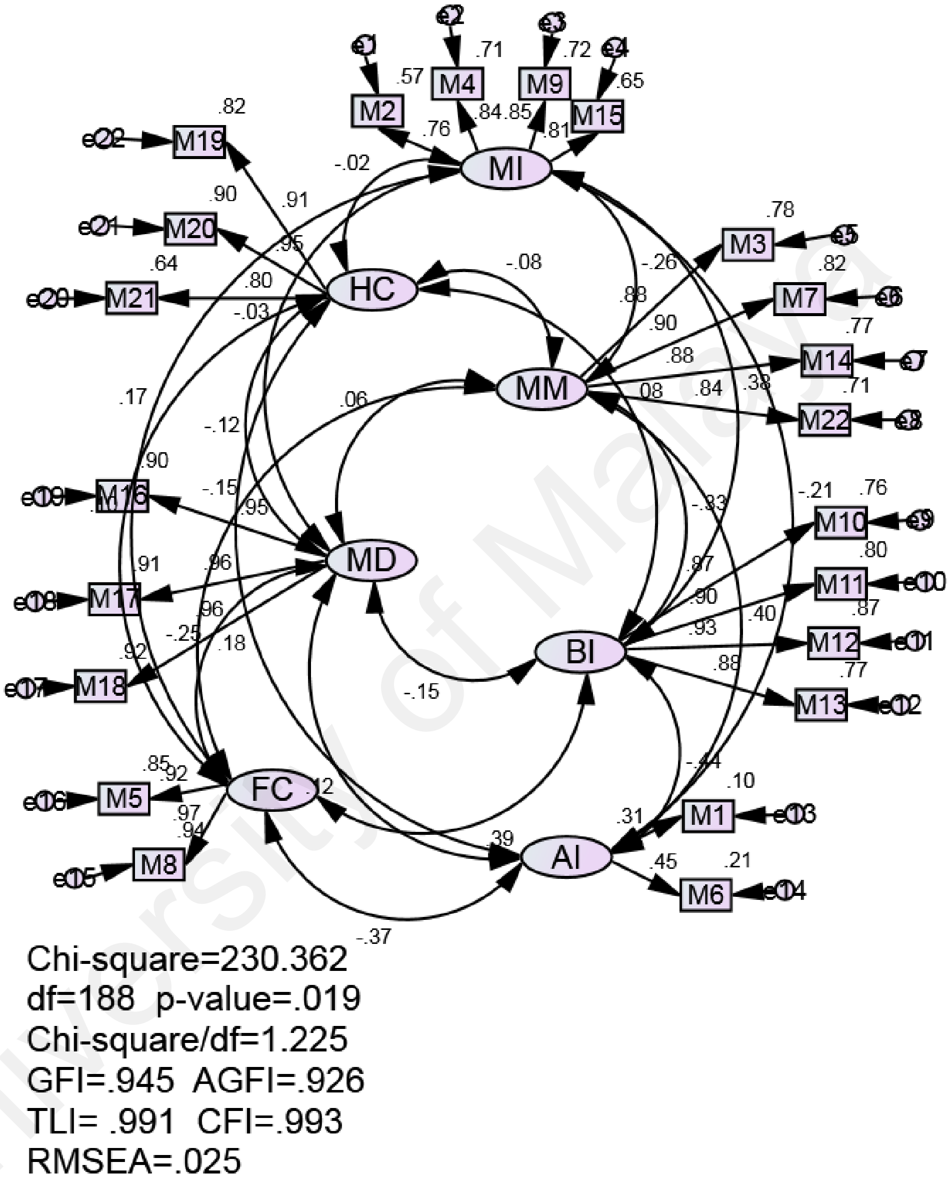


Figure 4.5: Factor structure of the Preliminary Model of the Malaysian Medication Adherence Reasons Scale (myMAR-Scale) using Confirmatory Factor Analysis (CFA)

Note: AGFI: adjusted goodness-of-fit index; AI: availability issues; BI: belief issues with medications; CFI: comparative fit index; df: degrees of freedom; FC: forgetfulness and convenience issues; GFI: goodness-of-fit index; MI: managing issues; MM: multiple medication issues; RMSEA: root mean square error of approximation; TLI: Tucker-Lewis index

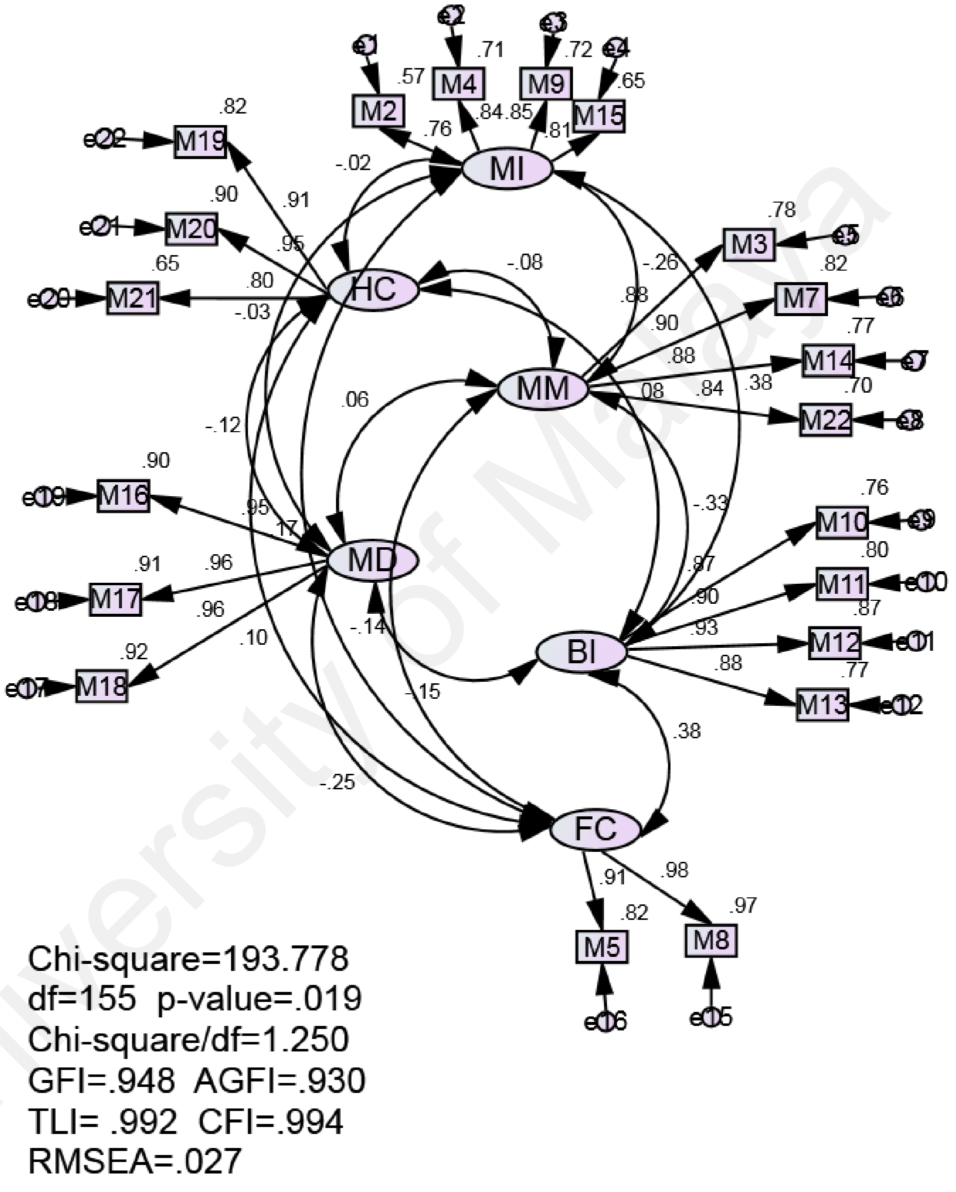


Figure 4.6: Factor Structure of Final Model of the Malaysian Medication Adherence Reasons Scale (myMAR-Scale) using Confirmatory Factor Analysis (CFA)

Note: AGFI: adjusted goodness-of-fit index; AI: availability issues; BI: belief issues with medications; CFI: comparative fit index; df: degrees of freedom; FC: forgetfulness and convenience issues; GFI: goodness-of-fit index; MI: managing issues; MM: multiple medication issues; RMSEA: root mean square error of approximation; TLI: Tucker-Lewis index

Multi-group analysis was done and factorial invariance was examined to test whether the items in the scale can be used equivalently across different populations such as differences in gender and ethnicity (Byrne, 2013). It is important to demonstrate factorial invariance, whereby, that the items have equivalent meaning across the ethnicity groups studied. As proposed by Cheung and Rensvold, a difference in CFI (diff CFI) value of <0.01 and p-value >0.05, indicates that factorial that invariance is present (Cheung & Rensvold, 2002). As depicted in Table 4.16, this model demonstrates sufficient factorial invariance across ethnicity. The findings support an equivalent six factor structure across the three ethnic subpopulations (Malays, Indians and Chinese) subpopulations studied. Based on these data, it can be concluded that, hypertensive patients attending government primary health clinics in Malaysian population across the three ethnicity groups studied interpreted items in a similar manner regardless of their ethnicity.

Table 4.16 (a): Factorial Invariance across Gender among Hypertensive Patients Attending Primary Health Clinics Settings in Hulu Langat and Klang Districts in the State of Selangor, Malaysia

Model	Chi-square	df	CFI	Diff. CFI	Diff. Chi-square	Diff. df	p-value
I) Configural	195.207	79	0.968				
II)Weak factorial invariance	201.266	86	0.969	0.001 (<0.01)	6.059	7	0.532
III)Strong factorial invariance	217.893	96	0.967	0.001 (<0.01)	22.686	17	0.160
IV)Strict factorial invariance	381.658	105	0.925	0.043	186.451	26	<0.01

Table 4.16 (b): Factorial Invariance across Ethnicity (Malay, Chinese and Indian) among Hypertensive Patients Attending Primary Health Clinics Setting in Hulu Langat and Klang Districts

Model	Chi-square	df	CFI	Diff. CFI	Diff. Chi-square	Diff. df	p-value
I)Configural	201.112	83	0.963				
II)Weak factorial invariance	207.133	90	0.974	0.001 (<0.01)	7.022	8	0.503
III)Strong factorial invariance	223.760	101	0.968	0.001 (<0.01)	23.649	18	0.151
IV)Strict factorial invariance	387.525	110	0.944	0.032	187.414	27	<0.01

4.3.1.4 Reliability Analysis

Reliability testing to assess the consistency of the factors was carried out using Cronbach's alpha (Cronbach, 1951). Cronbach's alpha is the most widely used measure for reliability (Hair, 2009). The Cronbach's alpha value for all the extracted factors surpasses , 0.70, the widely-accepted social science cutoff is that Cronbach's alpha should be 0.70 or higher for a set of items to be considered a scale (Garson, David, 2012). The overall Cronbach's alpha value was 0.81 and average values of the six subscales, in the Final Model (Figure 4.6), ranged between 0.72 to 0.86. Six factors namely MI, MM, BI, FC, MD and HC were internally consistent. The Cronbach's alpha values for each factor are as shown in Table 4.17.

Table 4.17: Cronbach's Alpha Values for Each Domain/Factor in Malaysian Medication Adherence Reasons Scale (myMAR-Scale)

Factors	Items	Cronbach's Alpha
MI (Managing issues)	M2= Difficulty in swallowing M4 = Unclear about proper administration of medication M9 = Embarassment in taking medications (e.g: you are with friends, you are in a public place, etc.) M15 = Difficulty in opening container	0.81
MM (Multiple medication issues)	M3= Cost of medication M7= Taking too many medication M14= Concern about long term effects of medications or dependency on medications M22= Using alternative/traditional medication	0.78
BI (Belief issues with medications)	M10= Medication is ineffective M11= Side effects or fear of side effects M12= Think medication is not needed because you are not showing any indications of the disease or you feel well without medication M13= Stop medication to see whether it still needed	0.85
FC (Forgetfulness and convenience issues)	M5= Forgetting due to busy schedule M8= Inconvenience in taking medications as prescribed(e.g:You are away from home, the medication makes you urinate more frequently, others)	0.86
MD (Motivational Drives)	M16= Influence from spouse/family M17= Influence from peers M18= Influence from community/social organization	0.83
HC (Healthcare provider factors)	M19= Lack of care from the doctor M20= Lack of information of what patients' need from the doctor and healthcare staff M21= Long waiting time	0.72

4.3 Part III (b)

This section provides the description of the participants and the association between the non-adherence factors and the blood pressure control. The model that is used to evaluate non-adherence to antihypertensive medication is based on the Anderson's Behavioral Model and Leventhal's Common Sense Model.

4.3.1 Descriptive Analyses

Study population characteristics

In total, 986 participants comprised the study population in the survey analysis. This figure represents 82.2% of the eligible participants (N=1200). Table 4.18provides the general profile and description of the participants at the settings in which they were located during the study. This profile will facilitate an understanding of the results presented in subsequent tables. Table 4.18 shows the distribution of participants by gender. The participants were predominantly female (58.3%) as compared to male participants (41.7%). Malays were the majority (42.1%). Most of the participants were at aged 31 to 50 year old (78.8%), overweight (54.6%), married (69.7%), had primary or secondary education (73.2%), non-professionals (74.1%), had income less than RM2999.00 (69.9%), had family history of hypertension (60.6%), never smoked (54.7%), had hypertension diagnosed at government primary health clinics (53.8%) and had hypertension duration of one to five years (53.8%). Regardless of gender, almost half (47.0%) of the participants had high non-adherence level while the rest had low non-adherence (53.0%). Most of the participants (45.9%) first discovered that they had hypertension during medical follow-up for other conditions had their blood pressure measured only in government primary health clinics (53.8%), had two to three chronic diseases (42.6%) and had taken at least one type of anti-hypertensive medication (55.7%). Almost half of the participants had poor blood pressure control (≥140/90mmHg) (46.2%).

Table 4.18: Socio-demographic Characteristics of 986 Hypertensive Patients attending Government Primary Health Clinics Settings under Hulu Langat and Klang Districts in the State of Selangor, Malaysia

Variables	**Men** n (%)	**Women** n (%)	**All** n (%)
Gender	411 (41.7)	575 (58.3)	986 (100)
Age group			
<30	23 (5.6)	20 (3.5)	43 (4.4)
31-50	319 (77.6)	458 (79.7)	777 (78.8)
>51	69 (16.8)	97 (16.9)	166 (16.8)
Ethnic group			
Malays	181 (44.0)	234 (40.7)	415 (42.1)
Chinese	110 (26.8)	143 (24.9)	253 (25.7)
Indian and others	120 (29.2)	198 (34.4)	318 (32.3)
Marital Status			
Never married	56 (13.6)	140(24.3)	196 (19.9)
Married	327 (79.6)	360 (62.6)	687 (69.7)
Divorced/separated/widowed	28 (6.8)	75(13.4)	103 (10.4)
Educational level			
No formal education	22 (5.4)	16 (2.8)	38 (3.9)
Primary education or secondary education	265 (64.5)	456 (79.3)	721 (73.2)
Tertiary education (Certificate/university)	124 (30.2)	103 (17.9)	227 (23.0)
Occupation			
Self-employed/unemployed/ housewife/retiree	73 (17.8)	104 (18.1)	177 (18.0)
Non-professionals	305 (74.2)	426 (74.1)	731 (74.1)
Professionals	33 (8.0)	45 (7.8)	78 (7.9)
Income			
<RM2999	242 (58.9)	447 (77.7)	689 (69.9)
RM3000-RM4999	110 (26.8)	70(12.2)	180 (18.3)
≥RM5000	59 (14.4)	58 (10.1)	117 (10.9)
Family history of hypertension			
Yes	269 (65.5)	329 (57.2)	598 (60.6)
No	116 (28.2)	224(39.0)	340 (34.5)
Not sure	26 (6.3)	22 (3.8)	48 (4.9)

[a]Categories may not total 100% due to rounding

Table 4.18, continued

Variables	**Men** n (%)	**Women** n (%)	**All** n (%)
Gender	411 (41.7)	575 (58.3)	986 (100)
Place of diagnosis			
Government health clinic	219 (53.3)	389 (67.7)	608 (61.7)
Private clinic/private hospital/pharmacy	149 (36.3)	130 (22.6)	279 (28.3)
Government hospital	43 (10.5)	56 (9.7)	99 (10.0)
Duration of hypertension			
<1 year	77 (18.7)	95(16.5)	172 (17.4)
1-5 years	233 (56.7)	297 (51.7)	530 (53.8)
>5 years	101 (24.6)	183 (31.8)	284 (28.8)
First discover hypertension			
In medical follow-up for other conditions	198 (48.2)	255 (44.3)	453(45.9)
In emergency service and others	129 (31.4)	221 (38.4)	350 (35.5)
In screening programme	84 (20.4)	99 (17.2)	183 (18.6)
Place usually blood pressure were measured			
Self-monitoring at home/family or in neighbours' house	20 (4.9)	27(4.7)	47 (4.8)
Only government primary health clinic	269 (65.5)	261 (45.4)	530(53.8)
Private clinic/ private hospital/ pharmacy	122 (29.7)	287 (49.9)	409 (41.5)
Presence of other chronic disease			
None/one	103 (25.1)	312(54.3)	415 (42.1)
2 to 3	240(58.4)	180 (31.3)	420 (42.6)
>3	68 (16.5)	83(14.4)	151 (15.3)
Total number of medication taken			
One	224 (54.5)	325 (56.5)	549(55.7)
2 to 3	109 (26.5)	165(28.7)	274 (27.8)
≥3	78 (19.0)	85 (14.8)	163 (16.5)

[a]Categories may not total 100% due to rounding

Table 4:18, continued

Variables	Men n (%)	Women n (%)	All n (%)
Gender	411 (41.7)	575 (58.3)	986 (100)
Medication for anxiety			
Yes	57 (13.9)	89 (15.5)	146 (14.8)
No	354 (86.1)	486 (84.5)	840 (85.2)
Medication for depression			
Yes	48 (11.7)	38 (6.6)	86 (8.7)
No	363 (88.3)	537 (93.4)	900 (91.3)
BMI			
<18.5 (Underweight)	93 (22.6)	98 (17.0)	191 (19.4)
18.5 – 22.99 (Normal)	104 (25.3)	113 (19.7)	257 (26.0)
≥ 23.0 (Overweight)	214 (52.1)	324 (56.3)	538 (54.6)
Smoking history			
Smoker	270 (65.7)	56 (9.7)	326 (33.1)
Ex-smoker, occasional smoker	107 (26.0)	13 (2.3)	120 (12.2)
Never smoke	34 (8.3)	506 (88.0)	540 (54.7)
Level of non-adherence			
High	190 (46.2)	273 (47.0)	463 (47.0)
Low	221 (53.8)	302 (53.0)	523 (53.0)
Blood pressure control			
Poor (≥140/90mmHg)	196 (47.7)	260 (45.2)	456 (46.2)
Well (<140/90mmHg)	215 (52.3)	315 (54.8)	530 (53.8)

[a]Categories may not total 100% due to rounding

4.3.2 Univariate Analyses

Table 4.19 shows the association between socio-demographic characteristics and risk factors with high non-adherence level. High non-adherence level is considered more non-adherence as compared to low non-adherence level. High non-adherence participants is considered as having more reasons and more higher scores of non-adherence as compared to participants with low non-adherence level. This is because, patients with high non-adherence had more high scores for reasons of non-adherence according to my MAR-Scale. High and low non-adherence were obtained from the SPSS procedure of visual binning There were sixfactors significantly associated with high non-adherence in univariate analysis namely poor blood pressure control, BMI group (overweight), marital status (divorced/separated/widowed), family support, lowconcerned about health, and place of hypertension diagnosis was made (Participants diagnosed in private clinic, private hospital and pharmacy).

Participants with poor blood pressure control tend to have high non-adherence level [Crude OR= 2.29; 95% CI(1.77-2.95)].Body Mass Index (BMI), there was a significant association between overweight participants and high non-adherence level ($p<0.01$). Overweight participants tend to have 2.15 times risk for developing high non-adherence compared to participants who were underweight and those with normal weight [Crude OR= 2.15; 95% CI(1.58-2.92)]. With regard to marital status of divorced, separated and widowed were significantly associated with high non-adherence ($p<0.01$), and these group of participants had 1.67 times risk of developing high non-adherence [Crude OR= 1.67; 95% CI(1.11-2.54)].

Participants with low family support had 2.54 times risk of having high non-adherence [Crude OR= 2.13; 95% CI(1.65, 2.75)]. Participants with low concerned about their health tend to 1.57 times risk of having high non-adherence level [Crude

OR= 1.57; 95% CI(1.19, 2.08)]. Participants diagnosed in private clinic, private hospital and pharmacy tend to have 3.75 times risk of developing high non-adherence level [Crude OR= 3.75; 95% CI(2.09, 6.73)].

However, there were no significant associations between age, gender, ethnicity, educational level, occupation, income, family history of hypertension, smoking history, duration of hypertension, place where participants first discovered they had hypertension, place where participants usually measure their blood pressure, presence of other medical conditions, total number of medication, taking medication for anxiety, taking medication for depression, necessity beliefs, concern beliefs, self-efficacy, friends support and support from significant others, perceived need factor and satisfaction in health outcomes with the participants' level of non-adherence.

Further analysis of all these significant factors were conducted using multivariate analysis.

UNIVARIATE ANALYSES

Table 4.19: Association Between the Risk Factors and Level of Non-Adherence of 986 Hypertensive Patients Attending Government Primary Health Clinics Settings under Hulu Langat and Klang Districts in the State of Selangor, Malaysia

Factors	Level of Non-Adherence		Crude OR	95% CI	p-value
	High (N=463) n (%)*	Low (N=523) n (%)*			
PREDISPOSING FACTORS					
Age					
≤30 years old	25 (4.8)	18 (3.9)	1.36	0.69-2.67	0.31
31 to 50	414 (79.2)	363 (78.4)	1.11	0.80 to 1.56	0.53
≥51 [a]	84 (16.1)	82 (17.7)			
Gender					
Male	175 (33.5)	236 (51.0)	0.48	0.37 to 0.63	<0.05
Female [a]	348 (66.5)	227 (49.0)			
Ethnicity					
Malay	183 (39.5)	232 (44.4)	1.02	0.75-1.40	0.89
Indian and Others	167 (36.1)	151 (28.9)	0.73	0.53-1.02	0.82
Chinese[a]	113 (24.4)	140 (26.7)			
Marital status					
Never married	102 (22.0)	94 (18.0)	1.42	1.03-1.95	<0.05
Divorced/separated/ widowed	63(13.6)	40(7.6)	1.67	1.11-2.54	<0.01
Married [a]	298(64.4)	389 (74.4)			

Note: All logistic regression associations are adjusted with the sampling weights; Crude OR represents crude odds ratio: CI represents confidence interval
[a] denotes the reference category
*Categories may not total 100% due to rounding

Table 4.19, continued

Factors	Level of Non-Adherence		Crude OR	95% CI	p-value
	High (N=463) n (%)*	Low (N=523) n (%)*			
Educational level					
No formal education	20 (4.3)	18 (3.4)	1.66	0.83-3.31	0.15
Primary or secondary school	352 (76.0)	369 (70.6)	1.43	0.39-0.83	<0.05
Tertiary education [a] (Certificate/University)	91 (19.7)	136 (26.0)			
Occupation					
Self-employed/ unemployed/housewife/ retiree	90 (19.4)	87 (16.6)	0.65	0.38-1.11	0.12
Non-professionals	325 (70.2)	406 (77.6)	0.50	0.31-0.98	<0.01
Professionals [a]	48 (10.4)	30 (5.7)	.		
Income					
<RM2999	290 (62.6)	399 (76.3)	0.38	0.25-0.57	<0.05
RM3000-RM4999	96 (20.7)	84 (16.1)	0.59	0.37-0.96	<0.05
≥RM5000 [a]	77 (16.6)	40 (7.6)			
Family history of hypertension					
Yes	262 (56.6)	336 (64.2)	0.85	0.47-1.53	0.58
No	178 (38.4)	162 (31.0)	1.19	0.65-2.19	0.57
Not sure [a]	23 (5.0)	25 (4.8)			

Note: All logistic regression associations are adjusted with the sampling weights; Crude OR represents crude odds ratio, CI represents confidence interval
[a] denotes the reference category
*Categories may not total 100% due to rounding

Factors	Level of Non-Adherence		Crude OR	95% CI	p-value
	High (N=463) n (%)*	Low (N=523) n (%)*			
BMI group					
Underweight	91 (19.7)	100 (19.1)	1.75	1.19-2.56	<0.01
Overweight	284 (61.3)	254 (48.6)	2.15	1.58-2.92	<0.01
Normal [a]	88 (19.0)	169 (32.3)			
Smoking history					
Smoker	151 (32.6)	175 (33.5)	0.94	0.72-1.24	0.68
Ex-smoker, occasional smoker	54 (11.7)	66 (12.6)	0.89	0.60-1.33	0.58
Never smoke [a]	258 (55.7)	282(53.9)			
Place of diagnosis					
Government health clinic	330 (71.3)	278 (53.2)	6.16	3.52-10.76	<0.05
Private clinic/private hospital/pharmacy	117 (25.3)	162 (31.0)	3.75	2.09-6.73	<0.01
Government hospital [a]	16 (3.5)	83 (15.9)			
Duration of hypertension					
<1 year	80 (17.3)	92 (17.6)	0.91	0.62-1.33	0.61
1 to 5 years	244 (52.7)	286 (54.7)	0.89	0.67-1.19	0.43
>5 years [a]	139 (30.0)	145 (27.7)			

Factors	Level of Non-Adherence		Crude OR	95% CI	p-value
	High (N=463) n (%)	Low (N=523) n (%)			
First discover hypertension					
In medical follow-up for other conditions	213 (46.0)	240 (45.9)	1.19	0.85-1.69	0.31
In emergency service and others	172 (37.1)	178 (34.0)	1.30	0.91-1.86	0.15
In screening programme[a]	78 (16.9)	105 (20.1)			
Place usually blood pressure were measured					
Only government primary health clinic	244 (52.7)	286 (54.7)	0.63	0.35-1.15	0.14
Private clinic/private hospital/pharmacy	192 (41.5)	217 (41.5)	0.66	0.36-1.21	0.18
Self-monitoring/family or in neighbours' house[a]	27 (5.8)	20 (3.8)			
Presence of other medical conditions					
>3	68 (14.7)	83 (15.9)	0.96	0.66-1.40	0.83
2 to 3	204 (44.1)	216 (41.3)	1.11	0.84-1.45	0.46
None/one[a]	191 (41.2)	224 (42.8)			
Total number of medication					
≥3					
2 to 3	83 (17.9)	80 (15.3)	1.30	0.89-1.79	0.20
One[a]	132 (28.5)	142 (27.2)	1.13	0.84-1.51	0.42
	248 (53.6)	301 (57.5)			

Factors	Level of Non-Adherence		Crude OR	95% CI	p-value
	High (N=463) n (%)	**Low (N=523) n (%)**			
Blood pressure control					
Poor (≥140/90)	264 (57.0)	192 (36.7)	2.29	1.77-2.95	p<0.001
Well (<140/90)	199 (43.0)	331 (63.3)			
Medication for anxiety					
Yes					
No[a]	64 (13.8)	82 (15.7)	0.86	0.61-1.23	0.41
	399 (86.2)	441 (84.3)			
Medication for depression					
Yes	37 (8.0)	49 (9.4)	0.84	0.54-1.31	0.44
No[a]	426 (92.0)	474 (90.6)			
Necessity beliefs					
Low	233 (50.3)	248 (47.4)	1.12	0.87-1.44	0.36
High[a]	230 (49.7)	275 (52.6)			
Concern beliefs					
High	243 (27.0)	227 (65.8)	1.44	1.12-1.85	<0.01
Low[a]	220 (73.0)	296 (34.2)			

Note: All logistic regression associations are adjusted with the sampling weights; Crude OR represents crude odds ratio: CI represents confidence interval

[a] denotes the reference category

*Categories may not total 100% due to rounding.

Table 4.19, continued

Factors	Level of Non-Adherence		Crude OR	95% CI	p-value
	High (463) n (%)	Low (523) n (%)			
Self-efficacy					
Low	328 (70.8)	352 (67.3)	1.18	0.90-1.55	0.23
High [a]	135 (29.2)	171 (32.7)			
Family support					
Low	268 (57.9)	205 (39.2)	2.13	1.65-2.75	p<0.001
High [a]	195 (42.1)	318 (60.8)			
Friends support					
Low	302 (60.8)	296 (64.9)	1.44	1.11-1.86	p<0.05
High[a]	161 (39.2)	227 (35.1)			
Support from significant others					
Low	293 (63.3)	276 (52.8)	1.54	1.19-1.99	p<0.001
High [a]	170 (36.7)	247 (47.2)			

Note: All logistic regression associations are adjusted with the sampling weights; Crude OR represents crude odds ratio: CI represents confidence interval
[a] denotes the reference category
[a]Categories may not total 100% due to rounding

Table 4.19, continued

Factors	Level of Non-Adherence		Crude OR	95% CI	p-value
	High (463) n (%)	Low (523) n (%)			
Perceived need factor					
Low	284 (61.3)	293 (56.0)	1.25	0.97-1.61	0.09
High [a]	179 (38.7)	230 (44.0)			
Concerned about own health					
Low	348 (75.2)	344(65.8)	1.57	1.19-2.08	<0.01
High [a]	115 (24.8)	179 (34.2)			
Satisfaction in health outcomes					
Low	352 (76.0)	388 (74.2)	1.10	0.83-1.47	0.51
High [a]	111 (24.0)	135 (25.8)			

Note: All logistic regression associations are adjusted with the sampling weights; Crude OR represents crude odds ratio: CI represents confidence interval
[a] denotes the reference category
*Categories may not total 100% due to rounding

4.3.3 Multivariate Analyses

This section provides the findings from the multivariate logistic regression for complex samples analyses. The significant factors with p-value of 0.025 were entered into the multiple logistic regression performed in SPSS. All the factors which is six significant factors in univariate analysis had a p-value of less than 0.025. Therefore, all the six factors were entered one by one according to the Conceptual Framework of non-adherence to antihypertensive medication based on Anderson's Behavioral Model and Leventhal's Common Sense Model; namely Model 1 for the *Predisposing Factors*, Model 2 for the *Enabling Factors* and Model 3 for the *Need Factors*. The results showed that there were four factors that determined high non-adherence among the sampled hypertensive patients, with participants' marital status of divorced, separated and widowed [OR = 3.60; 95% CI(1.66, 5.55)] contributing the most, the family support factors [OR = 3.22; 95% CI(2.51-3.94)] followed by poor blood pressure control [OR= 2.54; 95% CI(1.78, 3.40)] and;low concerned about their own health [OR= 1.83; 95% CI(1.56, 2.32)]. All these significant variables in the final model, which is the Model 3, were able to explain 75.0% of the high non-adherence with Nagelkerke value of 0.75 which was a good model.

Body mass index (BMI) and place of hypertension diagnosis were all the confounding factors for this study.

Summary of Findings in Multivariate Analysis

Multivariate logistic regression was conducted to predict level of non-adherencel and risk factors of non-adherence as predictors, using variables in *Predisposing Factors*, *Enabling Factors* and *Need Factors*. A test of the full model (Model III) against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between high and low non-adherence level. Nagelkerke's R^2 of

.75 indicated a moderately strong relationship between prediction and high level of non-adherence.

MULTIVARIATE ANALYSIS

Table 4.20: Adjusted Odds Ratio (AOR) from Multivariate Logistic Regression Analyses for Level of Non-Adherence of 986 Hypertensive Patients Attending Government Primary Health Clinics Settings under Hulu Langat and Klang Districts in the State of Selangor, Malaysia

Factors	Model 1		Model 2		Model 3	
	AOR (p-value)	95%CI	AOR (p-value)	95%CI	AOR (p-value)	95%
PREDISPOSING FACTORS						
Socio-demographic characteristics						
BMI group						
Underweight	0.41 (p< 0.01)	0.12-0.73	0.67 (p<0.05)	0.59-0.78	0.88 (p=0.23)	0.62-1.14
Overweight	1.99 (p< 0.01)	1.76-2.33	1.72 (p< 0.05)	1.43-3.72	1.44 (p= 0.11)	0.86-3.83
Normal [a]						
Blood pressure control						
Poor (≥140/90mmHg)	2.32 (p<0.01)	1.10-3.54	2.41 (p<0.01)	1.53-3.31	2.54 (p<0.01)	1.78-3.40
Well (<140/90mmHg)[a]						
Marital status						
Never married	3.59 (p< 0.01)	2.12-5.08	2.73 (p< 0.01)	1.56-3.90	1.78 (p< 0.14)	0.76-2.82
Divorced/separated/ widowed	1.85 (p< 0.01)	0.82-2.88	2.14(p< 0.01)	1.63-2.65	3.60 (p<0.01)	1.66-5.55
Married [a]						

Table 4.20, continued

Place of diagnosis						
Government health clinic	3.60 (p< 0.05)	2.42-4.79	3.15 (p=0.10)	1.89-4.41	2.05 (p=0.24)	0.94-3.17
Private clinic/private hospital/pharmacy	2.42 (p<0.05)	1.88-2.96	2.16 (p=0.24)	1.65-2.72	1.56 (p=0.31)	0.77-2.36
Government hospital[a]						
ENABLING FACTORS						
Family support						
Low			2.84 (p<0.01)	1.96-3.72	3.22 (p<0.01)	2.51-3.94
High[a]						
NEED FACTORS						
Concerned about own health						
Low					1.83 (p<0.01)	1.56-2.32
High[a]						

Note: All logistic regression associations are adjusted with the sampling weights; Crude OR represents crude odds ratio: CI represents confidence interval
[a] denotes the reference category
*Categories may not total 100% due to rounding

Note: All logistic regression associations are adjusted with the sampling weights; Adjusted OR represents crude odds ratio: CI represents confidence interval;
*p-value <0.05, **p-value <0.01; [a] denotes the reference category; R^2= .58, .75 (Nagelkerke), .62 (McFadden)

CHAPTER 5 : DISCUSSION

The quantitative and qualitative results from this study yielded several interesting findings about the research questions for this study. To review briefly, the main research questions addressed were: 1) What are the reasons for non-adherence to anti-hypertensive medication among hypertensive patients undergoing follow-up at government primary health clinic settings in Hulu Langat and Klang districts in the state of Selangor, Malaysia?; 2) What are the relationships between the non-adherence factors and level of non-adherence within the Malaysian government primary health care settings?

The findings from this mixed-methods study are abundant and must be understood and applied in the appropriate context. Because of the cross-sectional nature of the quantitative study, the findings are only a snapshot of the hypertensive patients attending government primary health care settings continuum. In this section, the core findings from qualitative and quantitative data are discussed concurrently. This is to reflect the flow of mixed-methods design, how the data get connected or set in to answer the research questions. The findings of the research were compared with previous studies presented in the literature review. Following these, the recommendations and implications of the study findings as well comments on the strengths and limitations of the study were given.

5.1 Part I (quantitative study)

In Part I, the results demonstrated that 11 items out of 15 items of MAR-Scale had good reliability and construct validity among hypertensive patients in government primary health care patients in Selangor, Malaysia. Factorial validation from this study confirmed a four factor structure instead of five factors which differed from the original version. This is due to the different study population background and cultures of the Malaysian population. Findings suggested that the participants had problems in managing their antihypertensive medication which was related to managing issues (K2= difficulty swallowing medication, K4= unclear about proper administration, K15= problems opening containers and K9= embarrassment in taking medication), multiple medications issues (K7= taking too many medications and K3= cost of medications), beliefs issues (K10= medication is ineffective, K12= medication is not needed and K13= stop medication to see whether it is still needed) and forgetfulness and convenience issues (K5= forgot due to busy schedule and K8= inconvenience in taking medications as prescribed). There were four items which were not significant, namely, 'K1= medications not available in the pharmacy', 'K6= ran out of prescription due to busy schedule', 'K11= side effects or fear of side effects' and 'K14= concern about long-term effects of medications or dependency on medications'. It was noted that, the availability issues were not reasons for non-adherence in this group of patients and these findings were similar to another study in Malaysia which reported that poor blood pressure control was not due to lack of therapeutic regimen or availability issues (Aziz & Ibrahim, 1999). The reasons for non-adherence to anti-hypertensive medicines in this group of patients were more towards intentional non-adherence. On the other hand, concern about long-term effects of medications and fear of side effects, a form of intentional non-adherence, were not significant items. On the contrary, many studies had reported that side-effect was one of the most important determinants of adherence in hypertensive patient(Bloom, 1998; Khan, Shah, & Hameed, 2014). A study done in Malaysia also reported that the majority of participants had negative perceptions towards Western medicine, they tend to self-adjust their prescribed medication with complementary and alternative medicine and concealed their self-adjusting habits from their doctors. Most of the participants perceived the nature of Western medicine as not being curative because of its side effects (Lee, Mokhtar, Krauss, & Ong, 2014).

This study has several strengths whereby four methods of validation were utilized in four government primary health clinics in two districts. Besides that, the sample size for the factor analysis was large and the overall response rate was very good. The findings provided initial evidence of face validation, content validation, good test-retest reliability, good internal consistency reliability and construct validity. Even though, the final four structure model resulted from multi-group analysis was valid and demonstrated sufficient factorial invariance across gender, the model could not be used among different ethnicities in Malaysia. Further exploration with a qualitative study need to be done to explore this group of hypertensive patients across ethnicities in Malaysia. If more items were found, they may be added to this scale in order to identify, quantify and explain more reasons of non-adherence.Thecomprehensive measurement of other factors leading to non-adherence needs further exploration. Therefore, a qualitative study was undertaken in order to explore more reasons for non-adherence.

5.2 Part II (qualitative study)

The qualitative findings showed that there was evidence of an agreement between the participants interviewedand their doctors before starting the antihypertensive medication and health care recommendations. However, it later resulted in partial adherence due to poor monitoring and counselling from their health care professionals. Most of the participants admitted not taking their antihypertensive medication as prescribed by their doctor, although, they agreed with the treatment recommendations earlier. The participants also had inadequate self-management and low self-efficacy in adherence to their hypertensive care. Consistent with previous studies conducted in other developing countries, and developed countries, this was partly attributed to lack of awareness of self-care and the importance of health screening (Dennis et al., 2011; Knight et al., 2001; Lau et al., 2006; Saleem, Hassali, Shafie, & Atif, 2012).

Most participants only had their blood pressure assessed during clinic visits during follow-up appointment with doctors or visit to the pharmacy. Only two participants had a blood pressure set at home, however, they did not use it regularly to monitor their blood pressure. A qualitative study done in Malaysia found that patients who self-monitored were eager to be more involved in discussions about their blood pressure control (Abdullah & Othman, 2011).Participants generally believed that their diet and exercise regime have an influence on their blood pressure readings but did not used the readings they obtained from home blood pressure monitoring asa form of feedback, to gauge the adequacy of their lifestyle changes. Similar findings were also reported in a qualitative study looking at primary care patients' experiences of home blood pressure measurement in Japan and United Kingdom (Rickerby & Woodward, 2003; Saito, Nomura, Hirose, & Kawabe, 2010). Therefore, wherever feasible, patients should betaught to measure and monitor their own blood pressure and to assess their own adherence.

The participants' lifestyles also remained the same after being diagnosed with hypertension. Instead, they claimed to have tried to lower their blood pressure by changing their lifestyle. However, their attempts have clearly failed. The participants in this study wanted to know more about how to control their diet and how to exercise correctly. However, accurate information was not given at screening and during follow-up visits. Seven participants stated that they were not referred to other health care providers, such as dietitian or staff nurse in charge of the resource centre for counselling regarding the need for lifestyle changes. There is a need for dietitian referral because if the participants knew what food to eat, they may succeed in controllingtheir diet.Most of the participants were unaware of the existence of the resource centre in the health clinics, where they can obtain information regarding hypertension from counselling, flyers, healthy cooking demonstration, and others. As a result, the participants were uncertain what they should do. In addition, patients also need personalised dietary advice by their dietitians as each individual dietary modifications may differ depending on the severity of their hypertension. A study showed that knowledge by itself may not impact adherence(Jolles, Padwal, Clark, & Braam, 2013).However, knowledge has been shown to enhance behaviour changes, but to a limited extent(Mooney & Franks, 2010).

A study in Malaysia reported that three quarters of the participants aged 30 years and above had unsatisfactory hypertensive control and, it was related to food intake and eating habits, including high salt diet (Suzana et al., 2011). This study found that, high sodium intake, regular coffee intake and not taking milk increased the risk of uncontrolled hypertension among the participants (Suzana, et al., 2011).A study done in Malaysia by Rampal et al., 2008, reported that only 26.8% had their blood pressure undercontrol (<140/90 mmHg) (Rampal, et al., 2008). Rampal's study was a population-based cross-sectional study for the whole states in Malaysia including hypertensive patients and undiagnosed hypertension.

Health care providers should provide patients with adequate education about the disease and its treatment. Health visits should include realistic assessment of patients' knowledge and their understanding of the prescribed medication regimen. There should be clear and effective communication between health professionals and their patients, and concerted efforts to build trust in the therapeutic relationship (Brownstein et al., 2007). Participants expressed their need for more information regarding side effects and longterm effects of medications that they were taking. This study revealed that the pharmacist has an important role in giving information related to missed doses, adverse effects, and patient understanding of medication regimen.

However, there was evidence that lack of communication still existed between patients and health care providers with regard to medications, especially with regard to their use and side effects. Participants need to understand the importance of adherence to their anti-hypertensive medication and ensure they take their medications routinely. Furthermore, they need to learn how to deal with missed doses, how to identify adverse events, and what to do when they occur. Participants also preferred simple daily dosing. A study showed that reducing the number of daily doses appeared to be effective in increasing adherence to anti-hypertensive medication intake and should be tried as a first-line strategy (Domino, 2005). A meta-analysis reported that patients with chronic diseases appear to be more adherent with once-daily compared with more frequently scheduled medication regimens (Coleman et al., 2012)

Among the many reasons given for not adheringto medication were mainly due to patients' attitudes and influence from others such as family members and peers. Health service availability was not a problem in this group of patients. Although the participants' health visit time were long, and they had to wait more than three hours outside the consultation room to see the doctor, this did not affect their satisfaction with the overall services at the clinic. The participants also did not have problems with the accessibility and affordability with regard to their anti-hypertensive medication. This finding is consistent with another study done in Malaysia(Aziz & Ibrahim, 1999).

Patients must be given the opportunity to share their experiences with hypertension during the follow-up. This may allow the health professionals to understand the crucial elements of patients' adherence, such as their beliefs, attitudes, subjective norms, cultural context, social supports, and emotional problems. For example, most of the participants interviewed experienced stress before they were diagnosed as hypertensive. Therefore, it is important to recognize that such patients need to have early referrals for counselling and aid from psychologists to reduce the stress before it becomes worse. A study by Crowley et al found that high stress was associated with medication non-adherence among hypertensive patients seen at primary health clinics. But it was not known which comes first, whether stress caused the high blood pressure or vice versa. A study in Pakistan reported that, the participants were found stressed with medicines and had almost similar ideology about this issue. This may be one of the reasons for non-adherence to the anti-hypertensive medication regimens (Saleem, et al., 2012).

There was a wide variety of reasons why patients did not adhere to their anti-hypertensive medications. This qualitative study findings suggest that adhering to each of these behaviours posed different challenges for the participants. Family members played an important role and may also pose barriers in motivating participants to take their medications compared to friends, neighbours, and others. This study found that family members discouraged some participants from taking anti-hypertensive medication.

This study identified aspects of patients' beliefs and behaviours regarding anti-hypertensive medications and their lifestyle change after being diagnosed as hypertensive. Most patients demonstrated that they accepted responsibility for the management of their hypertension, but some were unwilling to make decisions for themselves. The responsibility for adherence must be shared between the patient, health care provider, family and community. Mutual collaboration between the patients and their health care providers fosters greater patient satisfaction, reduces the risks of non-adherence, and improves patients' health care outcomes(Martin, Williams, Haskard, & DiMatteo, 2005).

This study discovered that there were differences between the three major ethnic groups with regard to reasons for non-adherence which influenced the participants. Future qualitative study should be done to further explore the reasons and barriers which influence the hypertensive patients in each ethnic group in Malaysia. By conducting these qualitative interviews, items for the reasons of non-adherence or noncompliance can be generated for development within a clinically meaningful scale. This scale may have the greatest importance in developing countries, such as Malaysia, because the information derived from the self-administered health questionnaires are comprehensive, practical and inexpensive.

5.3 Part III (quantitative study)

Part III (a)

There were six factors and 20 items found to be significant reasons for non-adherence among the population studied, namely: Managing issues (difficulty swallowing medication, unclear about proper administration, embarrassment in taking medication, problems opening containers), Multiple medication issues (cost of medications, taking too many medications, concern about long-term effects of medications, using alternative/traditional medication), Beliefs issues with medications (medication is ineffective, side-effects/fear of side-effects, medication is not needed, stop medication to see whether it is still needed), Forgetfulness and convenience issues (forgot due to busy schedule, inconvenience in taking medications as prescribed), Motivational drives (influence from spouse/family, influence from peers, influence from community/social organization) and Healthcare provider factors (lack of care from the doctor, lack of information of what patients' need from doctor and healthcare staff, long waiting time). The Availability issues (medication not available in the pharmacy and ran out of prescription due to busy schedule) were not significant and this is consistent with the Phase I findings. This finding also supported by a study conducted in Malaysia which reported that the average availability of key medicines in the public health clinics for the country was 95.4% (Saleh & Ibrahim, 2005).

In contrast, items ‘concern about long term effects of medications’ and ‘side-effects/fear of side-effects’ were not significant as compared to Part I study. This finding was expected as in qualitative study (Part II), participants seemed to regard these two items as synonymous. Therefore, further amendment was done in the Part III (b) Questionnaire (Refer to Appendix D). Examples were given for these two items to reflect the meaning of what is meant by ‘concern about long term effects of medications’ and ‘side-effects/fear of side-effects’. Motivational drives from spouse/family, peers, community/social organization were found to be important reasons in influencing participants’ non-adherence. The other factor discovered to be an important reason for non-adherence in this group of patients was the healthcare provider factors. This study found that there was still lack of care from the doctors and information from doctors and healthcare staff was lacking. Besides that, long waiting time was found to be significant factors in this study. This is finding was consistent with other studies (Balkrishnan et al., 2003; Grunebaum et al., 1996; Lawson, Lyne, Harvey, & Bundy, 2005; Moore et al., 2004; Wai et al., 2005).

In addition, poor communication with healthcare providers was also likely to cause a negative effect on patient’s compliance (Bartlett et al., 1984). A study done in Malaysia by Lim and Ngah, 1991, showed that non-compliant hypertensive patients felt the doctors lacked concern about their problems (Lim & Ngah, 1991). In addition, multiple physicians or healthcare providers prescribing medications might decrease patients’ confidence in the prescribed treatment (Vlasnik, Aliotta, & DeLor, 2005).A healthy relationship is based on patients’ trust in prescribers and empathy from the prescribers. Studies have found that compliance was good when doctors were emotionally supportive, giving reassurance or respect, and treating patients as an equal partner (Lawson, et al., 2005; Moore, et al., 2004). In situations where physicians asked few questions and seldom made eye contact with patients, the patients found it difficult to understand the physician's language or writing(Rubin, 2005). These findings demonstrate the need for cooperation between patients and healthcare providers and the importance of good communication. To build a good and healthy relationship between patients and providers, the latter should have patients involved in designing their treatment plan, and give patients a detailed explanation about the disease and treatment (Gonzalez, Williams, Noël, & Lee, 2005; Vlasnik, et al., 2005). Furthermore, long waiting time during clinic visits, difficulty in getting prescriptions filled, and unhappy or unsatisfactory experience during clinic visitsall contributed to poor compliance(Balkrishnan, et al., 2003; Lawson, et al., 2005; Moore, et al., 2004; Vlasnik, et al., 2005).

Alternative/ traditional medication was found to be a significant reason causing non-adherence in this group of patients. This is consistent with other studies which reported that the complementary alternative medication used was common among hypertensive patients (Bell et al., 2006; Gohar, et al., 2008). This is also true in the context of developing country such as Pakistan, in which the health-seeking behaviour always occurs in the context of medical pluralism, where the patient will use a different system of healing. In this study, it was obvious that patients focus more on complementary and alternative medicine compared to orthodox therapy (Saleem, et al., 2012). A study in Ghana also reported that, hypertensive patients in the country had also utilized complementary and alternative medicine. Out of the 400 study participants, 78 (19.5%) reported using complementary and alternative medicine and about 70% of complementary and alternative medicine users had not disclosed their use of complementary and alternative medicine to their healthcare professionals citing fear and the lack of inquiry by these health professionals as the main reasons for non-disclosure

(Kretchy, Owusu-Daaku, & Danquah, 2014). Therefore, it is important that healthcare providers understand the patterns and determinants of complementary and alternative medicine use among their patients in order to incorporate the intervention programmes to enhance the desired health outcomes of patients.

Cost of medication was found to be one of the significant reason of non-adherence in this group of patients. This might be due to cost of hypertensive medication in the private facilities as the medication and treatment in government primary health clinics are highly subsidized. A study conducted in Malaysia by Babar et al., 2007, found that treatments cost in private facilities of some disorders such as hypertension was expensive due to costly branded and generic medicines (Babar, Ibrahim, Singh, Bukahri, & Creese, 2007).

Part III (b)

Descriptive findings

The analysis showed that half of hypertensive patients in government primary health care settings have high level of non-adherence (47.0%). This study found that, most (54.6%) of the participants wereoverweight (BMI≥23.0). This number might be a contributor to the high percentage of participants with poor blood pressure control (46.2%).

Univariate Analysis findings

In the univariate analysis, the present study found that there were six factors that had significant associations with high non-adherence. These factors can be categorised as predisposing factors, enabling factors and need factors. The factors were ethnicity, BMI group (underweight and overweight), marital status (divorced, separated and widowed), low family support, low concerned about health and place of hypertension diagnosis was made (Government health clinic, private health clinic, private hospital, pharmacy or in government hospital).

Overweight participants tend to have greater risk of developing poor blood pressure control. This is supported Rampal et al., 2008, which reported that obese individualswere eighttimes more likely to have hypertension thanindividuals with a BMI <18.5 (Rampal, et al., 2008). Having a marital status of divorced, separated and widowed were significantly associated with poor blood pressure control. This is consistent with other studies conducted in developed and developing countries (Abu-Saad et al., 2014; Guo, He, Zhang, & Walton, 2012). The help and support from a spouse could be the reason why married patients were more compliant to medication than single patients(Cooper et al., 2005).

High non-adherence was associated with higher risk of developing poor blood pressure control. This finding supported that, participants who had more reasons for non-adherence tend to have poor blood pressure compared to participants who had less reasons. In this current study, the classification of non-adherence (high and low non-adherence level) was divided using the visual binning function in the SPSS software. It is not possible to compare to other studies done since different criteria, population and instrument were used. Further exploration with quantitative and qualitative study should be done to identify whether this finding is consistent with other studies done.

Participants with low necessity beliefs and high concern beliefs had a higher risk of developing poor blood pressure control. Patients' beliefs about the specific medication prescribed for them can be grouped under two themes. These are their beliefs about the necessity of the prescribed medication for maintaining health now and in the future (necessity beliefs), and concerns about thepotential adverse effects of taking it for example, becoming too dependent on the medication orthat regular use would lead to long term adverse effects (concern beliefs)(Horne, 1999).Necessity beliefs are about thepositive effects of a drug on someone's health and concern beliefs are about the adverseconsequences of taking a drug (Horne, et al., 1999). Concern beliefs in medication have also been associated with self-reporting an adverse drug events (Oladimeji, Farris, Urmie, & Doucette, 2008). Patients with strong concern beliefs in medicines were morelikely to report an adverse drug event after controlling for socio-demographic, clinical and behaviouralfactors. These patients may be more sensitive to symptoms and pay particular attention tounwanted reactions that occur possibly making them likely to report an adverse effect (Oladimeji, Farris, Urmie, & Doucette, 2009).

This study showed that low family support had a significantassociation with poor blood pressure, in which, participants with low family support had an increased risk of developing poor blood pressure control. The general findings from these articles showed that patients who had emotional support and help from family members, friends or healthcare providers were more likely to be compliant to the treatment (DiMatteo, 2004; Seo & Min, 2005; Voils, Steffens, Bosworth, & Flint, 2005). The social support helps patients in reducing negative attitudes to treatment, having motivation and remembering to implement the treatment as well (Li, Hu, Dong, & Arao, 2013). A number of literature indicate that patients with higher levels of family support would be more likely to exhibit self-care behaviours frequently (Baumann & Dang, 2012; Mollaoglu, 2006). In addition, patients with hypertension showed that family support might improve therapy complianceand healthy dietary habits (Wilson & Ampey-Thornhill, 2001). In addition, hypertensive patients with poor social networks had their systolic and diastolic pressure 4.29 mm Hg higher than hypertensive patients with broader social networks (Menéndez et al., 2003).

Multivariate Analysis Findings

This section provides the findings from the multivariate logistic regression for complex samples analyses. The significant factors with p-value of 0.025 were entered into the logistic regression performed in SPSS. In univariate analysis, all the eighteen significant factors were significant ($p<0.05$). Therefore, all the eighteen factors were entered one by one according to the Conceptual Framework of non-adherence to antihypertensive medication based on Anderson's Behavioral Model and Leventhal's Common Sense Model; namely Model 1 for the *Predisposing Factors* and Model 2 for the *Enabling Factors,* leaving only the significant factors (after all the confounding factors were adjusted) in Model 3 for the *Need Factors*. After adjusting for the confounders, the results showed that there were four factors which determined high level of non-adherence namely (i) marital status (divorced, separated and widowed) contributing the most [OR = 3.60; 95% CI(1.66, 5.55)] (ii) low family support[OR= 3.22, 95% CI(2.51, 3.94)], (iii) poor blood pressure control [OR=2.54; 95% CI(1.78, 3.40)] and, (iii) low concerned about own health[OR= 1.83, 95% CI(1.56, 2.32)].

This current study reported that marital status (divorced, separated and widowed) determined high level of non-adherence. This is consistent with a study done by Okoronkwoet. al. which reported that respondents who were single were more non-adhering due to poor communication by care providers than the married patients. The single respondents did not adhere to the treatment regimen due to stigma and long-term regimen of drug intake (Okoronkwo, 2013). Furthermore, the awareness of the status of hypertension varied according to whether the person saw friends and neighbors. The percentage of men with hypertension who were aware of the fact was greater among those who saw their friends or neighbors daily or nearly daily (Okoronkwo, 2013). A study done in Iran reported thatthe married respondents (24.7%, 134/543) have more adherence to hypertensive medication compared with unmarried (21.1%, 27/128), however, these differences were not significant (Kamran, 2015).A study done by Baker et al reported that the characteristics associated with marriage, persons with mild hypertension who reported greater satisfaction and cohesion with their partner had a lower blood pressure in a three-year follow-up study (Baker, 2003). Besides that, Gump et al also observed that the blood pressure was lower when there existed partner interaction than when the interaction was with other persons (Gump, 2001).English men with hypertension were more likely to receive treatment if they were widowed or divorced, lived with somebody else, or received less social support. English women were more likely to receive treatment if they received less social support, and no association was observed depending on their cohabitation status (Shah, 2001).

Whereas, studies in patients with heart failure reported that, these group of patients need assistance to adhere to prescribed medication (e.g., transportation to physician's office to keep the prescription updated, transportation and money to refill the prescription, reminders to take prescribed medications, and support to overcome cognitive changes and fatigue that could affect their ability to take medications as prescribed (Wu, 2008). Without a spouse or partner, patients with heart failure often have difficulty securing assistance for these needs (Chandra, 1983).

In a study by Wu et al. reported that compared to married patients, those who were unmarried were 2.2 times more likely to be nonadherent to their prescribed medication ($p = .033$) (Wu, 2012). Married patients perceived more social support compared to unmarried patients (70.8 vs. 58.8, $p = .001$); likewise, adherent patients had higher perceived social support scores than nonadherent patients (69.1 vs. 62.8, $p = .049$) (Wu, 2012). More married patients reported having someone usually remind them to take their prescribed medications compared to unmarried patients ($p = .036$) (Wu, 2012). Also, more married patients reported having someone to help them take their prescribed medications than unmarried patients ($p < .001$) (Wu, 2012).

Studies showed family support was associated with better adherence (Eng, Hatch, & Callan, 1985; Kirscht & Rosenstock, 1977; Morisky, DeMuth, Field-Fass, Green, & Levine, 1985; Wilson & Ampey-Thornhill, 2001) and hence advice for better hypertensionmanagement should involve the family members where possible.A study done in Spain reported that, hypertensive participants who saw their relatives daily or almost daily more often adhered to their antihypertensive treatment than those who had less contact with their relatives, although the difference was not statistically significant (OR=1.21; 95% CI, 0.96-1.53)(Redondo-Sendino, 2005).

This study showed that low support from family members resulted in high non-adherence level (more non-adherence as compared to low non-adherence). Medication adherence was influence by social support. Other study found that, social support influenced positively on adherence and had significant influence on good blood pressure control (Criswell, 2010).Social support from family members strongly associated with good adherence with anti-hypertensive medication. This finding suggest that a need for exploring the promotion of social support as a useful tool in chronic disease treatment programmes (Osamor, 2015).Another study reported that, absence of family support (AOR=0.170, 95%CI = 0.030- 0.905) was reported in this study to have a strong negative effect on adherence (Ali, 2014).

In regards to family cohesion, in which families are described as warm, accepting, and close, the odds of adherence were three times higher when compared with noncohesive families (DiMatteo, 2004). Furthermore, family structural support (ie, patient’s marital status and living arrangement) is also positively associated with treatment adherence (DiMatteo, 2004).

A systematic review of the published literature to evaluate what is known about the association between social support and medication adherence in a variety of disease states, and to explore features of one's social support that might encourage better behaviourfound that practical social support was most consistently associated with greater medication adherence. On the other hand, practical support as defined by the number of sources (or satisfaction with the sources) of practical support for medication reminders, household responsibilities, or transportation was consistently associated with improved medication adherence. Improved medication-taking behavior was most closely associated with assistance in the very process of purchasing or administration of therapy (Scheurer, 2012).In one study, patients reported that open communication with the nurses and social support from their family, friends and coworkers provided emotional support, information and guidance to assist them in being compliant with their hypertension management regimen (Rimando, 2012).A study done in Malaysia showed that lack of family support [OR=12.72; 95% CI (7.00, 23.12)] as a significant predictor (Rashid, 2011). Therefore, family members should be aware that family support plays an important part in patient adherence to treatment.

A study done in Japan reported that, subjects with a relatively low-adherence rate showed significantly higher blood pressure compared with those with a perfect adherence rate over a six-month treatment period(Matsumura, 2013).This is consistent with current study which showed that a poor blood pressure control was found to negatively affect non-adherence level. Participants with poor blood pressure control tend to have high non-adherence (more non-adherence) level compared to participants with low non-adherence (less non-adherence).A study done in Malaysia by Cheong et al., reported that the factors associated with blood pressure control were education level ($p = 0.003$), presence of comorbidities ($p = 0.015$), number of anti-hypertensive agents ($p = 0.001$) and number of total medications used ($p = 0.002$). Patients with lower education (less than secondary education) ($OR = 1.7$, $p = 0.008$) and the use of three or more anti-hypertensive agents (OR = 2.0, p = 0.020) were associated with poor blood pressure control (Cheong, 2015).

Therefore, developing intervention programs to address some of the factors identified is necessary to improve adherence and, in turn, to improve blood pressure control. A multidisciplinary approach with greater involvement of patients in managing their conditions should be adopted to promote better adherence to their anti-hypertensive medication prescribed.

This current study also showed that low concerned about own health is the determinant of high non-adherence. Participants with low concerned and worried about their own medications tend to be high non-adherence (more non-adherence).Participants' concern about their own health can have an effect upon medication adherence through perceived need (Williams, 1998). Participants who are satisfied about their health and who have few concern may have low perceived need to be adherent with medication compared to participants with high concerned about their own health.

Most of the factors found significant in this study were consistent with other studies. Although the participants did not have problems with the accessibility and affordability with their antihypertensive medication, they still were unable to adhere to their antihypertensive medication and change their lifestyle after being diagnosed with hypertension. This is because the medication cost is almost free in government primary health clinics in Malaysia. There were 1,025 government health clinics in Malaysia as of December 31, 2012, and these clinics are highly subsidized by the Malaysian government, including the medications and treatments(Ministry of Health Malaysia, 2012). However, this may not be applicable to other patient populations; hence, other studies found that patients who were without insurance coverage or who had low income were more likely to be non-adherent to their treatment(Briesacher, Gurwitz, & Soumerai, 2007).

A review of160 articles that evaluated the relationshipbetween changes in cost sharing and adherence showed that, 85% of participants who had an increasing patient share of medication costs wassignificantly associated with a decrease in adherence and eventually resulted in non-adherence and poor blood pressure control (Eaddy, Cook, O'Day, Burch, & Cantrell, 2012).

Place of hypertension diagnosis and BMI were the confounding factors in this study.

Theoretical implication

It is noted from this current study, medication non-adherence is an outcome of the interaction between predisposing factors, enabling factors, need factors and medication non-adherence. This pattern is generally consistent with the conceptual model in medication non-adherence adapted based on Andersen's Behavioural and Leventhal's Common Sense Models developed by Unni et al. (Unni & Farris, 2011).

Strengths and Limitations of the Study

There are several strengths to the current study that should be considered. Previous reviews and studies in Malaysia have not documented the use of mixed-methods techniques for any reasons of non-adherence to antihypertensive medication. Thus, this is the first study of its kind. Besides, the qualitative and quantitative studies form a good combination and complement each other by tighthening its attention to measurement error, incomplete information, omitted variables, and estimating the certainty of conclusions (Fielding, 2012).

This current study was also based on primary data and firsthand information was obtained from the Malaysian population. The instrument developed in this study (myMAR-Scale) can be used and very relevant to the Malaysian population. This study utilized large sample size. Besides that, the nurses were trained to measure the participants' blood pressure (BP) correctly and all the BP measuring instruments were standardized and calibrated. The same BP set, type and brand was used each time for all the participants in all the government primary health clinics.

The researcher was also trained to conduct qualitative research and was qualified to do so after receiving the following training: (1) seven years of clinical work as a medical officer which involved meeting and treating patients on a daily basis (2) had undergone training for qualitative research and (3) had undergone the training and passed the Good Clinical Practice (GCP) examination, which certifies and allows the researcher toconduct research in a clinical setting. The researcher also gained knowledge and understanding of human ethics as well as the knowledge to assure participants confidentiality which was discussed extensively in the GCP course.

The following limitations should be noted when interpreting some of the findings. In this study, dependence upon a single assessment of BP may overestimate the participants with poor blood pressure readings. The white coat effect (increase in BP due to the fact that it is being measured by medical personnel) may tend to underestimate hypertension control. To reduce the influence of this effect on the findings, future studies should take three BP measurements for each participant, exclude the first measurement (usually the most influenced by this effect) and used the mean of the second and third BP measurements (Abu-Saad, et al., 2014).

This study only utilized government primary health clinics managed by Malaysian Ministry of Health. Therefore, the findings might not reflect the problems in the private settings. This study also focused on adult hypertensives in the development myMAR-Scale. This scale might be extended for use in other chronic diseases such as diabetes or other group of hypertensive patients such as peadiatric or pregnant hypertensive patients. Meanwhile, a study to determine the prevalence of hypertension among primary school children in the state of Sarawak, Malaysia was conducted and 737 participants were involved. About 13% of the children were found to be at stage I hypertension, 3.1% as stage II hypertension, and 11.5% pre-hypertension (APPCCN, 2015).

All the in-depth interviews for the qualitative study (Phase II) were done in government primary health care clinics, and this may affect the participants' responses. In addition, further exploration by interviewing family members and health care providers would be useful for a better understanding of the problem.

As this is a cross-sectional study, if one intends to look at the causal relationship between factors and non-adherence, temporal relationships between those factors should be examined carefully. The design of the survey makes it difficult to tell whether the exposurefactor precedes the outcome factor. However, the indication of existing associations will be useful in generating hypotheses for future research.

Knowledge of the participants regarding their disease and medication were not asked. A proper diet history was unable to be captured. Diet history with other professionals such as dietitian or nutritionist would be better to have better understanding of the participants' dietary pattern. Besides that, the physical activity level of the participants should be assessed as a baseline of their current physical activity level.

In this study, in Part III (b), part of the disease characteristics, the researcher did ask regarding whether participants had depression or anxiety, but the tools were very limited. The researcher asked very briefly whether the participants took any medications for anxiety or depression without asking the name of medication. The 21 item Depression Anxiety and Stress Scale (DASS) was used to measure depression, anxiety and stress levels concurrently (Henry & Crawford, 2005; Musa, Fadzil, & Zain, 2007). This scale is not able to determine whether the participants were already diagnosed with anxiety or depression or vice versa. Hence it was not able to distinguish whether hypertension was diagnosed before or after the anxiety or depression. Therefore, the researcher was unable to certify whether the participants were suffering from anxiety or depression for the disease characteristics part under the predisposing factors (Please refer to Figure 2.1: Conceptual Framework for medication non-adherence based on Andersen's Behavioural Model and Leventhal's Common Sense Model). Therefore, further research needs to be explored more and use reliable questions regarding medication of anxiety and depression.

CHAPTER 6 : CONCLUSION

The problems of non-adherence are ubiquitous across medicine. Because adherence is a complex process; attempts to improve it need to be multifaceted. Understanding patients’ need and lack of shared decision making seem to be the major adherence barrier faced by hypertensive patientsinthisstudy. Therefore, the responsibility for non-adherence has to be shared by the patients, health professionals, the health care system,and the community.

6.1 Review of the Main Findings

This current study updates and provides the reasons for non-adherence to anti-hypertensive medication and, the factors which have the significant association with blood pressure control among hypertensive patients attending government primary health clinics with reference to Andersen’s Behavioural Model, and Leventhal’s Common Sense Model. Conceptual framework to tease out the *Predisposing factors, Enabling factors and* the *Need factors.*

The quantitative study results provide a strong confirmation of the qualitative findings through triangulation of the constructs. This resulted in myMAR-Scale which is can be used among the three major ethnic groups (Malays, Chinese and Indian) in Malaysian population. In major survey in Part III (b), there were four factors namely: marital status (divorced/separated/widowed), low family support, poor blood pressure control and low concerned about their own health which determined high non-adherence among studied population.

This study offers theoretical implications and suggestions for future research, guiding principles and pragmatic recommendations. The findings may benefit policy makers and various authorities such as health care practitioners, and local government.

6.2 Recommendations

Based on the literature and outcome of the current study, the following two recommendations are made: (A) (1) Recommendations for clinical practice and, (2) Recommendations for future directions for the research, and, (B) Recommendation based on multivariate findings in major survey (Part IIIb).

6.2.1 Recommendations for Clinical Practice

The recommendations for clinical practice in Malaysia which derived from this current study are as following:

(i) Health care professionals need to educate hypertensive patients regarding their disease with specific explanation on its causes, the severity of the disease, the complications of the disease, the side-effects of medication and how to deal with the side-effects. Patients should be referred early to the dietitian in charge and they should be taught how to control their diet. Patients also need to know how they can exercise regularly according to their busy schedule.

(ii) Health care professionals should educate the patients to self-monitor their blood pressure at home. In the current study, only 5.4% of the participants self-monitored their blood pressure.

(iii) Patients should be informed regarding the existence of the Resource Centre in each Health Clinics where they can get all the information such as pamphlets, healthy cooking demonstration and counselling from health care staff in charge by appointment basis. Patients should know and be informed of all the activities or Health Camp done in their community. Whenever possible, family members should be involved in the counselling sessions or the activities.

Patients need to recognisethe representative of the health advisory panel from their community. This may act as a starting point for creating a support group in the community as this will help both adhered and non-adherence patients to meet, interact and share their experiences.There is evidence that peer support groups among patients were able to improve adherence to therapy, while reducing the amount of time devoted by health care professionals for chronic disease management(Tehrani, Farajzadegan, Rajabi, & Zamani, 2011).Social support received by patients from other members of their community has been consistently reported as an important factor that affected health outcomes and improved adherence(Martin, et al., 2005).

(iv) Health care professionals should monitor patients continuously to ensure patients have full adherence to their hypertensive care. In the current study, it was discovered that participants with duration of hypertension less than one year was a significant factor of poor blood pressure control. Doctor need to stress on the importance of adherence to treatment and lifestyle recommendations despite the absence of symptoms. Doctors need to encourage patients to continue their treatment as prescribed and should be discouraged from relying on their complementary/ alternative medications such as herbs to treat their condition. It is necessary to explain the benefits of the treatment recommendation, lifestyle changes and their risks of developing complications.

(v) Health care professionals need to understand patients' reasons of non-adherence to their hypertensive care using the developed MAR-Scale in the current study as a guideline in managing their patients. Doctors should inquire whether patients adhere with the prescribed regimen and lifestyle modification during the consultation.

(vi) The developed myMAR-Scale should be suggested to be incorporated into the new Clinical Practice Guideline for hypertension management as an instrument to guide medical professionals to have a better understanding regarding reasons of non-adherence to anti-hypertensive medication among patients in primary health care settings.

(vii) Special emphasis should be placed on reducing the long waiting times at the government primary health clinics.

(viii) The current study shows that participants were not motivated to change their lifestyle after being diagnosed with hypertension. This study found high percentage of the participants to be overweight. Therefore, health care professionals should encourage patients to maintain their normal weight. Policies should be implemented at national level to address healthy diet and physical activity in the community and organization as a step to control obesity and hypertension.

(ix) In this current study, participants were found to experienced stress before they were diagnosed as hypertension. Therefore, it is important for the health care provider to identify patients who experienced stress and to refer them accordingly. Early management of stress is important because stress itself might be a risk factor or it could be that high levels of stress make blood pressure worse. In this current study, participants who were identified to have stress, depression and anxiety were referred to medical officers in charge in the primary health clinics for further management.

(x) Healthcare providers need to move towards adherence instead of adherence in treating hypertensive patients, to ensure that patients' agreement to the recommendations was taken into consideration.

6.2.2 Recommendations for Future Directions for the Research

The following are the recommendations and aspects which require further research:

(i) Future studies need to state whether patients' agreement were taken into consideration. This is to ensure adherence which taken patients' agreement into consideration.

(ii) Besides that, there is a need to develop culturally appropriate interventions to reduce the prevalence of hypertension among these populations to minimize the resultant cardiovascular morbidity and mortality. Furthermore, the exploration of the ethnicities in Malaysia should be extended to other than the three major ethnic groups including Indigenous population in Malaysia. The Indigenous groups of Malaysia represent around 12 percent of the 28.6 million people in Malaysia (International Work Group for Indigenous Affairs, 2013).

(iii) Future research should be directed in refining the myMAR-Scale and test it for other chronic diseases such as diabetes and asthma patients. This scale also should be tested across various medications and various populations other than major ethnic groups (Malays, Indian and Chinese). This will help in developing classes of non-adherence for each type of medication. The Andersen and Leventhal model combination can be used to predict the various classes of non-adherence and identify significant predisposing, enabling, and need factors that can be used for developing appropriate intervention strategies to decrease non-adherence.

(iv) Health in All Policies (HiAP) should be implemented in Malaysia. The core of HiAP is to examine the determinants of health, which can be influenced to improve health but are mainly controlled by policies of sectors others than health (Ståhl, Wismar, Ollila, Lahtinen, & Leppo, 2006). The HiAP approach is based on the recognition that the population health is not merely a product of health sector activities, but to a large extent determined by the living conditions and other societal economic factors. It is also concerned in addressing policies in the context of policy-making at all levels of governance, including national, regional and local levels of policies. One example of the country which has HiAP is Finland. The interventions used in terms of the level or sector of intervention in industries are; “heart-healthy” food products were developed and promoted in collaboration with local authorities, shops, supermarkets and the food industry, low saturated fat products were developed and marketed in collaboration with local and national manufacturers, a new type of rape seed plant was developed which was effective in cholesterol lowering and a broad collaboration for promoting berry farming including enterprises to produce berry products.

(v) Malaysia should encourage voluntary product reformulation by the food and restaurant industry, as a way of reducing the salt content of processed and prepared foods. In Singapore, the Health Promotion Board is working with industry partners to lower the sodium content of packaged foods, and to develop a “healthier salt” containing 25% less sodium than regular salt or using the pick and tick programme. This salt will be promoted for use in food establishments (He, Jenner, & MacGregor, 2010).

There is an ongoing study in Malaysia by Su et al. The study is a two armed, parallel group, un-blinded, cluster randomized controlled trial undertaken within lower income areas in Kuala Lumpur, Malaysia. The aim of this study was to evaluate the effect of lifestyle modification and peer support home blood pressure monitoring on blood pressure control, during a 6 month intervention period. In this study, the intervention group will receive training on self-measurement of blood pressure, health coaching on healthy diet, training for indoor exercise activities and the use of Body Mass Index (BMI) calculator. This study also aims to assess whether these effects can be sustainable more than six months after the intervention has ended(Su et al., 2014).

6.2.3 Recommendation based on multivariate findings in major survey (Part IIIb)

Based on the major survey in Part III(b), therewere four factors namely: marital status (divorced/separated/widowed), low family support, poor blood pressure control and low concerned about their own health which determined high non-adherence among studied population. Determining patient marital status can help to identify those who are at higher risk of worse medication adherence and poorer outcomes. It is important to design interventions to improve medication adherence and outcomes that take into account subgroups, such as unmarried patients, who are at higher risk for high non-adherence and poorer outcomes. Social support from family provides patients with practical help and can buffer the stresses of living with illness. Further research is needed to address how the differences in types of support, such as functional or emotional support, are linked to outcomes among hypertensive Malaysian population.

Family and community should be explained or briefed regarding patients' condition and how they can help patients to promote adherence. Therefore, they can support the patients to adhere to their antihypertensive medication and lifestyle changes. Community resources should be established to act as peer support groups to improve patients' self-efficacy in order to empower them to adhere to their antihypertensive care.

Community resources to empower this group of patients should be established in community settings, such as in mosques and churches, as a starting point for patients to develop self-care and create peer support groups. Social support groups are needed to promote the exchange of experiences in dealing with hypertension, its care, and to promote patients' responsibility for their own care. The widespread preference of people to seek alternative and complementary medicines must be acknowledged, and patients need to be encouraged to adopt approaches that are personally relevant, but supported by scientific evidence. Meanwhile, poor adherence to a regimen is only one of several possible reasons for its failure. Others that must beassessed include initial resistance to one or more of the therapeutic agents, altered absorption ormetabolism, and multi-drug pharmacokinetics that adversely affect levels of therapeutic drugs.

Multi-sector population-based interventions to promote physical activity and the consumption of healthy diet, as well as the need for more research to evaluate the effectiveness of interventions to promote adherence to anti-hypertensive medication. The implementation and evaluation of policies that influence the production, marketing and consumption of healthy foods, fiscal policies to increase the availability and consumption of healthy food and to reduce the consumption of unhealthy food; education and social marketing campaign and measures to improve healthy eating in workplace and school.

6.3 Conclusion

Self-management approach must be responsive to the needs of individuals, communities, and populations, recognizing that the provision of information or resources alone does not mean that people can or will access and use them. Within the limitations, our findings can help doctors who seek to understand their patients' thinking regarding their antihypertensive medication at the start or review of the course of drugs. They can contribute to discussions on the advantages of drugs in a way that is relevant for the patients personally,in support of decisionsthat are concordant between patients and doctors. Health care providers should work to establish a collaborative treatment relationship with their patients.Providers shouldopenly discuss with patients their readiness to follow treatment, the potential barriers to adherenceand possible solutions to problems. While the provider and his or her team can be a source of support,other possible sources (including family, friends and formal support services) should also be discussedwith patients.Casemanagers, social workers and other health care providers involved in the care of the patient may assist in this evaluation.

Future research should identify the many types of social support interventions that promote anti-hypertensive medication adherence; in doing so, hypertensive patients are given the ability to seek social support that is most conducive and appropriate for their lifestyle. Lastly, further empirical evidence is needed to address the mechanisms by which social support works to directly influence anti-hypertensive medication adherence, health outcomes, health care utilization, and behavior change.

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Appendix A: Phase I Questionnaire

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RESEARCH QUESTIONNAIRES FORM

Example of participant's identification number

Code No:

Date:

Adherence to Anti-Hypertensive Medication in a Malaysian Primary Care Population

Instructions to all participants

- This survey is about hypertensive patients attending Health Clinics under Hulu Langat District and Klang district in Selangor.
- DO NO write your name on this survey form. The answer you give will be kept confidential.
- Answer the questions based on what you really know and do.
- The information you give will be used to develop better health education and services for hypertensive patients.
- Completing this form is voluntary.
- Make sure you read the questions properly. Please tick where appropriate.

THANK YOU FOR YOUR COORPERATION

UNIVERSITY OF MALAYA

KUALA LUMPUR

Producing Leaders Since 1905

BORANG SOAL SELIDIK PENYELIDIKAN

No kod :

Tarikh :

Adherence to Anti-Hypertensive Medication in a Malaysian Primary Care Population

Arahan kepada peserta

- Kajian ini adalah mengenai pesakit hipertensi yang menghadiri Klinik Kesihatan Daerah Hulu Langat dan Klang daerah di Selangor.
- Anda TIDAK DIKEHENDAKI menulis nama anda pada borang kaji selidik ini. Jawapan yang anda berikan akan dirahsiakan.
- Anda dikehendaki menjawab berdasarkan apa yang anda benar-benar tahu dan amalkan.
- Maklumat yang anda berikan akan digunakan untuk menghasilkan pendidikan kesihatan dan perkhidmatan yang lebih baik untuk pesakit hipertensi.
- Melengkapkan borang ini adalah secara sukarela.
- Pastikan anda membaca soalan dengan betul. Sila tandakan di mana sesuai.

TERIMA KASIH DI ATAS KERJASAMA ANDA

SECTION A: PERSONAL INFORMATION
BAHAGIAN A: MAKLUMAT PERIBADI

1. Blood pressure / mmHg
   Tekanan darah

2. Weight _______ kg
   Berat

3. Height _______metre
   Tinggi

4. BMI (leave this space blank/ *tinggalkan ruang ini*)

   _______kg/m^2

5. What is your gender?
   Apakah jantina anda?

A) Male / *Lelaki*

B) Female / *Perempuan*

6. What is your birth date?
   Bilakah tarikh lahir anda?
   Day/ *Hari*Month/ *Bulan*Year/ *Tahun*

7. What is your ethnicity?
   Apakah bangsa anda?

A) Malay/ *Melayu*

B) Chinese/*Cina*

C) Indian/*India*

D) Others; Please specify _______________
   Lain-lain; Sila nyatakan

8. What is your marital status?
   Apakah status perkahwinan anda?

A) Never married / Tidak pernah berkahwin

B) Married / Berkahwin

C) Divorced / Bercerai

D) Separated / Berpisah

E) Widowed / Balu / Duda

9. What is your highest educational level?
   Apakah tahap pendidikan tertinggi anda?

A) No formal education/ *Tiada pendidikan formal*

B) Primary school / *Sekolah rendah*

C) Secondary school/ *Sekolah menengah*

D) Certificate @ other qualification after secondary school/*Sijil @ lain-lain kelayaan selepas seolah menengah*

E) University / *Universiti*

F) Others (Please specify) / Lain-lain (*Silanyatakan*)______________________

10. What is your current occupation?
    Kini anda bekerja sebagai apa?

A) Civil servant / *Kakitangan kerajaan*

B) Private sector employee/ *Kakitangan swasta*

C) Self-employed / *Bekerja sendiri*

D) Government retiree / *Pesara kerajaan*

E) Private retiree / *Pesara swasta*

F) Studying / *Masih belajar*

G) Studying and working / *Bekerja sambil belajar*

H) Housewife/ *Surirumahtanga*

I) Unemployed / *Tidak Berkerja*

SECTION B: MEDICATION ADHERENCE REASONS SCALE (MAR-SCALE)
BAHAGIAN B: SKALA PENYEBAB UNTUK MENGUKUR KEPATUHAN UBATAN

If you have missed taking your medication, please indicate how often you have missed taking your medication due to the various reasons listed below (√)/*Jika anda terlepas pandang mengambil ubat-ubatan anda, sila nyatakan berapa kerap anda telah terlepas mengambil ubat anda kerana pelbagai sebab-sebab yang disenaraikan di bawah (√).*

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
1. Medication not available in the pharmacy/ *Ubat tidak terdapat di farmasi*					
2. Difficulty swallowing medication/ *Kesukaran untuk menelan ubat*					
3.Cost of medication/*Harga ubat*					
4.Unclear about proper administration of medication/*Tidak jelas dengan cara pengambilan ubat*					
5.Forgetting due to busy schedule/*Lupa kerana jadual yang sibuk*					
6. Prescription ran out due to busy schedule/*Ubat habis kerana jadual sibuk*					

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
7. Taking too many medications/ *Mengambil terlalu banyak ubat-ubatan*					
8.Inconvenience in taking medications as prescribed (e.g: you are away from home, the medication makes you urinate more frequently, etc.)/ Kesulitan dalam mengambil ubat seperti yang ditetapkan (contoh: anda berada jauh dari rumah, ubat-ubatan yang membuat anda kerap membuang air kecil lebih kerap, dll.)					
9.Embarrassment in taking medications (e.g: you are with friends, you are in a public place, etc.) *Malu dalam mengambil ubat-ubatan (contohnya anda dengan rakan-rakan, anda berada di tempat awam, dll.)*					
10. Medication is ineffective/*Ubat tidak berkesan*					
11.Side effects/Fear of side effects *Kesan sampingan atau takut pada kesan sampingan*					

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
12. Think medication is not needed because you are not showing any indications of the disease or you feel well without medication/*Berfikir ubat tidak diperlukan kerana anda tidak menunjukkan sebarang tanda penyakit atau anda merasa sihat tanpa ubat*					
13. Stop medication to see whether it is still needed/*Berhenti mengambil ubat untuk melihat samada masih memerlukannya*					
14. Concern about long term effects of medications or dependency on medications/*Kebimbangan mengenai kesan jangka panjang ubat-ubatan atau pergantungan kepada ubat-ubatan.*					
15.Problems opening containers/*Kesulitan membuka bekas*					

Appendix B: Phase II Questionnaire

INTERVIEW GUIDE FOR IN-DEPTH INTERVIEW

Code Number/:

Kod nombor

Date/*Tarikh*:_________________

Name of participant/*Nama peserta*:_________________________________

Place of interview/ *Tempattemuduga*:_________________________

Phone number/*Nombor telefon*: _________________________

Start/*Bermula*:____________

End/*Berakhir*:______________

PERSONAL INFORMATION/ *MAKLUMAT PERIBADI*

1. **What is your age?/**
   Berapakah umur anda? **____________________years old/*tahun***

2. **What is your gender?/** Male/*Lelaki*
   Apakah jantina anda Female/Perempuan

3. **What is your ethnicity?/** Malay/Melayu
   Apakah bangsa anda? Chinese/Cina
   Indian/India
   Others/Lain-lain

4. **Family history of hypertension/** Yes
   Sejarah keluarga untuk darah tinggi No

5. **Blood pressure reading taken today/**
   Bacaan tekanan darah tinggi yang diambil pada hari ini

6. **Duration of hypertension/**
   Tempoh menghidap darah tinggi **______________**

7. **Occupation/** **_________________________________**
   Pekerjaan

QUESTION/*SOALAN*

1. **How did you first discover you have hypertension?**
   Bagaimanakah anda mula-mula mendapat tahu yang anda menghidap darah tinggi?

2. **Please describe your feeling regarding taking anti-hypertensive medication?**
   Ceritakan perasaan anda mengenai pengambilan ubat darah tinggi.

3. **Describe problems and reasons for not taking your anti-hypertensive medication?**
   Huraikan masalah-masalah dan sebab-sebab tertentu mengapa anda tidak mengambil ubat darah tinggi anda.

4. **Have you ever tried alternative medicine to control your blood pressure? Please describe.**
   Adakah anda pernah mencuba ubat-ubatan alternatif untuk mengawal tekanan darah tinggi anda?Huraikan.

5. **What causes fear to you in taking hypertensive medication? Please describe.**
   Apakah ketakutan yang menyebabkan anda tidak mengambil ubat darah tinggi?Huraikan.

6. **Is there any changes in your lifestyles in terms of physical activity and your diet after being diagnosed as hypertensive patient? Describe the reasons.**
   Adakah terdapat perubahan cara hidup anda dari segi aktiviti fizikal dan pemakanan selepas bergelar sebagai pesakit darah tinggi?Huraikan sebab-sebabnya.

7. **Do you think is important to take care of your own health and your own blood pressure?**
   Adakah anda rasa penting untuk menjaga kesihatan anda dan tekanan darah anda sendiri?

8. **Describe any activities conducted in your community which you have involved such as exercise group (aerobic, brisk walking), talks regarding healthy lifestyle, membership of a club or join any support group in the mosque, church or temple?**
   Huraikan mana-mana aktiviti yang dijalankan dalam komuniti yang anda pernah terlibat seperti kumpulan senaman (aerobik, berjalan pantas), ceramah mengenai gaya hidup sihat, keahlian kelab atau menyertai mana-mana kumpulan sokongan di masjid, gereja atau kuil?

9. **Describe in terms of motivation in taking high blood pressure medication; and follow physical activity and diet recommendations.**
   Huraikan dari segi motivasi dalam pengambilan ubat darah tinggi; dan mengikuti aktiviti fizikal dan pemakanan yang dicadangkan.

10. **Are there problems or reasons related to the culture or ethnicity which discourage or causing you not taking anti-hypertensive medication?**
    Adakah terdapat terdapat masalah-masalah atau sebab-sebab tertentu yang berkaitan budaya atau kaum yang tidak menggalakkan anda atau menyebabkan anda tidak mengambil ubat darah tinggi?

11. **Please describe how doyou feel about this health clinic's services.**
    Huraikan apakah yang anda rasa mengenai perkhidmatan yang diberikan di klinik kesihatan ini.

12. **Does your doctor request your agreement regarding the treatment recommendations that he/she is going to give you?**
    Adakah doktor anda meminta persetujuan anda tentang cadangan rawatan yang akan diberikan kepada anda?

13. **Describe what do you think regarding information given about your illness and your anti-hypertensive medication from your doctor, nurses, pharmacist and dietitian.**
Huraikan apakah pendapat anda dengan maklumat yang mengenai penyakit anda dan ubat darah tinggi anda oleh doktor, jururawat, pegawai farmasi dan pakar pemakanan.

Appendix C: Phase III(a) Questionnaire

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RESEARCH QUESTIONNAIRES FORM

Code No:

Date :

Adherence to Anti-Hypertensive Medication in a Malaysian Primary Care Population

Instructions to all participants

- This survey is about hypertensive patients attending Health Clinics under Hulu Langat District and Klang district in Selangor.
- DO NO write your name on this survey form. The answer you give will be kept confidential.
- Answer the questions based on what you really know and do.
- The information you give will be used to develop better health education and services for hypertensive patients.
- Completing this form is voluntary.
- Make sure you read the questions properly. Please tick where appropriate.

THANK YOU FOR YOUR COORPERATION

UNIVERSITY OF MALAYA

KUALA LUMPUR

Producing Leaders Since 1905

BORANG SOAL SELIDIK PENYELIDIKAN

No kod :

Tarikh :

Adherence to Anti-Hypertensive Medication in a Malaysian Primary Care Population

Arahan kepada peserta

- Kajian ini adalah mengenai pesakit hipertensi yang menghadiri Klinik Kesihatan Daerah Hulu Langat dan Klang daerah di Selangor.
- Anda TIDAK DIKEHENDAKI menulis nama anda pada borang kaji selidik ini. Jawapan yang anda berikan akan dirahsiakan.
- Anda dikehendaki menjawab berdasarkan apa yang anda benar-benar tahu dan amalkan.
- Maklumat yang anda berikan akan digunakan untuk menghasilkan pendidikan kesihatan dan perkhidmatan yang lebih baik untuk pesakit hipertensi.
- Melengkapkan borang ini adalah secara sukarela.
- Pastikan anda membaca soalan dengan betul. Sila tandakan di mana sesuai.

TERIMA KASIH DI ATAS KERJASAMA ANDA

SECTION A: PERSONAL INFORMATION
BAHAGIAN A: MAKLUMAT PERIBADI

1. Blood pressure / mmHg
   Tekanan darah

2. Weight _______ kg
   Berat

3. Height _______metre
   Tinggi

4. BMI (leave this space blank/ *tinggalkan ruang ini*)

   _______kg/m^2

5. What is your gender?
   Apakah jantina anda?

C) Male / *Lelaki* ☐

D) Female / *Perempuan* ☐

6. What is your birth date? ☐☐☐☐☐☐☐☐
   Bilakah tarikh lahir anda?
   Day/ *Hari*Month/ *Bulan*Year/ *Tahun*

7. What is your ethnicity?
   Apakah bangsa anda?

E) Malay/ *Melayu*

F) Chinese/*Cina*

G) Indian/*India*

H) Others; Please specify _______________

   Lain-lain; Sila nyatakan

8. What is your marital status?
Apakah status perkahwinan anda?

F) Never married / Tidak pernah berkahwin

G) Married / Berkahwin

H) Divorced / Bercerai

I) Separated / Berpisah

J) Widowed / Balu / Duda

9. What is your highest educational level?
Apakah tahap pendidikan tertinggi anda?

G) No formal education/ *Tiada pendidikan formal*

H) Primary school / *Sekolah rendah*

I) Secondary school/ *Sekolah menengah*

J) Certificate @ other qualification after secondary school/*Sijil @ lain-lain kelayaan selepas seolah menengah*

K) University / *Universiti*

L) Others (Please specify) / Lain-lain (*Silanyatakan*)______________________

10. What is your current occupation?
Kini anda bekerja sebagai apa?

J) Civil servant / *Kakitangan kerajaan*

K) Private sector employee/ *Kakitangan swasta*

L) Self-employed / *Bekerja sendiri*

M) Government retiree / *Pesara kerajaan*

N) Private retiree / *Pesara swasta*

O) Studying / *Masih belajar*

P) Studying and working / *Bekerja sambil belajar*

Q) Housewife/ *Surirumahtangga*

R) Unemployed / *Tidak Berkerja*

SECTION B: MEDICATION ADHERENCE REASONS SCALE (MAR-SCALE)

BAHAGIAN B: SKALA PENYEBAB UNTUK MENGUKUR KEPATUHAN UBATAN

If you have missed taking your medication, please indicate how often you have missed taking your medication due to the various reasons listed below(√)/ *Jika anda terlepas pandang mengambil ubat-ubatan anda, sila nyatakan berapa kerap anda telah terlepas mengambil ubat anda kerana pelbagai sebab-sebab yang disenaraikan di bawah(√).*

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
1. Medication not available in the pharmacy/ *Ubat tidak terdapat di farmasi*					
2. Difficulty swallowing medication/ *Kesukaran untuk menelan ubat*					
3.Cost of medication/*Harga ubat*					
4.Unclear about proper administration of medication/*Tidak jelas dengan cara pengambilan ubat*					
5.Forgetting due to busy schedule/*Lupa kerana jadual yang sibuk*					
6.Prescription ran out due to busy schedule/*Ubat habis kerana jadual sibuk*					

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
7. Taking too many medications/ *Mengambil terlalu banyak ubat-ubatan*					
8.Inconvenience in taking medications as prescribed (e.g: you are away from home, the medication makes you urinate more frequently, etc.)/ Kesulitan dalam mengambil ubat seperti yang ditetapkan (contoh: anda berada jauh dari rumah, ubat-ubatan yang membuat anda kerap membuang air kecil lebih kerap, dll.)					
9.Embarrassment in taking medications (e.g: you are with friends, you are in a public place, etc.) *Malu dalam mengambil ubat-ubatan (contohnya anda dengan rakan-rakan, anda berada di tempat awam, dll.)*					
10. Medication is ineffective/*Ubat tidak berkesan*					
11.Side effects/Fear of side effects *Kesan sampingan atau takut pada kesan sampingan*					

	1=None of the time/*Tidak pada semua masa*	2=A little of the time/*Sedikit masa*	3=Some of the time/*Ada masa tertentu*	4=Most of the time/*Kebanyakan masa*	5=All of the time/*Semua masa*
12. Think medication is not needed because you are not showing any indications of the disease or you feel well without medication/*Berfikir ubat tidak diperlukan kerana anda tidak menunjukkan sebarang tanda penyakit atau anda merasa sihat tanpa ubat*					
13. Stop medication to see whether it is still needed/*Berhenti mengambil ubat untuk melihat samada masih memerlukannya*					
14. Concern about long term effects of medications or dependency on medications/*Kebimbangan mengenai kesan jangka panjang ubat-ubatan atau pergantungan kepada ubat-ubatan.*					
15.Problems opening containers/Kesulitan membuka bekas					
16. Influence from spouse/family/ *Pengaruh dari pasangan/keluarga*					
17.Influence from peers/ *Pengaruh dari rakan*					

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
18. Influence from community/social organization (e.g:you are a member of a club, involved in activities or Health Camp in your community or in your living area, etc.)/*Pengaruh dari komuniti /organisasi social (cth:anda adalah salah seorang ahli kelab,terlibat dalam aktiviti-aktiviti atau Kem Kesihatan di komuniti anda atau di tempat tinggal anda,dll.)*					
19. Lack of care from the doctor/*Kurang perhatian dari doktor*					
20. Lack of information of what patients' need from doctor and healthcare staff/*Kurang penerangan tentang apa yang pesakit perlu dari doctor dan anggota kesihatan*					
21. Long waiting time/*Masa menunggu yang lama*					
22. Using alternative/traditional medication/*Menggunakan ubat alternative/ubat tradisional*					

Appendix D: Phase III (b) Questionnaire

RESEARCH QUESTIONNAIRES FORM

Code No:

Date :

Adherence to Anti-Hypertensive Medication in a Malaysian Primary Care Population

Instructions to all participants

- This survey is about hypertensive patients attending Health Clinics under Hulu Langat District and Klang district in Selangor.
- DO NO write your name on this survey form. The answer you give will be kept confidential.
- Answer the questions based on what you really know and do.
- The information you give will be used to develop better health education and services for hypertensive patients.
- Completing this form is voluntary.
- Make sure you read the questions properly. Please tick where appropriate.

THANK YOU FOR YOUR COORPERATION

BORANG SOAL SELIDIK PENYELIDIKAN

No kod :

Tarikh :

Adherence to Anti-Hypertensive Medication in a Malaysian Primary Care Population

Arahan kepada peserta

- Kajian ini adalah mengenai pesakit hipertensi yang menghadiri Klinik Kesihatan Daerah Hulu Langat dan Klang daerah di Selangor.
- Anda TIDAK DIKEHENDAKI menulis nama anda pada borang kaji selidik ini. Jawapan yang anda berikan akan dirahsiakan.
- Anda dikehendaki menjawab berdasarkan apa yang anda benar-benar tahu dan amalkan.
- Maklumat yang anda berikan akan digunakan untuk menghasilkan pendidikan kesihatan dan perkhidmatan yang lebih baik untuk pesakit hipertensi.
- Melengkapkan borang ini adalah secara sukarela.
- Pastikan anda membaca soalan dengan betul. Sila tandakan di mana sesuai.

TERIMA KASIH DI ATAS KERJASAMA ANDA

SECTION A: PERSONAL INFORMATION
BAHAGIAN A: MAKLUMAT PERIBADI

1. Blood pressure / mmHg
   Tekanan darah

2. Weight _______ kg
   Berat

3. Height _______metre
   Tinggi

4. BMI (leave this space blank/ *tinggalkan ruang ini*)

   _______kg/m^2

5. What is your gender?
   Apakah jantina anda?

A) Male / *Lelaki*

B) Female / *Perempuan*

6. What is your birth date?
   Bilakah tarikh lahir anda?
   Day/ *Hari*Month/ *Bulan*Year/ *Tahun*

7. What is your ethnicity?
   Apakah bangsa anda?

A) Malay/ *Melayu*

B) Chinese/*Cina*

C) Indian/*India*

D) Others; Please specify _______________
   Lain-lain; Sila nyatakan

8) What is your marital status?/*Apakah status perkahwinan anda?*

A) Never married / Tidak pernah berkahwin

B) Married / Berkahwin

C) Divorced / Bercerai

D) Separated / Berpisah

E) Widowed / Balu / Duda

9) What is your highest educational level?/*Apakah tahap pendidikan tertinggi anda?*

A) No formal education/ *Tiada pendidikan formal*

B) Primary school / *Sekolah rendah*

C) Secondary school/ *Sekolah menengah*

D) Certificate @ other qualification after secondary school/*Sijil @ lain-lain kelayaan selepas seolah menengah*

E) University / *Universiti*

F) Others (Please specify) / *Lain-lain (Sila nyatakan)*______________________

10) What is your current occupation?/*Kini anda bekerja sebagai apa?*

A) Self-employed/*Bekerja sendiri*
B) Unemployed/*Tidak bekerja*
C) Housewife/Surirumahtangga
D) Retiree/*Pesara*
E) Non-professionals/*Tidak profesional*
F) Professionals/*Profesional*

11) What is your estimated household income per month?
Apakah anggaran pendapatan isi rumah anda sebulan?

A) <RM400
B) RM400-RM699
C) RM700-RM999
D) <RM2000-RM2999
E) RM3000-RM3999
F) RM4000-RM4999
G) ≥RM5000

12) Do you have family history of hypertension?/*Adakah anda mempunyai sejarah keluarga yang menghidap darah tinggi?*

A) Yes/*Ya*
B) No/*Tidak*
C) Not sure/*Tidak pasti*

13)What is your current smoking status?

A) Never smoke
B) Smoker
C) Ex-smoker/occasional smoker

*14)*Where do you were diagnosed hypertension?/*Di Manakah anda didiagnosadengan penyakit darah tinggi?*

A) Government health clinic
B) Private clinic
C) Government hospital
D) Private hospital
E) Pharmacy

15) How long since have you been diagnosed as hypertension?/*Berapa lamakah semenjak anda didiagnosa dengan darah tinggi?*

A) <1 year
B) 1-5 years
C) >5

16) Where do you first discover that you have hypertension?/*Di manakah anda mula-mula mengetahui yang anda mempunyai penyakit darah tinggi?*

A) In medical follow-up for other conditions
B) In emergency service and others
C) In screening programme

17) Do you have other medical illness besides hypertension?State the number./*Adakah anda menghidap penyakit lain selain dari darah tinggi?Nyatakan bilangannya.*

A) None/one/ *Tiada/satu*

B) 2 to 3/ *2 atau 3*

C) >3

SECTION B: MALAYSIAN MEDICATION ADHERENCE REASONS SCALE (myMAR-SCALE)
BAHAGIAN B: SKALA PENYEBAB UNTUK MENGUKUR KEPATUHAN UBATAN, MALAYSIA

If you have missed taking your medication, please indicate how often you have missed taking your medication due to the various reasons listed below / *Jika anda terlepas pandang mengambil ubat-ubatan anda, sila nyatakan berapa kerap anda telah terlepas mengambil ubat anda kerana pelbagai sebab-sebab yang disenaraikan di bawah.*

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
1. Difficulty swallowing medication/ *Kesukaran untuk menelan ubat*					
2.Cost of medication/*Harga ubat*					
3.Unclear about proper administration of medication/*Tidak jelas dengan cara pengambilan ubat*					
4.Forgetting due to busy schedule/*Lupa kerana jadual yang sibuk*					
5. Taking too many medications/ *Mengambil terlalu banyak ubat-ubatan*					

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
6.Inconvenience in taking medications as prescribed (e.g: you are away from home, the medication makes you urinate more frequently, etc.)/ Kesulitan dalam mengambil ubat seperti yang ditetapkan (contoh: anda berada jauh dari rumah, ubat-ubatan yang membuat anda kerap membuang air kecil lebih kerap, dll.)					
7.Embarassment in taking medications (e.g: you are with friends, you are in a public place, etc.) *Malu dalam mengambil ubat-ubatan (contohnya anda dengan rakan-rakan, anda berada di tempat awam, dll.)*					
8. Medication is ineffective/*Ubat tidak berkesan*					
9.Side effects or fear of side effects (e.g:dizziness, buah pinggang terjejas) *Kesan sampingan atau takut pada kesan sampingan(cth:pening, kidney problem)*					

	1=None of the time/*Tidak pada semua masa*	**2=A little of the time/*Sedikit masa***	**3=Some of the time/*Ada masa tertentu***	**4=Most of the time/*Kebanyakan masa***	**5=All of the time/*Semua masa***
10. Think medication is not needed because you are not showing any indications of the disease or you feel well without medication/*Berfikir ubat tidak diperlukan kerana anda tidak menunjukkan sebarang tanda penyakit atau anda merasa sihat tanpa ubat*					
11. Stop medication to see whether it is still needed/*Berhenti mengambil ubat untuk melihat samada masih memerlukannya*					
12. Concern about long term effects of medications or dependency on medications (e.g: you have to depend on the medication for the rest of your life, without the medication you will feel not well throughout your life)/*Kebimbangan mengenai kesan jangka panjang ubat-ubatan atau pergantungan kepada ubat-ubatan(cth:Anda perlu bergantung kepada ubat untuk sepanjang hidup anda, tanpa ubat-ubatan yang anda akan rasa tidak begitu sihat sepanjang hidup anda)*					

13.Problems opening containers/Kesulitan membuka bekas					
14. Influence from spouse/family/ *Pengaruh dari pasangan/keluarga*					
15.Influence from peers/ *Pengaruh dari rakan*					
16. Influence from community/social organization (e.g:you are a member of a club, involved in activities or Health Camp in your community or in your living area, etc.)/*Pengaruh dari komuniti /organisasi social (cth:anda adalah salah seorang ahli kelab,terlibat dalam aktiviti-aktiviti atau Kem Kesihatan di komuniti anda atau di tempat tinggal anda,dll.)*					
17. Lack of care from the doctor/*Kurang perhatian dari doktor*					
18. Lack of information of what patients' need from doctor and healthcare staff/*Kurang penerangan tentang apa yang pesakit perlu dari doctor dan anggota kesihatan*					
19. Long waiting time/*Masa menunggu yang lama*					
20. Using alternative/traditional medication/*Menggunakan ubat alternative/ubat tradisional*					

SECTION C: DISEASE CHARACTERISTICS
BAHAGIAN C: CIRI-CIRI PENYAKIT

1. Are you currently prescribed with any medication for depression?/*Adakah anda sekarang diberi sebarang ubat untuk kemurungan?*

A) Yes/*Ya*
B) No/*Tidak*

2. Are you currently prescribed with any medication for anxiety? *Adakah anda sekarang diberi sebarang ubat untuk kebimbangan?*

A) Yes/*Ya*
B) No/*Tidak*

SECTION D: DISEASE CHARACTERISTICS/ *BAHAGIAN D: CIRI-CIRI PENYAKIT*

	1=Strongly disagree/*Sangat tidak setuju*	**2=Disagree/*Tidak setuju***	**3=Uncertain/*Tidak pasti***	**4=Agree/*Setuju***	**5=Strongly agree/*Sangat setuju***
My health, at present, depends on my medicines/*Kesihatan saya, pada masa ini, bergantung kepada ubat-ubatan saya*.					
My life would be impossible without my medicines/*Hidup saya akan menjadi mustahil tanpa ubat-ubatan saya*					
My health in the future will depends on my medicines/*Masa depan kesihatan saya bergantung kepada ubat-ubatan saya*					
My medicines protect me from becoming worse/*Ubat saya melindungi saya daripada menjadi lebih teruk*					
Without my medicines, I will very ill/*Tanpa ubat-ubatan, penyakit saya akan menjadi sangat teruk*					
Having to take medicines worries me/*Adalah membimbangkan kerana saya perlu mengambil ubat-ubatan*					
I sometimes worry about the long-term effects of my medicines/*Kadang-kadang saya berasa bimbang tentang jangkamasa panjang ubat-ubatan saya*					
My medicines are a mystery to me/Ubat-ubatan saya adalah misteri kepada saya					
My medicines disrupt my life/Ubat-ubatan saya mengganggu hidup saya					
I sometimes worry about becoming too dependent on my medicines/*Kadang-kadang saya terlalu bergantung kepada ubat-ubatan saya*					

SECTION E: TREATMENT CHARACTERISTICS
BAHAGIAN E: CIRI-CIRI RAWATAN

1. How long have you been taking medications for hypertension?
   Berapa lamakah anda telah mengambil ubat untuk darah tinggi?

A) <1 year
B) 1-5 years
C) >5

2. What are the total number of medication currently you are taken daily?/*Berapakah jumlah ubat yang anda harus ambil setiap hari sekarang?*

   A) 1

   B) 2

   C) ≥3

SECTION F: SELF-EFFICACY
BAHAGIAN F: KEBERKESANAN DIRI

Please rate how sure you are that you can take your medication all of the time as prescribed in the following situations. Please tick (√) where appropriate/*Sila nilaikan berapa pasti anda adalah bahawa anda boleh mengambil ubat anda setiap masa sebagaimana yang ditetapkan dalam keadaan seperti berikut. Sila tandakan (√) di tempat yang sesuai.*

	Not at all sure/*Tidak pasti sama sekali*	Somewhat sure/ *Agak pasti*	Very sure/ Sangat pasti
When you are busy at home/*Apabila anda sibuk di rumah*			
When you are at work/*Apabila anda berada di tempat kerja*			
When there is no one to remind you/*Apabila tiada siapa yang mengingatkan anda*			
When you worry about taking them for the rest of your life/*Apabila anda bimbang mengambil ubat-ubatan untuk sepanjang hidup anda*			
When they cause some side effects/*Apabila ia menyebabkan kesan sampingan*			
When they cost a lot of money/*Apabilaia menyebabkan duit yang banyak*			
When you come home late from work/*Apabila anda pulang lewat dari tempat kerja*			
When you do not have symptoms/*Apabila anda tiada simtom*			
When you are with family members/*Apabila anda bersama ahli keluarga*			
When you are in a public place/*Apabila anda berada di tempat awam*			
When you are afraid of becoming dependent on them/*Apabila anda takut bergantung kepada ubatan*			
When you are afraid they may affect your sexual performance/*Apabila anda takut ia akan menjejaskan prestasi seksual*			

When the time to take them is between your meals/*Apabila masa untuk mengambil ubatan adalah diantara waktu makan anda*			
When you feel you do not need them/Apabila anda merasakan anda memerlukan ubatan			
When you are traveling/*Apabila anda melancong*			
When you take them more than once a day/*Apabila anda mengambilnya lebih dari sekali dalam satu hari*			
If they sometimes make you tired/*Apabila ia kadang-kadang menyebabkan anda keletihan*			
If they sometimes may you feel dizzy/*Jika kadang-kadang anda rasaipening*			
When you have other medications to take/*Apabila anda mempunyai ubatan lain untuk diambil*			
When you feel well/*Apabila anda merasa sihat*			
If they make you want to urinate while away from home/*Apabila ia menyebabkan anda kerap membuang air kecil apabila anda berada di luar rumah*			
Get refills for your medications before you run out/*Dapatkan pengisian semula untuk ubat-ubatan anda sebelum anda kehabisan*			
Fill your prescriptions whatever they cost/*Mengisi preskripsi anda tanpa mengira kos*			
Make taking your medications part of your routine/*Membuatkan pengambilan ubatan menjadi amalan harian anda*			
Always remember to take your antihypertensive medications/*Sentiasa mengingati untuk mengambil ubatan anda*			
Take your medications for the rest of your life/*Mengambil ubat untuk seumur hidup anda*			

SECTION G: COMMUNITY ENABLING FACTORS
BAHAGIAN G: FAKTOR PERSEKITARAN KOMUNITI

Please read the following statements. Circle the number on the scale below/*Sila baca pertanyaan-pertanyaan berikut /Bulatkan nombor pada skala di bawah*

1	There was a special person with me when I'm in a state that requires help/*Ada orang yang istimewa dengan saya apabila saya dalam keadaan yang memerlukan*	0	1	2	3	4	5	6	7
2	There is someone special to share my joys and sorrows/ *Ada seseorang yang istimewa untuk saya berkongsi kegembiraan dan kesedihan*	0	1	2	3	4	5	6	7
3	My family have tried their very best to help me/*Keluarga saya cuba sedaya-upaya untuk menolong saya*	0	1	2	3	4	5	6	7
4	I get emotional help and support I need from family/*Saya mendapat pertolongan dan sokongan emosi yang saya perlukan daripada keluarga*	0	1	2	3	4	5	6	7
5	I have a special person who really makes me comfortable/*Saya mempunyai seseorang yang istimewa yang benar-benar membuat saya rasa selesa*	0	1	2	3	4	5	6	7
6	My friends try their best to help me/*Kawan-kawan saya cuba sedaya-upaya untuk menolong saya*	0	1	2	3	4	5	6	7
7	I can count on my friends when something bad happens/*Saya boleh berharap kepada kawan-kawan saya apabila sesuatu hal yang tidak baik berlaku*	0	1	2	3	4	5	6	7
8	I can talk about my problems with my family/*Saya boleh bercerita tentang masalah saya dengan keluarga*	0	1	2	3	4	5	6	7
9	I have friends whom I can share my joys and sorrows with/*Saya mempunyai kawan-kawan yang saya boeh berkongsi kegembiraan dan kesedihan*	0	1	2	3	4	5	6	7
10	There is a special person in my life who cares about my feelings/*Ada seseorang yang istimewa dalam hidup saya yang mengambil berat tentang perasaan saya*	0	1	2	3	4	5	6	7
11	My family is willing to help me make a decisión/*Keluarga saya bersedia untuk menolong saya membuat keputusan*	0	1	2	3	4	5	6	7
12	I can talk about my problems with my friends/ *Saya boleh bercerita tentang masalah saya dengan kawan-kawan saya*	0	1	2	3	4	5	6	7

SECTION H: PERCEIVED NEED FACTOR
BAHAGIAN H: PERSEPSI FAKTOR KEPERLUAN

Please read the following statements. Circle the number on the scale below/*Sila baca pertanyaan-pertanyaan berikut /Bulatkan nombor pada skala di bawah*

Which of the following best describes your current overall health?
Yang manakah di antara berikut menggambarkan keseluruhan kesihatan semasa anda

Poor/ *Lemah*	Fair/ *Sederhana*	Good/ *Baik*	Very good/*Sangat baik*	Excellent/ *Cemerlang*

Thinking about your own health, how would you say about it compared to other people's health of your own age?*Mengingatkan tentang kesihatan anda, bagaimanakah dapat anda katakan mengenainya berbanding dengan kesihatan orang lain yang sama umur dengan anda.*

Much worse than others/*Lebih teruk daripada orang lain*	Somewhat worse than others/*Agak teruk berbanding orang lain*	About the same as others/*Lebih kurang sama seperti orang lain*	Somewhat better than others/*Agak baik dari orang lain*	Much better than others/*Amat baik daripada orang lain*

How concerned are you about your own personal health?/ *Bagaimanakah anda mengambil berat terhadap kesihatan peribadi anda*

Not at all concerned/ *Tidak sama sekali mengambil berat*	Somewhat concerned/ *Agak mengambil berat*	Concerned/ *Mengambil berat*	Very concerned/ *Sangat mengambil berat*	Extremely concerned/*Terlalu mengambil berat*

SECTION I: HEALTH OUTCOMES
BAHAGIAN I: KUALITI HIDUP

Overall, how confident are you that taking this medication is a good thing for you?*Secara keseluruhan, bagaimana yakin anda bahawa pengambilan ubat ini adalah baik untuk anda?*

Not at all confident Extremely confident
Tidak sama sekali yakin *Amat yakin*

1 2 3 4 5

How certain are you that the good things about your medication outweigh the bad things?*Bagaimanaanda tentu bahawa perkara yang baik mengenaiubat anda mengatasi perkara-perkara yang tidak baik?*

Not at all certain Extremely certain
Tidak tentu sama sekaliAmat tentu

1 2 3 4 5

Taking all things into account, how satisfied or dissatisfied are you with this medication?*Mengambil kira kesemuanya, bagaimanakah anda berpuas hati atau tidak berpuas hati dengan ubat ini?*

Extremely dissatisfied Extremely satisfied
Amat tidak berpuas hatiAmat berpuas hati

1 2 3 4 5 6 7

Appendix E: Translation of the interviews transcript from Bahasa Malaysia to English

A) Symptoms of hypertension at first diagnosis

(i)

<u>Bahasa Malaysia version</u>:

"Banyak sangat bersoal jawab dengan bos baru saya tu. Bila saya balik, saya tak dapat tidur dan mula mengalami sakit kepala dan susah nak tidur. Kemudian saya pening.Bila saya pergi periksa, saya masih ingat, bacaan atas 160.Doktor suruh saya ambil ubat tapi saya tak nak, sebab saya tak fikir saya perlu ubat. Saya telah cuba kawal '*stress*' saya, tapi tekanan darah saya masih tinggi. Saya rasa ia penyakit keturunan. Saya dapat dari ibu bapa saya" (temubual secara mendalam/berusia 43 tahun/6 tahun didiagnosa dengan darah tinggi).

<u>English version</u>:

"I have to reason with my new boss. When I came back, I could not sleep and started having headaches and difficulty in sleeping. Then I had dizziness. When I went and checked, I still remember, the upper reading was 160. The doctor asked me to take medication but I don't want to, because I don't think I need this medication. I've tried controlling my stress, but my blood pressure is still high. I think it is a hereditary disease. I've got it from my parents" (in-depth interview (IDI)/43 years-old/6 years diagnosed with hypertension).

(ii)

(This interview was originally conducted in English)

"At first, I've got headaches. But I don't know it was high blood pressure sign. I have to take care of my husband who is suffering from stroke. He's bedridden and I had no helper. I've overworked and can you imagine how stressful I am? That's why my blood pressure shot up. I know if I don't take my medication, I can be just like my husband" (IDI/65 years-old/1 year diagnosed with hypertension).

(iii)

Bahasa Malaysia version:

"Saya alami pening kadang-kadang sebab saya tiada rehat dan tidur yang cukup. Saya bekerja dan terus bekerja tanpa tidur. Saya tiada masa untuk rehat dan saya rasa begitu tertekan. Saya tak tahu macamana nak kawal '*stress*' saya.Itulah sebabnya saya dapat masalah tekanan darah tinggi" (temubual secara mendalam/berusia 50 tahun/8 tahun didiagnosa dengan darah tinggi).

English version:

"I experienced dizziness on and off because I don't have enough rest and sleep. I work and continue working without sleeping. I have no time to rest and I feel so stressed. I don't know how to control my stress. That's why I'm suffering from high blood pressure" (IDI/50 year old/8 years diagnosed with hypertension).

(iv)

Bahasa Malaysia version:

"Saya ada alat untuk periksa tekanan darah di rumah.Anak saya yang beli untuk saya, tapi saya tak kerap periksa tekanan darah saya sehinggalah sampai satu masa saya dapat sakit kepala yang betul-betul teruk dan saya perhatikan tekanan darah saya melonjak" (temubual secara mendalam/berusia 61 tahun/2 tahun didiagnosa dengan darah tinggi).

English version:

"I have blood pressure set at home. My son bought it for me, but I don't check my blood pressure regularly until at one time I had a really bad headache and I noticed my pressure shot up" (IDI/61 years-old/2 years diagnosed with hypertension).

(v)

Bahasa Malaysia version:

"Saya alami '*blackou*t' lepas makan ikan masin. Saya pergi ke klinik syarikat saya dan doktor kata perut saya ni angin saja. Tapi saya masih pening walaupun dah makan ubat.Jadi, saya pergi ke Jabatan Kecemasan di hospital kerajaan.Doktor periksa tekanan darah saya beberapa kali dan beritahu yang tekanan darah saya tinggi tapi saya tak ingat bacaannya.Saya diberi ubat dan diperhatikan untuk beberapa jam. Lepas tu, saya balik dengan ubat tekanan darah tinggi dan tarikh temujanji ke klinik kesihatan kerajaan"(temubual secara mendalam/berusia 63 tahun/4 tahun didiagnosa dengan darah tinggi).

English version:

"I experienced blackout after eating salted fish. I went to my company clinic and the doctor said I just had stomach wind. But I still have dizziness even with the medication. So, I went to the Emergency Department in government hospital. The doctor check my blood pressure few times and told that my blood pressure was high but I don't remember the readings. I was given medication and was observed for few hours. After that, I was discharged with antihypertensive medication with an appointment date to the government primary health clinic*s"* (IDI/63 years-old/4 years diagnosed with hypertension).

B) Reasons/barriers of hypertensive care non-adherence to antihypertensive medication

(i)

Bahasa Malaysia version:

"Saya tak ambil ubat saya semalam dan hari ini sebab saya bercuti.Tiada siapa yang mendorong saya untuk makan ubat.Sebenarnya, saya tidak mempunyai motivasi untuk makan ubat.Saya tinggalkan ubat-ubat saya di tempat kerja sebab mudah nak ingat.Saya perlu ambil ubat dua kali sehari, satu tablet sebelum dan satu tablet selepas balik kerja. Saya lebih suka ambil ubat satu tablet satu kali sehari sebab mudah bagi saya untuk ingat. Saya ada banyak kerja yang kena buat.Oleh sebab itu, mengambil ubat tak menjadi keutamaan dalam rutin harian saya" (temubual secara mendalam/berusia 49 tahun/12 tahun didiagnosa dengan darah tinggi).

English version:

"I did not take my medication yesterday and today because I'm on leave. Nobody motivate me to take my medication. Actually, I have no motivation to take the medication. I left my medication at workplace because it's easy to remember. I have to take it twice a day, which is one tablet before and one tablet after working. I prefer daily dosing because it's easy for me to remember. I have a lot of work to do. Therefore, taking medication is not a priority in my daily routine" (IDI/49 years-old/12 years diagnosed with hypertension).

(ii)

Bahasa Malaysia version:

"Saya rasa kering selepas mengambil ubat darah tinggi saya. Saya rasa susah sebab saya sentiasa perlu ingat untuk mengambil setiap hari. Saya mengalami beberapa kesan sampingan selepas mengambil ubat darah tinggi.Saya rasa seperti saya telah kehilangan keinginan seksual.Kadang-kadang saya berasa panas dan mudah marah.Semua anak-anak saya nasihatkan saya untuk mendapatkan ubat alternatif dahulu sebab mereka tak mahu saya terlalu bergantung kepada ubat-ubatan. Saya dah cuba herba dan ginseng. Kadang-kadang anak-anak saya belikan multivitamin dan mineral" (temubual mendalam/berusia 58 tahun/3 tahun didiagnosa dengan darah tinggi).

English version:

"I feel dry after taking my blood pressure medication. I find it is so difficult because I always have to remember to take it every day. I experienced few side-effects after taking the antihypertensive medication. I feel like I have lost sexual desire. Sometimes I feel heaty and easily get agry. All my children have advised me to seek alternative medicine first because they don't want me to be too dependent on medication. I've tried herbs and ginseng. Sometimes my children bought me multivitamins and minerals to take" (IDI/58 years-old/3 years diagnosed with hypertension).

(iii)

Bahasa Malaysia version:

"Doktor ada minta persetujuan saya sebelum mulakan ubat.Tapi saya tak ambil ubat-ubat saya sebab saya ambil ubat alternatif macam teh herba, kerana kehidupan seksual saya berubah selepas saya ambil ubat darah tinggi.Saya rasa letih dan tak mempunyai keinginan. Saya juga rasa panas, berdebar-debar, dan berpeluh bila ambil ubat. Jadi, saya buat keputusan hentikan ubat untuk sementara waktu.Saya takut suami dan ibu mertua saya tahu yang saya ambil ubat darah tinggi.Mereka cakap saya masih muda dan tak perlu ambil ubat lagi.Rakan-rakan dan jiran-jiran saya juga ada beritahu saya bahawa ubat boleh menyebabkan kerosakan kepada badan kita.Ia boleh menyebabkan masalah buah pinggang dan hati" (temubual mendalam/berusia 31 tahun/5 tahun didiagnosa dengan darah tinggi).

English version:

"The doctor did asked my agreement before starting medication. But I didn't take my medication because I took alternative medication which is the herbal tea, because my sexual life changed after I took the antihypertensive medication. I got tired easily and had no mood. I also experienced heatiness, palpitations, and sweating with the medication. So, I decided to stop the medication for a moment.

I'm afraid that my husband and my mother in law know that I'm taking the anti-hypertensive medication. They said that I'm still young and need not take any medication yet. My friends and neighbours also told me that medication can cause damages to our body. It can cause kidney and liver problem (IDI/31 years-old/5 years diagnosed with hypertension).

(iv)

Bahasa Malaysia version:

"Kadang-kadang saya terlepas pandang untuk ambil ubat sebab saya perlu ambil dua kali sehari.Saya lebih suka dos yang sekali sehari.Saya selalu lupa untuk makan ubat disebabkan jadual yang sibuk.Saya belum bincangkan perkara ini dengan doktor lagi, tetapi saya akan beritahu semasa temu janji yang akan datang" (temubual mendalam/berusia 48 tahun/7 tahun didiagnosa dengan darah tinggi).

English version:

"I sometimes missed my medication because I have to take it twice daily. I prefer daily dosage of medication. I always forget to take my medicine due to my busy schedule. I haven't discuss this matter with the doctor yet, but I will tell him during the next appointment" (IDI/48 year-old/7 years diagnosed with hypertension).

(v)

Bahasa Malaysia version:

"Saya selalu terlupa untuk ambil ubat saya.Saya sibuk terutama di tempat kerja.Tapi isteri saya sentiasa ingatkan saya untuk mengambil ubat darah tinggi.Bila di tempat kerja saya tak ambil ubat sebabtiada siapa yang mengingatkan saya" (temubual secara mendalam/berusia 50 tahun/8 tahun didiagnosa dengan darah tinggi).

English version:

"I always forget to take my medication. I'm busy especially in the workplace. But my wife always reminds me to take high blood pressure medication. When at work I did not take my medication because no one reminds me" (IDI/50 year old/8 years diagnosed with hypertension).

C) Reasons/barriers of hypertensive care non-adherence to physical activity and diet

(i)

Bahasa Malaysia version:

"Saya tiada masanak '*exercise'* walaupun saya ada'*treadmill*' di rumah. Saya makan apa saja yang saya rasa nak makan. Saya makan ikan masin tiap-tiap hari dan jika diambil banyak, saya perhatikan tekanan darah saya akannaik.Isteri saya masih memasak makanan yang tinggi garam dan lemak walaupun dia tahu saya ada darah tinggi.Kami dah biasa dengan makanan harian begini dan susahnak ubah" (temubual secara mendalam/berusia 63 tahun/ 4 tahun didiagnosa dengan darah tinggi).

English version:

"I've got no time to exercise although I have a treadmill at home. I just eat whatever I want to eat. I eat salted fish every day and if taken a lot, I notice my blood pressure will hike. My wife still cooks food high in salt and fats although she knows I have hypertension. We are so used to our daily food and it's difficult to change" (IDI/63 year old/4 years diagnosed with hypertension).

(ii)

Bahasa Malaysia version:

"Sukar nak buat senaman yang kerap dan kawal diet saya. Saya tak peduli dan tak ada gunanya nakkawal sebab saya dah pun dapat penyakit ini" (temubual secara mendalam/berusia 31 tahun/5 tahun didiagnosa dengan darah tinggi).

English version:

"It's difficult to do regular exercise and control my diet. I don't care and there's no point in controlling because I have already got the disease" (IDI/31 year old/5 years diagnosed with hypertension).

(iii)

Bahasa Malaysia version:

"Saya buat senaman sebulan sekali tapi saya rasa susah sangat nak kawal makanan saya sebab makanan di Malaysia semua sedap-sedap dan saya rasa mahu makan semuanya.Saya baru sahaja membeli makanan di luar walaupun saya tahu bahawa makanan dari luar adalah tidak sihat" (temubual secara mendalam/berusia 49 tahun/12 tahun didiagnosa dengan darah tinggi).

English version:

"I go for exercise once a month but I find it so difficult to control my food because delicious food in Malaysia is everywhere and I want to eat everything. I just bought food outside although I know that food from outside is unhealthy (IDI/49 years-old/12 years diagnosed with hypertension).

(iv)

(This interview was originally conducted in English)

"I am unaware of any activities going on in my neighbourhood. Nowadays is not like before because nobody talks to their neighbours. I just go to church and watch television at home. I'm afraid to go for a jog alone because I remembered last time my necklace had been snatches by a motorcyclist while jogging in the park " (IDI/62 years-old/1 year diagnosed with hypertension).

(v)

Bahasa Malaysia version:

"Saya dijemput beberapa kali oleh '*staff nurse in charge'* untuk menyertai kelas aerobik yang dikendalikan oleh komuniti tapi saya tiada masa.Saya tahu beberapa orang kawan-kawan yang ada darah tinggi yang masuk kelas aerobik dua kali seminggu.Mereka juga ada buat seminggu sekali pada hujung minggu di luar masjid di kawasan rumah saya" (temubual secara mendalam/berusia 59 tahun/12 tahun didiagnosa sengan darah tinggi).

English version:

"I was invited a few times by the staff nurse in charge to join aerobic class handled by the community but I've got no time. I know some of my friends with hypertension have joined the aerobic class twice a week. They also have it once a week during the weekend outside the mosque in my neighbourhood" (IDI/59 years-old/12 years diagnosed with hypertension).

(vi)

Bahasa Malaysia version:

"Saya menyertai kelab berbasikal di kawasan komuniti saya, tetapi akhir-akhir ini kelab itu tidak aktif.Saya masih ingat lagi saya seronok sangat berbasikal ke sana-sini dengan kawan-kawan saya.Sekarang, saya tak mempunyai motivasi untuk '*exercise*' lagi" (temubual secara mendalam/berusia 37 tahun/3 tahun didiagnosa dengan darah tinggi).

English version:

"I've joined the cycling club in my community area, but lately the club is not active. I had such a great time cycling round with my friends. Now, I have no motivation to exercise anymore." (IDI/37 years-old/3 year diagnosed with hypertension).

(vii)

Bahasa Malaysia version:

"Saya tak dapat nak pergi berjalan sebab hujan turun hampir setiap petang.Saya juga perhatikan yang lalu lintas berhampiran kawasan perumahan ini sangat sibuk dan ada beberapa pembentung longkang yang tak ditutup.Ini berbahaya kepada pengguna jalan raya" (temubual secara mendalam/berusia 38 tahun/8 tahun didiagnosa dengan darah tinggi).

English version:

"I was unable to go for a brisk walk because it's raining almost every evening. I also noticed that the traffic near this housing area is heavy and some of the sewer drain was uncovered. These posed dangers to road users" (IDI/38 years-old/8 years diagnosed with hypertension).

D) Issues with health care professionals and the health care system

(i)

Bahasa Malaysia version:

"Saya kurang faham apa yang doktor cakap tiap kali saya buat rawatan susulan.Doktor hanya cakap yang saya ada tekanan darah tinggi.Saya perlu mengambil ubat dan mengawal pemakanan saya. Dia tak terangkan bahawa tekanan darah tinggi ini berbahaya dan apa yang akan berlaku pada masa akan datang jika saya tak makan ubat. Anak-anak saya masih kecil.Jadi, jika doktor tak ambil berat tentang saya, kenapa perlu saya ambil berat tentang diri saya?"(IDI / berusia 31 tahun / 5 tahun didiagnosa dengan darah tinggi).

English version:

"I do not quite understand what the doctor says every time I go for my follow-up. The doctor just says that I have high blood pressure. I have to take the medication and control my diet. He does not explain that high blood pressure is dangerous and what would happen in the future if I do not take my medication. My children are still small. So, if the doctor doesn't care about me, why must I care about myself?" (IDI/31 years-old/5 years diagnosed with hypertension).

(ii)

Bahasa Malaysia version:

"Saya tak berkongsi masalah saya mengenai pengambilan ubat dengan doktor.Mereka biasanya cakap sepatah dua kata saja "Okay, ambil ubat awak dan awak boleh pergi sekarang." Tak sampai lima minit pun berbanding dengan masa menunggu yang panjang. Jururawat biasanya yang selalu menghabiskan masa mereka bercakap kepada pesakit.Saya selalu bercakap dengan jururawat yang biasanya ambil tekanan darah saya di luar bilik perundingan.Beliau menasihati saya banyak. Beliau memberitahu saya cara yang betul untuk mengambil makanan (IDI / berusia 43 tahun /6 tahun didiagnosa dengan tekanan darah tinggi).

English version:

"I don't share my problem regarding taking medication with the doctor. They usually say a few words "Okay, just take your medication and you can go now." It's not even five minutes compared to the long time spent for waiting. The nurses usually spend their time talking to the patients. I always talk to the nurse who usually takes my blood pressure outside the consultation room. She advises me a lot. She told me the correct way of taking meals (IDI/43 years-old/6 years diagnosed with hypertension).

(iii)

Bahasa Malaysia version:

"Doktor memberitahu saya bahawa saya mungkin mengalami beberapa kesan sampingan dengan ubat darah tinggi ini, seperti sakit kepala, sakit perut, dan lain-lain.Tetapi dia tak beritahu saya bagaimana untuk menangani kesan sampingan tersebut"(IDI / 49 tahun berusia / 7 tahun didiagnosis dengan tekanan darah tinggi).

English version:

"The doctor told me that I might experience some side effects with this antihypertensive medication, such as headaches, stomach upsets, and others. But he didn't tell me how to handle the side effects" (IDI/49 years-old/7 years diagnosed with hypertension).

(iv)

Bahasa Malaysia version:

"Pegawai Farmasi di klinik kesihatan ini akan menjelaskan mengenai dos dan kekerapan ubat.Kadang-kadang mereka juga ada terangkan kesan-kesan sampingan dari ubat kalau saya bertanya kepada mereka.Tapi saya perlukan maklumat lanjut daripada doktor mengenai kesan sampingan dan bagaimana untuk menanganinya.Jika saya ada masa, saya akan cari di internet"(temubual secara mendalam / berusia 56 tahun / 10 tahun didiagnosa dengan tekanan darah tinggi).

English version:

"Pharmacist in this health clinic will explain regarding the dosage and frequency of the medication. Sometimes they also explain the side effects of the medication if I ask them. But I need more information from the doctor regarding the side effects and how to deal with it. If I have the time, I will surf the internet" (IDI/56 years-old/10 years diagnosed with hypertension).

(v)

Bahasa Malaysia version:

"Saya tak pastilah mengenai pusat sumber.Saya dah dirujuk kepada pakar pemakanan sekali selepas doktor tahu saya mempunyai tekanan darah tinggi, tetapi tiada susulan selepas itu"(IDI / berusia 39 tahun / 9 tahun didiagnosa dengan tekanan darah tinggi).

English version:

"I'm not sure about the resource centre. I've been referred to a dietitian once after the doctor discovered I have hypertension, but there's no follow-up" (IDI/39 years-old/9 years diagnosed with hypertension).

(vi)

Bahasa Malaysia version:

"Kalau lama sangat menunggu, saya buang saja nombortu. Saya hanya boleh menunggu selama setengah jam saja. Kalau tak, hanya buang masa saya.Doktor yang dikhaskan hanya untuk melihat pesakit darah tinggi perlu diperuntukkan untuk mempercepatkan masa menunggu" (IDI / 50 tahun / 8 tahun didiagnosa dengan tekanan darah tinggi).

English version:

"If I waited for so long to see doctor, I just throw the number. I only can wait for half an hour. Otherwise, it's just wasting my time. Doctor just to see hypertensive patients must be allocated to make it faster" (IDI/50 year old/8 years diagnosed with hypertension).

Appendix F: Permission to conduct research from the Ministry of Health, Malaysia

u/p: Dr Daisy / Cik masdiana

H/p: 0123388717 Dr Razatul Shima

PEJABAT TIMBALAN KETUA PENGARAH KESIHATAN
OFFICE OF DEPUTY DIRECTOR GENERAL OF HEALTH
(PENYELIDIKAN DAN SOKONGAN TEKNIKAL)
(RESEARCH AND TECHNICAL SUPPORT)
KEMENTERIAN KESIHATAN MALAYSIA
MINISTRY OF HEALTH MALAYSIA
Aras 12, Blok E7, Parsel E, Presint 1
Level 12, Block E7, Parcel E, Precinct 1
Pusat Pentadbiran Kerajaan Persekutuan
Federal Government Administrative Centre
62590 PUTRAJAYA

Tel : (03) 88832543
Fax : (03) 88895184

JAWATANKUASA ETIKA & PENYELIDIKAN PERUBATAN
KEMENTERIAN KESIHATAN MALAYSIA
d/a Institut Pengurusan Kesihatan
Jalan Rumah Sakit, Bangsar
59000 Kuala Lumpur

Ruj. Kami : (2) dlm.KKM/NIHSEC/08/0804/P12-656
Tarikh :11 September 2012

Dr Razatul Shima Binti Abdul Razak
Fakulti Perubatan
Universiti Malaya

Puan,

NMRR-12-625-12500
Hypertensive Care in Selangor, Peninsular Malaysia: Quantitative And Qualitative Studies On Correlations For Both Adherence And Non-Adherence
Lokasi Projek : Klinik Kesihatan di Selangor

Dengan hormatnya perkara di atas adalah dirujuk.

2. Jawatankuasa Etika & Penyelidikan Perubatan (JEPP), Kementerian Kesihatan Malaysia (KKM) mengambil maklum bahawa projek tersebut adalah untuk memenuhi keperluan kajian program Doktor Kesihatan Masyarakat, Universiti Malaya.

3. Sehubungan dengan ini, dimaklumkan bahawa pihak JEPP KKM tiada halangan, dari segi etika, ke atas pelaksanaan projek tersebut. JEPP mengambil maklum bahawa kajian ini tidak mempunyai intervensi klinikal keatas subjek dan melibatkan soal selidik dan temuramah dalam mengumpul data kajian .Segala rekod dan data pegawai adalah SULIT dan hanya digunakan untuk tujuan kajian dan semua isu serta prosedur mengenai *data confidentiality* mesti dipatuhi. Kebenaran daripada Pengarah hospital/ Kesihatan Negeri di mana kajian akan dijalankan mesti diperolehi terlebih dahulu sebelum kajian dijalankan. Puan perlu akur dan mematuhi keputusan tersebut.

4. Adalah dimaklumkan bahawa kelulusan ini adalah selama setahun dan puan perlu menghantar *'Continuing Review Form'* setiap tahun bagi memperbaharui kelulusan etika. Laporan tamat kajian dan sebarang penerbitan dari kajian ini hendaklah dikemukakan kepada Jawatankuasa Etika & Penyelidikan Perubatan selepas tamatnya kajian ini.

Sekian terima kasih.

BERKHIDMAT UNTUK NEGARA

Saya yang menurut perintah,

(DATO' DR CHANG KIAN MENG)
Pengerusi
Jawatankuasa Etika & Penyelidikan Perubatan
Kementerian Kesihatan Malaysia

'Sila catatkan rujukan surat ini apabila menjawab'

Appendix G: Permission to Conduct the Study from the Medical Ethics Committee, University of Malaya Medical Centre

UNIVERSITI MALAYA

PUSAT PERUBATAN UM

MEDICAL ETHICS COMMITTEE
UNIVERSITY MALAYA MEDICAL CENTRE
ADDRESS: LEMBAH PANTAI, 59100 KUALA LUMPUR, MALAYSIA
TELEPHONE: 03-79493209 FAXIMILE: 03-79494638

NAME OF ETHICS COMMITTEE/IRB: Medical Ethics Committee, University Malaya Medical Centre **ADDRESS:** LEMBAH PANTAI 59100 KUALA LUMPUR	**ETHICS COMMITTEE/IRB REFERENCE NUMBER:** 914.7
PROTOCOL NO: **TITLE:** Hypertensive care in Selangor, Peninsular Malaysia: Quantitative and qualitative studies on correlations for both adherence and non- adherence	
PRINCIPAL INVESTIGATOR : Dr. Razatul Shima Abdul Razak **TELEPHONE:** **KOMTEL:**	**SPONSOR:**

The following item [✓] have been received and reviewed in connection with the above study to be conducted by the above investigator.

[✓] Application Form — Ver date: 06 Apr 12
[✓] Study Protocol — Ver date:
[ ] *Investigator Brochure* — Ver date:
[✓] Patient Information Sheet
[✓] Consent Form
[ ] Questionnaire
[✓] Investigator (s) CV's (Dr. Razatul Shima Abdul Razak)

and have been [✓]

[✓] Approved
[ ] Conditionally approved (identify item and specify modification below or in accompanying letter)
[ ] Rejected (identify item and specify reasons below or in accompanying letter)

Comments:

Investigator are required to:

1) *follow instructions, guidelines and requirements of the Medical Ethics Committee.*
2) *report any protocol deviations/violations to Medical Ethics Committee.*
3) *provide annual and closure report to the Medical Ethics Committee.*
4) *comply with International Conference on Harmonization – Guidelines for Good Clinical Practice (ICH-GCP) and Declaration of Helsinki*
5) *note that Medical Ethics Committee may audit the approved study.*

Date of approval: 18th APRIL 2012

c.c. Head
Department of Social & Preventive Medicine

Deputy Dean (Research)
Faculty of Medicine

Secretary
Medical Ethics Committee
University Malaya Medical Centre

……………………………………
PROF. DATUK LOOI LAI MENG
Chairman
Medical Ethics Committee

Appendix H: Approval of the Thesis Title

KELULUSAN TAJUK TESIS

Hairiah Haran

To

razatul shima

Sep 3

UM.M/PDG/606

3 September 2015

Dr. Razatul Shima Binti Abdul Razak (MHC110011)
No. 5, Jalan Impian Putra 4/2D
Taman Impian Putra
43000 Bangi
Selangor Darul Ehsan

(Email: razatulshima@yahoo.com)

Tuan/Puan,

KELULUSAN TAJUK TESIS

Dengan segala hormatnya perkara di atas adalah dirujuk.

Sukacita dimaklumkan bahawa Fakulti dalam mesyuaratnya pada 2 September 2015 telah meluluskan pindaan tajuk tesis tuan/puan seperti berikut:-

"ADHERENCE TO ANTI-HYPERTENSIVE MEDICATION IN A MALAYSIAN PRIMARY CARE POPULATION"

Sekian, terima kasih.

Yang benar,

HARIL MUZAMMIL AWANG
Penolong Pendaftar Kanan (Ijazah Tinggi)
Fakulti Perubatan.

s.k. Ketua, Jabatan Perubatan Kemasyarakatan dan Pencegahan

Prof. Madya Dr. Farizah Mohd Hairi - Penyelia
Prof. Madya Dr. Hazreen bn Abdul Majid - Penyelia
Jabatan Perubatan Kemasyarakatan dan Pencegahan

Cik Joan Tang May Yin
Penolong Pendaftar (Unit Tesis)
Institut Pengajian Siswazah

Hairiah Haran
Pembantu Tadbir (P/O)
Pejabat Dekan
Fakulti Perubatan
Universiti Malaya

Appendix I: Certificate as a Reviewer

SCIENCEDOMAIN *international*
www.sciencedomain.org

SCIENCEDOMAIN

TO WHOM IT MAY CONCERN

Date: 23/03/2015.

Ref. No: SDI/HQ/PR/Cert/ 2015_BJMMR_17345

*We hereby certify that **Dr. Razatul Shima Binti Abdul Razak** of **Disease Control Division, Ministry of Health, Malaysia** was invited for peer reviewing of the below mentioned Manuscript.*

Journal Name:	*British Journal of Medicine and Medical Research*
Manuscript Number:	*2015_BJMMR_17345*
Title of the Manuscript:	*Validating the Persian Version of the Morisky Medication Adherence Scale-8.*

***Dr. Razatul Shima Binti Abdul Razak** completed the review in time and submitted academically important review comments, which helped to maintain the high peer review standard of this international journal.*

Thanking you.

(Dr. M. Basu)
Chief Managing Editor, SCIENCEDOMAIN international

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