CHRONIC PAIN AMONG OLDER PEOPLE IN MALAYSIA: PREVALENCE, ASSOCIATED FACTORS AND HEALTHCARE UTILIZATION

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FACULTY OF MEDICINE
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ABSTRACT

Pain is an unpleasant experience that serves as a warning for the individual to withdraw from damaging situations and protect oneself against injury. However, when pain becomes chronic, it stops from being protective and instead becomes a threat to the individual. Chronic pain is defined as a form of pain that lasts for three months or more, or a form of pain that persists beyond the normal period of tissue healing, which is typically three months. Many studies on chronic pain have been carried out in developed countries, however data are sparse in middle-income country, such as Malaysia. To fill this gap, this research aims to describe the prevalence and correlates of chronic pain among older people in Malaysia and its association with obesity, psychiatric morbidity and healthcare utilization. The study was conducted using a national representative data from the Third National Health and Morbidity Survey (NHMS III). This thesis analyses the subpopulation data of older people aged 60 and above (n=4954) from the NHMS III. Analysis was conducted using Survey Data Analysis in STATA to account for complex sample data. The findings revealed that the prevalence of chronic pain among older people in Malaysia is high, amounting to 15.6% (95% CI: 14.5, 16.8). Among 755 older people with chronic pain, 655 (88.3%) reported some level of interference on their daily activities. Socio-demographic characteristics that were significantly related to chronic pain among older people includes female gender (PR= 1.50, 95% CI= 1.31, 1.72), Indian ethnicity (PR= 1.45, 95% CI= 1.14, 1.84), widow or widower group (PR= 2.70, 95% CI= 1.24, 5.91) and those with no formal education background (PR=2.25, 95% CI= 1.72, 2.95). Whereas, health-related factors that were associated with chronic pain in older people were presence of comorbidities (PR= 1.31, 95% CI= 1.12, 1.54) where increase in the number of comorbidities increased the risk as well (PR=1.69, 95% CI= 1.44, 1.99). Presence of abdominal obesity (PR=1.62, 95% CI=1.42, 1.86) and overweight and obesity (PR=1.23, 95% CI=1.06, 1.44) were also related to chronic pain in older people.

However, presence of psychiatric morbidity was not significantly associated with chronic pain. Chronic pain in older people also significantly related to higher frequency of hospitalization. After adjusting for important confounders, chronic pain remained as a significant factor (IRR of 1.69, 95% CI: 1.24, 2.31). Pain interference, level of interference and ambulatory care visits were not significantly associated with chronic pain in older people. Instead, higher level of chronic pain interference among older people was found to reduce the number of visits to ambulatory care facilities. This study provides additional insights on the chronic pain problem among older people in Malaysia. It is hoped that the findings of this research will be used as a basis to establish chronic pain policy in Malaysia especially among older people, thus expanding and improving current services of older people in Malaysia.

ABSTRAK

Kesakitan adalah satu keadaan yang tidak menyenangkan yang berfungsi sebagai tanda amaran kepada seseorang individu agar melindungi atau menjauhkan diri daripada sebarang kecederaan. Walaubagaimanapun, apabila kesakitan itu berterusan dan menjadi kronik, ianya bukanlah lagi bertindak sebagai perlindungan diri, malahan ianya merupakan ancaman kepada individu terbabit. Sakit kronik didefinasikan sebagai sejenis kesakitan yang berterusan selama 3 bulan atau lebih. Ianya merupakan sejenis kesakitan yang berterusan di luar tempoh biasa atau normal penyembuhan tisu badan, yang selalunya mengambil masa hanya selama 3 bulan. Terdapat banyak kajian mengenai sakit kronik yang telah dijalankan di negara-negara maju. Namun, data dari negara-negara berpendapatan rendah dan sederhana seperti Malaysia adalah kurang. Bagi mengatasi kekurangan ini, kajian ini adalah bertujuan untuk menerangkan kelaziman dan menghubungkan sakit kronik di kalangan warga tua di Malaysia dan kaitannya dengan obesiti, morbiditi psikiatri dan penggunaan penjagaan kesihatan. Kajian ini dijalankan dengan menggunakan data wakilan daripada Tinjauan Kesihatan dan Morbiditi Kebangsaan yang Ketiga (NHMS III). Analisis subpopulasi telah dijalankan untuk warga tua yang berumur 60 tahun ke atas (n = 4954). Analisis dijalankan dengan menggunakan Analisis Data Tinjauan dalam STATA bagi mengambil kira data sampel yang kompleks. Hasil kajian menunjukkan bahawa kelaziman sakit kronik di kalangan warga tua di Malaysia adalah tinggi iaitu berjumlah sehingga 15.6 peratus (95% CI: 14.5, 16.8). Di antara 755 orang warga tua dengan sakit kronik, 655 (88.3%) melaporkan beberapa tahap gangguan ke atas aktiviti harian mereka. Ciri-ciri sosiodemografi yang dikaitkan secara signifikan dengan sakit kronik di kalangan warga tua termasuk jantina perempuan (PR= 1.50, 95% CI= 1.31, 1.72), etnik India (PR= 1.45, 95% CI= 1.14, 1.84), kumpulan balu atau duda (PR= 2.70, 95% CI= 1.24, 5.91) dan mereka yang tidak mempunyai latar belakang pendidikan formal (PR= 2.25, 95% CI= 1.72, 2.95). Manakala, faktor-faktor

yang berkaitan dengan kesihatan yang dikaitkan dengan sakit kronik pada warga tua adalah kehadiran penyakit kronik (PR= 1.31, 95% CI= 1.12, 1.54) di mana peningkatan dalam bilangan komorbiditi meningkatkan risiko juga (PR= 1.69, 95% CI= 1.44, 1.99). Kehadiran obesiti abdomen (PR= 1.62, 95% CI= 1.42, 1.86) dan berat badan berlebihan serta obesiti (PR= 1.23, 95% CI= 1.06, 1.44) juga berkaitan dengan sakit kronik di kalangan warga tua. Walau bagaimanapun, kehadiran morbiditi psikiatri tidak dikaitkan secara signifikan dengan sakit kronik. Sakit kronik pada orang tua juga dikaitkan secara signifikan dengan kekerapan yang lebih tinggi dimasukkan ke hospital. Selepas melaraskan untuk faktor pembaur penting, sakit kronik kekal sebagai faktor yang signifikan (IRR 1.69, 95% CI: 1.24, 2.31). Gangguan sakit, tahap gangguan dan lawatan penjagaan ambulatori tidak dikaitkan secara signifikan dengan sakit kronik di kalangan warga tua. Sebaliknya, tahap gangguan sakit kronik yang lebih tinggi di kalangan warga tua didapati mengurangkan bilangan lawatan ke kemudahan penjagaan ambulatori. Kajian ini memberikan maklumat tambahan kepada masalah sakit kronik di kalangan warga tua di Malaysia. Hasil kajian ini diharapkan akan digunakan sebagai asas untuk melaksanakan polisi sakit kronik di Malaysia terutamanya di kalangan warga tua, sekali gus mengembangkan dan menambah baik perkhidmatan semasa untuk warga tua di Malaysia.

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TABLE OF CONTENTS

ABSTRACT ..... **iii**

ABSTRAK ..... **v**

ACKNOWLEDGEMENTS ..... **vii**

TABLE OF CONTENTS ..... **viii**

LIST OF FIGURES ..... **xiv**

LIST OF TABLES ..... **xv**

LIST OF SYMBOLS AND ABBREVIATIONS ..... **xvii**

LIST OF APPENDICES ..... **xix**

AUTHOR'S CONTRIBUTIONS ..... **xx**

CHAPTER 1: INTRODUCTION **1**

1.1 About this chapter 1

1.2 Chronic Pain 1

1.2.1 Chronic pain, its importance on public health and its impact on the population 1

1.2.2 Population Ageing 4

1.2.3 Ageing population in Malaysia 7

1.2.4 Ageing and Chronic Pain 14

1.2.4.1 Chronic Pain among Older People 16

1.2.5 Ageing and Obesity 18

1.2.6 Ageing and Health Care Utilization 21

1.3 Problem Statement 23

1.4 Rationale of the study 24

1.5 Significance of this study 25

1.6 Research Questions 26

1.7 Research Objectives 27
1.8 Organization of the thesis 28
1.9 Summary 30

CHAPTER 2: LITERATURE REVIEW 31

2.1 About this chapter 31
2.2 Systematic Review of Chronic Pain in Asian Adult 31
2.2.1 Background 31
2.2.2 General Objectives 32
2.2.3 Methods 33
2.2.4 Selection Criteria 34
2.2.5 Methodological Quality Assessment 35
2.2.6 Results 35
2.2.7 Summary of Systematic Review of Chronic Pain in Asian Adult 57
2.3 Prevalence of chronic pain in developed countries 57
2.4 Prevalence of chronic pain in older people 59
2.5 Risk Factors of Chronic Pain 60
2.5.1 Age 60
2.5.2 Gender 61
2.5.3 Low Socioeconomic status 61
2.5.4 Obesity 62
2.5.5 Psychiatric Morbidity 62
2.5.6 Presence of Comorbidity 63
2.5.7 Cultural 64
2.6 Pain Interference among Older People 66
2.7 Impacts of Chronic Pain 67

2.8 Chronic pain and healthcare utilization 69
2.9 Conceptual Framework of Research 71
2.9.1 The Biopsychosocial model of Chronic Pain 71
2.9.2 Andersen and Newman Healthcare Utilization Model 74
2.10 Summary 77

CHAPTER 3: METHODS 78
3.1 About this chapter 78
3.2 Study Design 78
3.3 Data Source 78
3.4 Sampling and Data Collection Methods of the NHMS 79
3.5 Quality Control of NHMS III 2006 82
3.6 Selected Participants 82
3.7 Definitions of Selected Variables Used in the Analyses 84
3.7.1 Independent Variables 84
3.7.2 Dependent/ Outcome Variables 88
3.7.2.1 Chronic Pain and Pain interference 88
3.7.2.2 Health care Utilization 90
3.8 Data Analysis 94
3.8.1 Preliminary and Exploratory Analyses 94
3.8.2 Missing Data Analysis 94
3.8.3 Descriptive Statistics Analysis 96
3.8.4 Inferential Statistics Analysis 97
3.9 Ethical Consideration 99
3.10 Summary 100

CHAPTER 4: RESULTS.....101

4.1 About This Chapter.....101

4.2 Response Rate and Demographic Characteristics of Study Sample.....102

4.3 Prevalence and Correlates of Chronic Pain among Malaysian older people.....108

4.3.1 Prevalence of chronic pain by older people categories. 111

4.3.2 Socio-demographic correlates of chronic pain among Malaysian older people 115

4.3.3 Health-related correlates of chronic pain among Malaysian older people……..117

4.4 Prevalence and Correlates of Pain Interference among Malaysian Older People122

4.5 Chronic Pain and Obesity among Malaysian Older People.....126

4.5.1 Gender difference in association between chronic pain, BMI categories and abdominal obesity among Malaysian older people 126

4.6 Chronic Pain and Psychiatric Morbidity among Malaysian Older People. 130

4.6.1 Somatic Symptoms, Anxiety, Social Dysfunction and Depression among Malaysian older people with Chronic Pain 133

4.6.2 Association between somatic, anxiety, depression and social dysfunction symptoms with Malaysian older people with chronic pain.....135

4.7 Chronic Pain and Health Care Utilization among Malaysian Older People.....139

4.8 Summary.....146

CHAPTER 5: DISCUSSION 147

5.1 About this Chapter.....147

5.2 Summary of Research Objectives.....148

5.3 Major Findings and Comparison with Other Literature 149

5.3.1 Definition, Prevalence and Measurement of Chronic Pain among Asian Adults 149
5.3.2 Prevalence and Correlates of Chronic Pain among Older People in Malaysia 152
5.3.3 Chronic Pain and Obesity among Older People in Malaysia 158
5.3.4 Chronic Pain and Psychiatric Morbidity among Older People in Malaysia..... 160
5.3.5 Chronic Pain and Health Care Utilization among Older People in Malaysia..... 162
5.4 Implications of thesis's findings 164
5.4.1 Public Health Implications – implications for policy makers 164
5.4.2 Public Health Implications – Potential for prevention 167
5.5 Strengths and Limitations 168
5.6 Summary 171

CHAPTER 6: CONCLUSION 172

6.1 About This Chapter 172
6.2 Conclusion of thesis 172
6.3 Recommendations based on thesis's findings 175
6.3.1 Establishment of Chronic Pain Guidelines for Older People in Malaysia..... 175
6.3.2 Expansion of Chronic Pain Service to Primary Care Level 176
6.3.3 Screening of Chronic Pain among All People Aged 60 and Above. 178
6.3.4 Preventive Strategies of Chronic Pain among Older People. 180
6.3.5 Screening of Mental Health among Older People with Chronic Pain. 180
6.3.6 Recommendations for future research 181

6.4 Summary 182

REFERENCES 183

LIST OF PUBLICATIONS 216

LIST OF PAPERS PRESENTED 217

LIST OF FIGURES

Figure 1.1 Map of Southeast Asia 8

Figure 1.2: Number of the Older People in Malaysia from year1970 to 2020. 12

Figure 1.3:Proportion of the Older Population in Malaysia since 1970- 2020. 13

Figure 1.4: Percentage of overweight and obesity cases among older people in Malaysia in year 1996 and 2006 20

Figure 1.5: Number of new cases of older people in public health clinics and hospitals from 2008 to 2010 22

Figure 2.1: Results of literature search 37

Figure 2.2: Biopsychosocial Model of Chronic Pain 73

Figure 2.3: Andersen and Newman Healthcare Utilization Model 76

Figure 3.1: Flow of Selected Subpopulation 83

Figure 4.1: Type of facilities used for hospitalization among elderly with chronic pain 143

Figure 4.2: Type of treatments received during hospitalization among patient with chronic pain 144

Figure 4.3: Type of facilities used for ambulatory care service (ACS) visits among elderly with chronic pain 145

Figure 6.1: Trends in number of attendance at Chronic Pain Clinics in Malaysia, 2006-2012 177

LIST OF TABLES

Table 1.1: Number of older people aged 60 years and above throughout the world in year 2012 and 2050 6

Table 1.2: Population and Proportion of older people aged 60 years and above in South-East Asian countries 9

Table 2.1: Criteria for methodological quality assessment 36

Table 2.2: Comparative Descriptions of Study Characteristics in Asian Adults 42

Table 2.3: Comparative Description of Study Characteristics in Asian Geriatric Population 55

Table 3.1: Breakdown of Enumeration Block Strata 80

Table 3.2: Classification of Obesity 85

Table 3.3: Classification of Abdominal Obesity 86

Table 3.4: Summary of Selected Variables as well as Scale Of Measurement Used in this Study. 91

Table 3.5: Missing Values Recorded for Selected Variables Among Older People in NHMS III 2006 (n=4954). 95

Table 4.1: Comparison of selected demographic characteristics of Malaysian older people according to the National Health and Morbidity Survey (NHMS, 2006) and the Older People Census (2012) of Malaysia. 103

Table 4.2: Baseline characteristics of Malaysian older people in the National Health and Morbidity Survey (NHMS 2006), its actual number (n) and weighted percentages (%). 105

Table 4.3: Prevalence of Chronic Pain among older people based on demographic and health characteristics variables. 109

Table 4.4: Prevalence of chronic pain among elderly based on elderly categories 112

Table 4.5: Univariate analysis of Socio-demographic variables with chronic pain among older people. 116

Table 4.6: Univariate analysis of Health-related variables with chronic pain among older people. 118

Table 4.7: Sociodemographic and health-related correlates of chronic pain among older people using the National Health and Morbidity Survey data (NHMS, 2006) 120

Table 4.8 : Characteristics of Older People with Pain Interference 123

Table 4.9: Unadjusted and adjusted Prevalence Ratio of Pain Interference among Malaysian Older People 124

Table 4.10: Estimated prevalence and prevalence ratios for chronic pain by gender, BMI categories and abdominal obesity 128

Table 4.11: Estimated prevalence ratio for presence of interference by BMI category and abdominal obesity 129

Table 4.12: Number (n) and percentages (%) of older people by psychiatric morbidity status in Malaysia 131

Table 4.13: Number (n) and percentages (%) of older people with and without presence of psychiatric morbidity by chronic pain status in Malaysia 132

Table 4.14: Distribution of mean of GHQ subscales scores by chronic pain status 134

Table 4.15: Crude Prevalence Ratio of Chronic Pain by Psychiatric Illness Symptoms among older people in Malaysia. 136

Table 4.16: Crude and Adjusted Prevalence Ratio for Chronic Pain by Psychiatric Symptoms status. 138

Table 4.17: Crude and Adjusted Incidence Rate Ratio (IRR) for different categories of chronic pain, with hospitalization as dependent variable. 140

Table 4.18: Crude and Adjusted Incidence Rate Ratio (IRR) for different categories of chronic pain, with ambulatory care services (ACS) as dependent variable. 141

LIST OF SYMBOLS AND ABBREVIATIONS

ACS	:	Ambulatory Care Services
ASEAPS	:	Association of South-East Asian Pain Societies
BMI	:	Body Mass Index
CINAHL	:	Cumulative Index to Nursing and Allied Health Literature
CPG	:	Clinical Practice Guidelines
DOSM	:	Department of Statistics Malaysia
EB	:	Enumeration Block
FMS	:	Family Medicine Specialist
GHQ-28	:	General Health Questionnaire-28
GP	:	General Practitioners
IASO	:	International Association for the Study of Obesity
IASP	:	International Association for the Study of Pain
IOM	:	Institute of Medicine
IOTF	:	International Obesity Task Force
IPH	:	Institute of Public Health
IRR	:	Incidence Rate Ratio
LBP	:	Low Back Pain
LQ	:	Living Quarters
MAR	:	Missing At Random
MASP	:	Malaysia Association for the Study of Pain
MCAR	:	Missing Completely At Random
MeSH	:	Medical Subject Headings
MNAR	:	Missing Not At Random

NHNES	:	National Health and Nutrition Examination Survey
NMRR	:	National Medical Research Registry
OA	:	Osteoarthritis
OR	:	Odds Ratio
PDN	:	Peripheral Diabetic Neuropathy
PR	:	Prevalence Ratio
QC	:	Quality Control
SD	:	Standard Deviation
SIP	:	Special Interest in Pain
SLE	:	Systemic Lupus Erythematous
TNF	:	Tumour Necrosis Factors
UMMC	:	University of Malaya Medical Centre
WHO	:	World Health Organization
ZIP	:	Zero Inflated Poisson
95% CI	:	95% Confidence Interval

LIST OF APPENDICES

Appendix A: Letter of Permission from Director General of Health, Malaysia……219

Appendix B: Ethical Approval Letter from University Malaya Medical Centre (UMMC) Medical Ethics Committee……....220

Appendix C: National Medical Research Registry Registration Approval……...221

Appendix D: Approval of Journal Publication and Journal Article 1……. 222

Appendix E: Approval of Journal Publication and Journal Article 2……...224

Appendix F: Approval of 3rd Manuscript Submission……226

Appendix G: Scoring of articles selected for Systematic review……..227

AUTHOR'S CONTRIBUTIONS

The work presented in this thesis has been carried out by the author under the supervision of Associate Professor Noran Naqiah Hairi, Department of Social and Preventive Medicine, University of Malaya, Kuala Lumpur.

All aspects of the work presented in this thesis including planning, literature search, analysis as well as manuscript and thesis writing were conducted by the author. All co-authors in the papers published from this thesis read and approved final draft prior its publications. As for this thesis, the supervisor read and approved its final draft prior its submission to Institute of Graduate Studies (IGS).

CHAPTER 1: INTRODUCTION

1.1 About this chapter

A brief background of this thesis is presented in this chapter. An overview of chronic pain, its importance on public health as well as its impact on the population is presented in Section 1.2. The issues pertaining to ageing and chronic pain, and the problem statement of this study are presented in Section 1.3. The rationale for carrying out this study is described briefly in Section 1.4, whereas significance of this study is described in Section 1.5. The research questions and objectives of this study are presented in Section 1.6 and Section 1.7 respectively. The organization of this thesis is presented in section 1.8. This chapter concludes with the summary in Section 1.9.

1.2 Chronic Pain

1.2.1 Chronic pain, its importance on public health and its impact on the population

Pain is a universal unpleasant phenomenon experienced by all. Pain is produced by the brain via inputs when it interprets a certain stimuli as a danger to the body. It serves primarily as a warning for the individual to withdraw oneself from damaging situations and protect against injury. Pain can be further classified into acute or chronic pain. Acute pain is often described as sudden severe pain which accompanies injury or disease. While chronic pain, is pain that persists beyond the time of expected healing often without cause. Thus, when pain becomes chronic, it stops from being protective and instead becomes a threat to the individual. Chronic pain is a physical, neurological and physiological experience that is believe to serve no useful purpose. It is a form of pain that lasts for three months or more, or pain that persists beyond the normal period of tissue healing, which is typically three months (IASP, 1986a).

Chronic pain is initially perceived as a symptom of underlying disease, a non-specific symptom of the disease or, a non-specific symptom of the disease process, and is considered as a passive condition (Croft, P., 2010). Consequently, chronic pain and its treatment are often neglected since medical practitioners focus primarily on the condition or diseases that are presumed to cause the pain. Currently, chronic pain is no longer perceived as a passive condition as it fulfils the criteria of being a condition on its own (Siddall, P. J. & Cousins, M. J., 2004; Tracey, I. & Bushnell, M. C., 2009). Hence, it is imperative to study chronic pain as a disease by itself rather than assuming that chronic pain is equivalent to conditions such as arthritis, back or neck disorders and headaches.

Chronic pain is now acknowledged as a condition that has significance on public health (Goldberg, D. & McGee, S., 2011). There are various reasons for chronic pain being regarded as a public health threat and one of them is the high prevalence of chronic pain. Chronic pain is a common condition which affects all levels of the population and a large number of studies have shown the various effects of chronic pain. Chronic pain does not only affect the individual suffering from chronic pain, but also their spouses and family members. Chronic pain results in physical limitations, emotional and psychological disturbance to the sufferers (Kikuchi, N., Ohmori-Matsuda, K., Shimazu, T. et al., 2009; Macfarlane, G. J., Morris, S., Hunt, I. M. et al., 1999; Poole, H., White, S., Blake, C. et al., 2009; Bergh, I., Steen, G., Waern, M. et al., 2003; Goral, A., Lipsitz, J. D., & Gross, R.; Landi, F., Onder, G., Cesari, M. et al., 2005), poor work performance (Gerdle, B., Bjork, J., Coster, L. et al., 2008; Blyth, F. M., March, L. M., Nicholas, M. K. et al., 2003; van Leeuwen, M. T., Blyth, F. M., March, L. M. et al., 2006) and high healthcare expenditure (Bhattarai, B., Pokhrel, P. K., Tripathi, M. et al., 2007; Goral, A., et al., 2010; Blyth, F. M., March, L. M., Brnabic, A. J. M. et al., 2004). It has been reported from previous studies that chronic pain affects traditional family roles, deteriorates sexual and marital relationships, leads to financial difficulties and creates distress to other family

members (Flor, H., Turk, D. C., & Berndt Scholz, O., 1987; Turk, D. C., Flor, H., & Rudy, T. E., 1987).

Owing to the lack of awareness and understanding on chronic pain, chronic pain is often neglected not only by healthcare professionals but also by the policy makers. Chronic pain is typically under-diagnosed and under-treated (Institute of Medicine, 2011). According to the Institute of Medicine (IOM), about 116 millions of Americans do not receive adequate treatment from health care providers every year and this situation is referred to as the "public health crisis of pain". Approximately, 40% of those with chronic pain, seek pain relief from complementary and alternative therapies even though there are no proven efficiencies with these therapies (Barnes, P. M., Powell-Griner, E., McFann, K. et al., 2004). However, it has been reported recently that some analgesic components are isolated from certain traditional Chinese medicines to alleviate chronic pain (Zhang, Y., Wang, C., Wang, L. et al., 2014). The lack of awareness and treatment of chronic pain results in the creation of the "Declaration for Chronic Pain Relief" at the First Congress of the Association of South-East Asian Pain Societies (ASEAPS) held in Manila in 2006. The aim of ASEAPS is to help patients and physicians identify, diagnose and manage chronic pain in the Asia Pacific region. As a whole, the goal of this declaration is to improve awareness and elevate chronic pain as a condition in its own right and, establish chronic pain as a priority health issue among government sectors, healthcare professionals and the public. ASEAPS also aims to improve the knowledge of chronic pain management among healthcare professionals and help sufferers seek appropriate treatment across the Asia Pacific region (First Asia Pacific Declaration, 2006).

To fulfil the above objectives, chronic pain must be emphasized to all medical practitioners, general public and health policy makers. Hence, a consistent and comprehensive database on chronic pain is required to monitor the changes in the prevalence of chronic pain and to assess the health, societal and financial consequences of chronic pain to the nation. Much research in chronic pain is needed in order to highlight chronic pain as a public health problem.

1.2.2 Population Ageing

Population ageing occurs due to a reduction in mortality and a fertility, which leads to a smaller proportion of children and a larger proportion of older people in the population. According to a United Nations report (United Nations, 2013), the number of older people is expected to increase from 841 million in 2013 to more than 2 billion in 2015. In general, the rate of population ageing is different between developed and developing countries. Ageing in developed countries has begun many decades ago and therefore, most developed countries already have an ageing population. In contrast, ageing is just taking off in developing countries such as Malaysia. However, the rate of ageing among the older people is faster in developing countries compared to developed countries. At present, about two-thirds of older people are living in developing countries and it is forecasted that roughly 8 in 10 of the world's elderly people will be living in developing countries in year 2050 (United Nations, 2013).

The numbers of older people aged 60 years and above throughout the world in year 2012 and 2050 are presented in Table 1.1. It can be seen that the number of older people is expected to double in 2050 relative to the figures given in year 2012 in developing regions such as Asia, Africa and Latin America. It can also be seen that a large number of older people live in developing regions, with the highest number in Asia amounting to 1,252,588 (thousand) older people in year 2050. Ageing is one of the major challenges

for health-care system. With the increase in the number of older people in Asia, it is crucial that the healthcare in Asia is able to cope with the expected increase in age-related diseases and disabilities.

There is lack of standardization of old age definition in ageing research, with some defining older people as adults aged 60 years and above, while some use the cut-off point of 65 years and above. This study refers older people as adults aged 60 years and above, in line with Malaysia definition of older person. The cut-off point is consistent with the cut-off point suggested by World Assembly on Ageing in Vienna in 1982 (Oriol, W. E., 1982) and United Nations (United Nations, 2013).

Table 1.1: Number of older people aged 60 years and above throughout the world in year 2012 and 2050

Region	Number of peoples (Thousands)		Proportion of the total population (Percentages)	
	2012	2050	2012	2050
Asia	**446,974**	**1,252,588**	**11**	**24**
East Asia	237,507	521,949	15	13
South-Central Asia	138,728	473,859	8	10
South-Eastern Asia	53,152	183,259	9	11
Western Asia	17,587	73,522	7	12
Africa	**59,782**	**215,249**	**6**	**10**
Europe	**166,397**	**241,828**	**22**	**34**
Latin-America and The Caribbean	**63,064**	**187,869**	**10**	**25**
Oceania	**5,928**	**13,006**	**16**	**24**

Source: United Nations, Department of Economic and Social Affairs, Population Division. Population Ageing and Development 2012.
Available from http://undesadspd.org/Ageing/DataonOlderPersons.aspx.

1.2.3 Ageing population in Malaysia

Malaysia is part of the South-East Asian region which comprises Brunei Darussalam, Cambodia, Indonesia, Laos, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Vietnam. Most of West Malaysia, formerly known as Malaya, gained independence from British rule in 1957. Malaysia was formed in 1963 with the addition of the East Malaysian states of Sabah and Sarawak. Malaysia consists of thirteen states and three federal territories, with a total landmass of 330, 803 km^2. The capital city of Malaysia is Kuala Lumpur whereas Putrajaya is the city where the federal government is located. Malaysia is further divided into two regions, namely Peninsular Malaysia and East Malaysia, which are separated by the South China Sea (Figure 1.1).

The total population in Malaysia was 28.3 million in 2010, and the average annual population growth is 2.0%. However, our Malaysian population is aging. The percentage of older people aged 60 years and above in 2012 was 8.3% (United Nations, 2013) and it is expected that the number of older people will increase from 2,437 (thousand) in 2012 to 8,850 (thousand) in 2050 as shown in Table 1.2. The population and proportion of older people aged 60 years and above in South-East Asian countries are presented in Table 1.2.

Figure 1.1 Map of Southeast Asia

Table 1.2: Population and Proportion of older people aged 60 years and above in South-East Asian countries

Countries	Numbers of peoples (Thousands)		Proportion of the total population (Percentages)	
	2012	2050	2012	2050
Brunei	27	139	6	23
Cambodia	951	3,612	7	19
Indonesia	20,834	74,703	9	25
Laos	387	1,581	6	19
Malaysia	**2,437**	**8,850**	**8**	**20**
Myanmar	4,122	13,566	8	25
Philippines	5,905	23,633	6	15
Singapore	814	2,308	15	38
Thailand	9,600	22,620	14	32
Timor-Leste	58	211	5	7
Vietnam	8,018	32,037	9	31

Source: United Nations, Department of Economic and Social Affairs, Population Division. Population Ageing and Development 2012.
Available from http://undesadspd.org/Ageing/DataonOlderPersons.aspx

The elderly population in Malaysia from year 1970 to 2020 is presented in the form of a bar chart and line graph, as shown in Figure 1.1 and 1.2, respectively. It can be seen that there is an increasing trend in the number of older people in Malaysia since the 1970s, however, the increase is rather slow between 1970 and 2000. In contrast, there is a rapid growth in the number of older people from year 2010 onwards and it is forecasted that the older people will grow rapidly in the near future. The ethnic make-up of Malaysia consists of Malays (50.1%), Chinese (22.5%), Indian (6.7%), indigenous groups (11.7%), others (0.8%) and foreigners (8.1%) (Malaysia. Department of Statistics, 2010) . The various ethnicities also subscribe to many different religions including Islam, Hinduism, Buddhism and Christianity, and communicate using many languages including Bahasa Melayu, Chinese dialects (such as Mandarin, Cantonese, and Hokkien), Indian dialects (Tamil, Telugu, Malayalam) and English (Malaysia. Department of Statistics, 2010) . There are also differences in the ageing processes between the ethnic groups. In 2000, a larger proportion of the ethnic Chinese (8.8%) were aged 65 years and above compared to ethnic Malays and Indians (5.6%). It is projected that by 2020, 16.6% of ethnic Chinese will be aged 65 years or above, compared to 11.6% ethnic Indians, and 8% ethnic Malays (Ong, F. S., Phillips, D. R., & Hamid, T. A., 2009). These differences are attributed to the longer-life expectancy and lower fertility rate of the ethnic Chinese (Ong, F. S., et al., 2009; Wong, Y. & Mohamad Amin, J., 2005).

Like many other developing nations, Malaysia has undergone major economic changes and social shifts within a short period of time. This had led to rapid increase in literacy rates and a change from the traditional land-based to manufacturing based economy. In turn, this has led to an increase in urban migration. With large scale outward migration especially of the working population, rural Malaysia is ageing faster than the urban areas. This leads to various issues among older rural Malaysians (Ambigga, K. S., Ramli, A. S., Suthahar, A. et al., 2011; Ahmad, W. I. W. & Ismail, Z., 2011; Rostam, K., 2012). Among

others, urban migration has also led to social isolation of older people in rural communities, with their children living as nuclear families in urban areas. Overcrowding is, however, a potential issue for urban and suburban older people who live with children and grandchildren due to high cost of living and low accommodation affordability (Ong, F. S., et al., 2009; Rostam, K., 2012). Malaysia being a developing country has much shorter time to adjust to rapid population ageing. In country like ours, the limited resources (human and financial) to provide supplementary support to cater the needs for older people will be a challenge. In general, this has significant implications for the country's economy and its resources for services. This change has a lot of implications to the older people and for those who may be involved in their care. It is anticipated that age-related diseases (e.g. arthritis) and musculoskeletal problems (e.g. back pain) will increase in line with the increase in the elderly population in Malaysia. It is also anticipated that chronic pain problems will be more prevalent, particularly among the older people. Thus, it is crucial to investigate chronic pain problems among older people in order to improve future healthcare needs of these people.

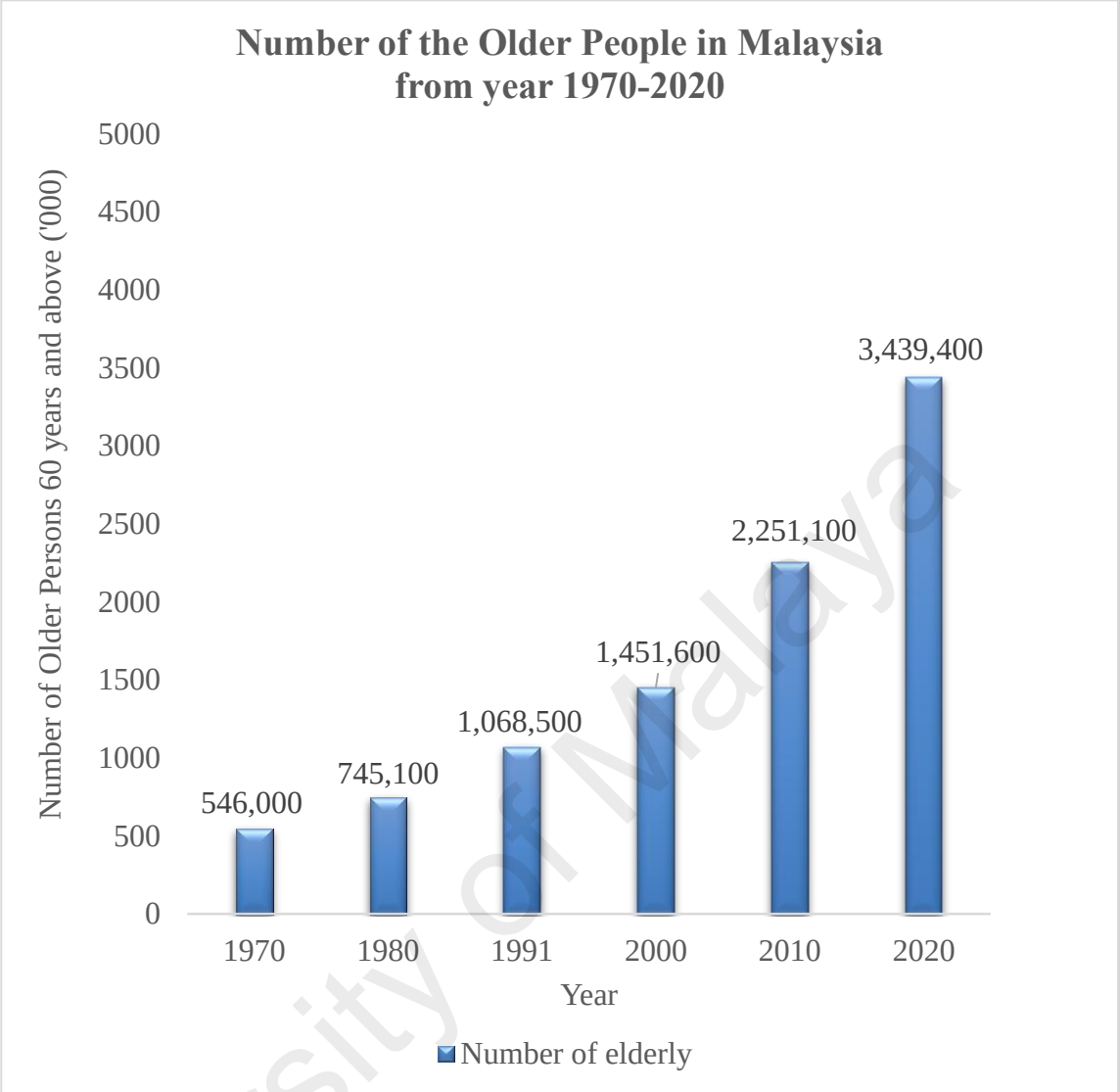

Figure 1.2: Number of the Older People in Malaysia from year1970 to 2020.

Note: The bar chart is created by the author based on census data from the Department of Statistics Malaysia (DOSM) published in 2005 and 2010.

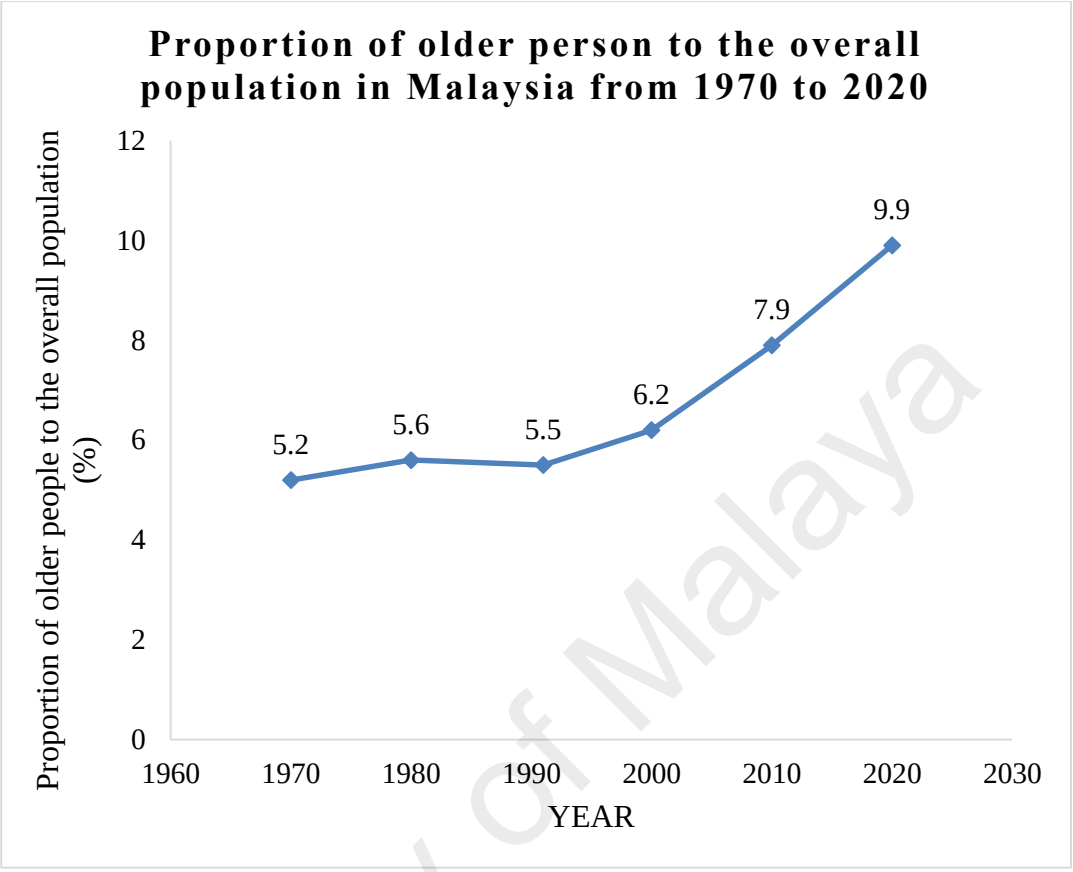

Figure 1.3: Proportion of the Older Population in Malaysia since 1970- 2020.

Note: The line graph is created by the author based on census data from the Department of Statistics Malaysia (DOSM) published in 2005 and 2010.

1.2.4 Ageing and Chronic Pain

Chronic pain is highly prevalent among community-dwelling older people. It has been estimated the prevalence of chronic pain varies from 18 to 57 percent based on population surveys (Croft, P., Blyth, F. M., & Windt, D. V. D., 2010a; Dionne, C. E., Dunn, K. M., & Croft, P. R., 2006). Pain is a rather complex mechanism which involves a number of factors. Pain can be difficult to assess and measure, especially so with the older population. This can be due to age-related conditions affecting this population such as sensory impairments as well as cognitive decline. Presence of chronic conditions and co-morbidities also makes assessment of pain and management of pain more difficult. The condition of pain differs between young and older people in terms of pain perception, pain beliefs and attitudes, pain-related coping strategies and social support. It is known that ageing leads to changes in the structure, function and chemistry of the nervous system, which are believed to affect the perception of pain among older people. Ageing may be associated with the reduction in the density of unmyelinated nerve fibers in the peripheral system which slows down nerve conduction (Verdú, E., Ceballos, D., Vilches, J. J. et al., 2000).

Ageing is also associated with loss of brain volume, especially in the prefrontal cortex and hippocampus, which are essential in pain perception (Farrell, M. J., 2012). In addition, ageing may cause a reduction in the function of endogenous pain modulatory mechanism, especially dopaminergic neurons in the basal ganglia, and this may affect pain perception among older people (Cole, L. J., Farrell, M. J., Gibson, S. J. et al., 2010). A previous study has highlighted an increase in pain threshold among older adults on experimental stimulus (Gibson, S. J. & Farrell, M., 2004). However, some studies reported that pain sensitivity in older adults may depend on the type of stimulus applied. For example, older adults may be less sensitive to painful heat stimuli (Lautenbacher, S., Kunz, M., Strate, P. et al., 2005; Quiton, R. L., Roys, S. R., Zhuo, J. et al., 2007) and may

be more sensitive to painful mechanical pressure (Cole, L. J., et al., 2010). Hence, it can be deduced that pain perception among older people depends not only on the type of stimulus but also on its duration and its heterogeneous individual characteristics.

There is high prevalence of chronic pain among the older people as shown by previous studies, but this is not to say that chronic pain is part of aging process despite this view being broadly mentioned (Kumar, A. & Allcock, N., 2008). It was reported that, 87.0% of older people agree that suffering from aches and pain is normal. It is found that 94.0% of these respondents who suffer from aches and pain consult a healthcare professional for treatment (Sarkisian, C. A., Hays, R. D., & Mangione, C. M., 2002) . However, there is a tendency for older people not to report their pain and they do not seek professional treatment to address the underlying condition that causes persistent pain since they believe that it is normal for them to suffer from pain (Gagliese, L., 2009; Miaskowski, C., 2000).On the other hand, the belief that suffering from pain is normal among older people causes less emotional distress (Williamson, G. M., 2000; Williamson, G. M. & Schulz, R., 1992, 1995). It has been noted that older people tend to adopt certain strategies to cope with their pain; however, they tend to have fewer coping strategies compared to younger adults (Aldwin, C. M., 1991; Molton, I., Jensen, M. P., Ehde, D. M. et al., 2008). Older people tend to use less strategies to cope with pain, whereby they use strategies that work for them and usually use them more consistently regardless of flare-ups of pain. In contrast, younger adults will usually increase the frequency of coping efforts if the pain worsens (Molton, I., et al., 2008). Thus, pain is under-recognised and under-treated in the older population.

Social support is also a prevailing issue among older people. Previous studies have shown that older people have fewer friends and therefore, less social support compared to younger adults (van Groenou, M. B., Hoogendijk, E. O., & van Tilburg, T. G., 2013;

Huxhold, O., Fiori, K. L., & Windsor, T. D., 2013). It has been reported that the emotional well-being of older people is strongly associated with having a few close friends and family members rather a broad network of support (Fiori, K. L., Antonucci, T. C., & Akiyama, H., 2008; Huxhold, O., et al., 2013). It has been reported that older people tend to be selective when it comes to socializing (Brown, S. L., Asher, T., & Cialdini, R. B., 2005). The downsizing of social support may be attributed to the lack of energy in maintaining a large group of friends (Aartsen, M. J., Van Tilburg, T., Smits, C. H. et al., 2004). However, smaller social networks may reduce support to older people since this group relies heavily on social support as their coping mechanism for almost every single conditions or diseases including chronic pain (Martin, K. R., Schoster, B., Woodard, J. et al., 2012). Hence, chronic pain among older people is a critical issue since it involves addressing a number of issues related to the ageing process.

For all the reasons above, it is important that research on chronic pain of older people specifically describing its prevalence, associations with important risk factors and impact on the healthcare utilization is researched independently to that of the younger population.

1.2.4.1 Chronic Pain among Older People

Chronic musculoskeletal pain such as osteoarthritis is typically associated with chronic pain among older people (Bergman, S., Herrström, P., Högström, K. et al., 2001; Ferrell, B. A., Ferrell, B. R., & Osterweil, D., 1990; Dionne, C. E., et al., 2006). Older people often experience pain in the joints particularly in the knees, hips, hands and feet due to cartilage degeneration and bony thickening (i.e. osteoarthritic changes). The majority of older people with knee pain have shown radiographic changes of osteoarthritis (Duncan, R., Peat, G., Thomas, E. et al., 2007). However, it has been shown there is a rather high occurrence of radiographic changes of osteoarthritis without symptoms among the elderly (McAlindon, T., Cooper, C., Kirwan, J. et al., 1992).

Obesity is also a condition that is typically associated with chronic pain among older people. Obesity among older people is notably a significant public health problem. Obesity and chronic pain may be partially correlated since obesity results in increase weight-bearing on the joints and reduced physical activity (Hitt, H. C., McMillen, R. C., Thornton-Neaves, T. et al., 2007). Although this may be true, this relationship is rather complex which cannot be simplified to a simple mechanical overload and inflammation issues. It has been reported that genetic and environmental factors may also play a role in the relationship between obesity and chronic pain (Wright, L. J., Schur, E., Noonan, C. et al., 2010).

Since cancer becomes increasingly common with increasing age, there is a tendency that older people will develop neuropathic pain due to cancer (Cancer Research UK, January 2014). According to Cancer Research UK (Cancer Research UK, January 2014), more than one-third (36%) of cancer cases are diagnosed in adults aged 75 years and above. About 70 percent of these patients reported chronic pain syndromes and the number of chronic pain cases increases from 80 to 100 percent in patients with advanced cancers. Cancer patients may experience pain due to the direct and indirect effects of the tumor, treatment-related pain such as invasive diagnostic procedures, or from the cancer treatment itself. In Malaysia, colorectal, lung, nasopharynx, prostate and liver cancers are predominant among elderly men aged 50 years and above, whereas breast, colorectal, cervix, lung and ovary cancers are common among elderly women in the same age group (Zainal Ariffin Omar, Zainuddin Mohd. Ali, & Nor Saleha Ibrahim Tamin., 2006). In fact, a previous study (Bernabei, R., Gambassi, G., Lapane, K. et al., 1998) has also reported that 25 percent to 40 percent of older people with cancer experienced chronic pain.

Painful diabetic neuropathy (PDN) is another debilitating condition that is often associated with chronic pain among older people, with a percentage occurrence of 8 and 20 percent among patients with Type 2 diabetes (Davies, M., Brophy, S., Williams, R. et al., 2006; Wu, E., Borton, J., Said, G. et al., 2007). Diabetes mellitus is a common disease among older people which is attributed to lifestyle such as physical inactivity and unhealthy diet. Diabetes leads to an increase in the occurrence of PDN among older people.

Based on the aforementioned reasons, it is expected that the prevalence of chronic pain among older people will increase in the future due to an increase in the elderly population as well as pain-related conditions.

1.2.5 Ageing and Obesity

Overweight and obesity is a common problem among the older people in both developed and developing countries. The number of overweight and obesity cases involving older people varies from 0.1 percent in selected Asian and African countries (Launer, L. J. & Harris, T., 1996) to 64.5% overweight and 30.5 percent obesity in the United States (Flegal, K. M., Carroll, M. D., Ogden, C. L. et al., 2002). According to the National Health and Nutrition Examination Survey (NHNES), there is a linear increase in the prevalence of obesity among older men in the United States in the following periods: 1999-2002, 2003-2006 and 2007-2010. However, the change is found not to be statistically significant for women in these periods (Fakhouri, T. H. I., Ogden, C. L., Carroll, M. D. et al., September 2012) .

Overweight and obesity among the older people is escalating in Malaysia. According to the Second National Health and Morbidity Survey (NHMS II) in 1996, 15.6 percent of older people were overweight and obese (Fatimah, S., Tahir, A., Siti Sa'adiah, H. N. et al., 1999). In a more recent study, the proportion of overweight or obesity older people

are found to be 25 and 24.3% for men and women, respectively. The study is carried out on a sample of elderly Malays in rural areas (Suzana S, Zuriati I, Afaf Ruhi AF et al., 2007). According to a report released by the Ministry of Health, Malaysia, the number of overweight cases among Malaysian older people has doubled from 15.6 percent in 1996 to 29.8 percent in 2006 within a decade (Suzana, S., Kee, C. C., Jamaludin, A. et al., 2012), as shown in Figure 1.3. In addition, the number of obesity cases increases by threefold from 3.1 percent in 1996 to 10.8 percent in 2006, which is rather alarming.

Based on the data, it can be expected that obesity-related pain (e.g. back pain and knee pain) will eventually increase and this in turn, increases the prevalence of chronic pain among older people. This trend has been observed in the "baby boom" population (i.e. those born between 1946 and 1964) whereby the percentage of arthritis cases attributable to obesity increases from 3 percent to 18 percent between 1971 and 2002 (Leveille, S. G., Wee, C. C., & Iezzoni, L. I., 2005). This value is expected to increase in the future.

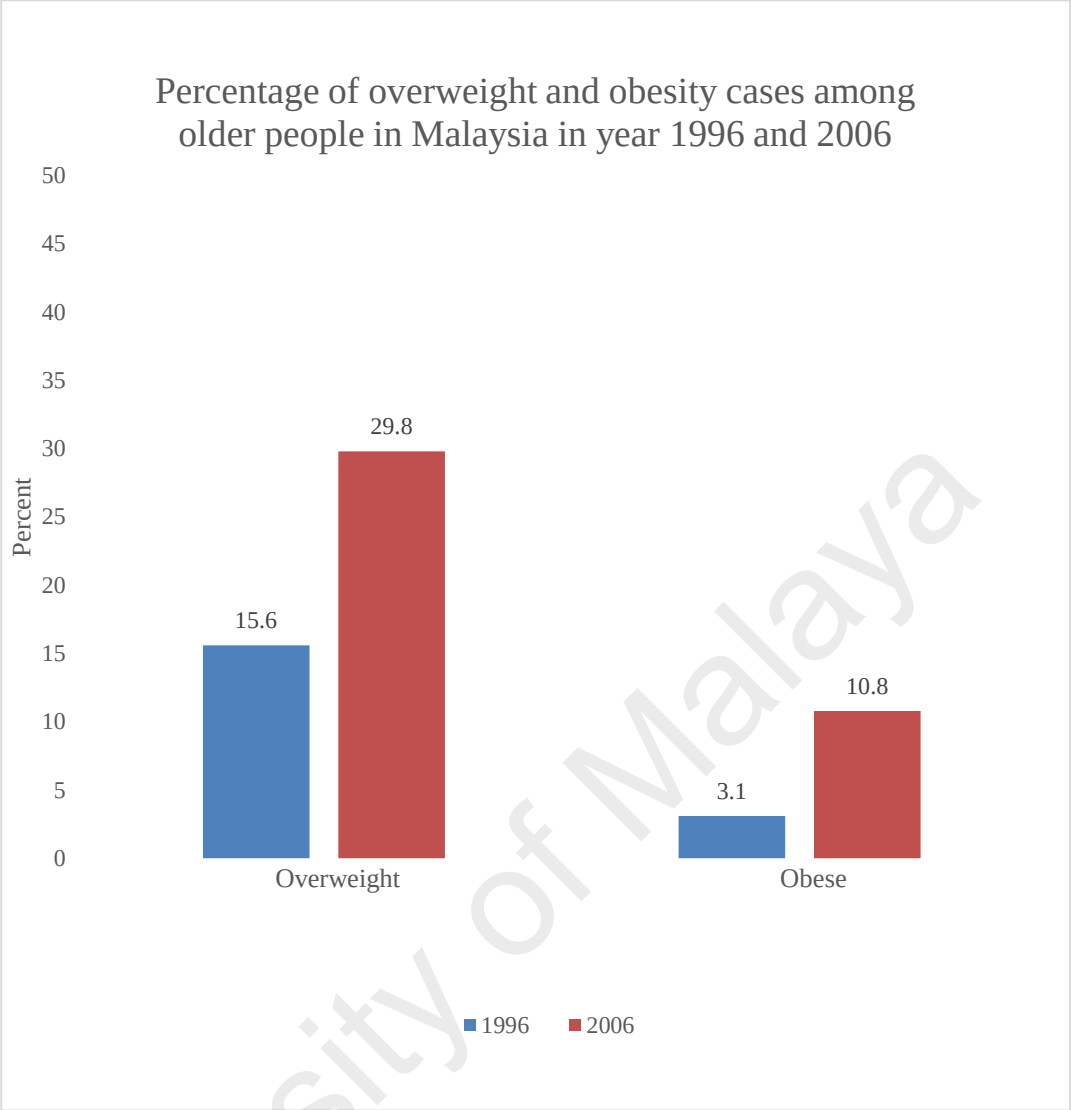

Figure 1.4: Percentage of overweight and obesity cases among older people in Malaysia in year 1996 and 2006

Note: The bar chart is created by the author based on data published in NHMS II 1996 and NHMS III 2006.

1.2.6 Ageing and Health Care Utilization

Population ageing that is taking place throughout the globe will have an unprecedented impact on healthcare systems, particularly the supply and demand of caregiver services for older people. People who live longer will have more complex needs, and they will require health and social care for extended periods of time (Bardsley, M., Georghiou, T., & Dixon, J., 2010). This is particularly the case in developed countries in which population ageing had already occurred. For example, in the United States, the impact of the "baby boom" generation on the healthcare system will increase as the century progress (Schneider, E. L. & Guralnik, J. M., 1990; Keehan, S., Sisko, A., Truffer, C. et al., 2008). In the United Kingdom, those aged 65 years and above constitute two-thirds of general and acute hospital bed use (Rickards, L., 2004).

In Malaysia, the number of new cases of older people seeking treatment has increased between 2008 and 2010, as shown in Figure 1.4. In general, the number of older people who have registered to seek treatment in public clinics and hospitals increases within these three years, and this is expected to increase in the future.

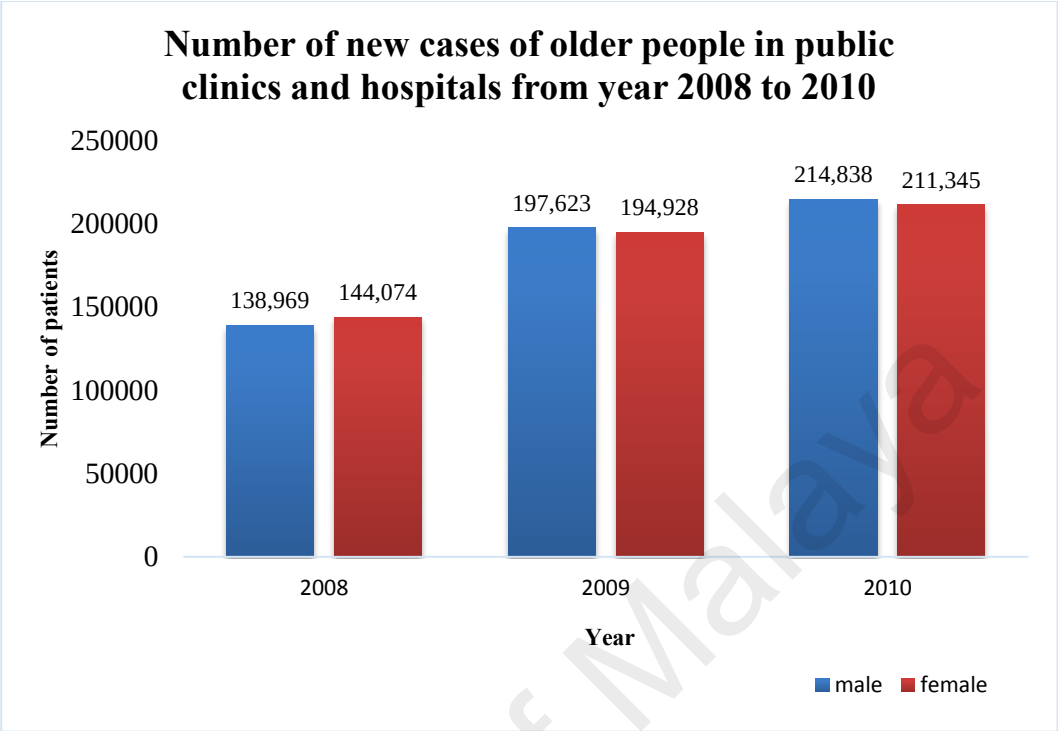

Figure 1.5: Number of new cases of older people in public health clinics and hospitals from 2008 to 2010

Note: The bar chart is created by the author based on the data published by the Family Health Division, Ministry of Health, Malaysia, 2011

1.3 Problem Statement

This study is focused on the prevalence of chronic pain among older people in Malaysia and its association with obesity, psychiatric morbidity and health care utilization. Chronic pain is a public health problem in Malaysia despite economic progress and advancement in healthcare services. The prevalence of chronic pain of adults aged 18 years and above is 7.1 percent in Malaysia and there is a significant association with age, gender and chronic diseases (Institute for Public Health, 2008) . At present, there is a lack of studies focused on chronic pain among older people, especially in developing countries such as Malaysia, and most studies are centered towards the elderly population in developed countries such as Australia and United Kingdoms (Helme, R. D. & Gibson, S. J., 2001).

Even though there are a number of recent findings in neighbouring countries such as Singapore (Yeo, S. N. & Tay, K. H., 2009) and Philippines (Lu, H. & Javier, F., 2011),much more information is needed . In fact, the number of studies on chronic pain among older people is rather sparse worldwide, whereby there is less than one percent of 4000 research papers published each year which is focused on the subject (Melding, P., 1996; Evans, R. G. & Stoddart, G. L., 1990). This present study reports on the chronic pain prevalence and its association with obesity, psychiatric morbidity, as well as healthcare utilization among older people in Malaysia. In many developing countries, including Malaysia there is still gap in knowledge in the understanding of chronic pain and its correlates, particularly those aspects pertaining to obesity, psychiatric morbidity and healthcare utilization.

As most of the studies on chronic pain were conducted in more developed countries, this research is aimed to fulfil this gap since there is a critical need to investigate on chronic pain among older people in Malaysia. These valuable information will be used to guide policy and practice in the prevention of chronic pain as well as its consequences. Improvement of our healthcare services to cater the needs of older people is extremely crucial. Adding data from a middle income developing country like ours is a useful step forward.

1.4 Rationale of the study

The world ageing population is steadily increasing and this demographic change is not slowing down. Malaysia is no exception. Based on the research problem described in the preceding section, it is evident that a large number of studies are focused on the prevalence of chronic pain among older people in developed countries (Helme, R. D. & Gibson, S. J., 2001) and little is known regarding the prevalence of chronic pain specifically among older people in developing countries including Asian countries (Mohamed Zaki, L. R. & Hairi, N. N., 2014). Hence, the main goal of this study is to expand the current knowledge in this area by investigating the prevalence of chronic pain among older people in Malaysia and its association with obesity, psychiatric morbidity and healthcare utilization. If these relationships are observed, then population at risk of developing chronic pain could be identified and interventions to prevent chronic pain could be targeted and developed. With this in mind, it is believed that the findings of this study will be beneficial to improve healthcare policies, facilities and infrastructure in Malaysia in the long term, which will account for the specific needs of older people suffering from chronic pain in Malaysia.

1.5 Significance of this study

This study is indeed important since it is forecasted that the number of older people in Malaysia will increase in the future, along with the number of age-related medical conditions such as chronic pain. Hence, this study will provide insight on the prevalence of chronic pain among older people in Malaysia and alert the healthcare authorities regarding the problem. The findings of this study are also useful to facilitate healthcare professionals as providing insight on the risk factors that lead to chronic pain among older people such as obesity and psychiatric morbidity. This will enable the healthcare providers to develop and evaluate preventive measures by targeting population at risk. The findings of this study can be used to improve the healthcare systems in Malaysia particularly chronic pain treatment and services.

1.6 Research Questions

This study, therefore had two major aims. The first aim was to summarize the evidence of the prevalence of chronic pain, definition of chronic pain as well as measurement strategy used to measure chronic pain among Asian adults, via a systematic review. The second aim was to describe the prevalence of chronic pain among older people in Malaysia and to determine the association between chronic pain and obesity, psychiatric morbidity as well as healthcare utilization among older people in Malaysia. This is done through secondary data analysis.

This study aims are to find the answers to the following research questions:

Part 1

i. What are the prevalence of chronic pain, the definitions of chronic pain and measurement strategy used to measure chronic pain in Asian adult?

Part 2

ii. What is the prevalence and correlates of chronic pain among older people in Malaysia?
iii. Does gender influence the association between chronic pain and obesity among older people in Malaysia?
iv. Is there an association between chronic pain and psychiatric morbidity among older people in Malaysia?
v. Is there an association between chronic pain and health care utilization among older people in Malaysia?

1.7 Research Objectives

The objectives of this study are divided into Part 1 and Part 2.

Part 1

Objective: To describe the prevalence of chronic pain, the definitions of chronic pain and measurement strategy for chronic pain in Asian adult.

Part 2

General objectives: To determine the prevalence of chronic pain among older people in Malaysia and its association with obesity, psychiatric morbidity and healthcare utilization.

Specific objectives:

i. To describe prevalence and correlates of chronic pain among older people in Malaysia.
ii. To determine if gender has a significant influence on the association between chronic pain and obesity among older people in Malaysia.
iii. To examine the association between chronic pain and psychiatric morbidity among older people in Malaysia.
iv. To explore the association of chronic pain with healthcare utilization among older people in Malaysia.

1.8 Organization of the thesis

There are six chapters in this thesis. Three articles have been written during the course of this doctoral research; two published in selected journal and one manuscript currently under reviewed. Parts of the journal article are embedded in the chapters of the thesis, where appropriate. The journal articles that have been published are included at the end of the thesis in PDF format.

An introduction of this thesis is presented in Chapter One, comprising the background of the research, problem statement, rationale of the study, research questions and research objectives. Chapter One includes a brief account of the Malaysian Aging population and issues on aging with chronic pain.

A review of literature relevant to chronic pain is presented in Chapter Two. Chapter two begins with a description on the prevalence of chronic pain among older people in developed and developing countries, followed by an overview of chronic pain among Asian adults. It shall be noted that some sections of the author's journal article entitled, "A Systematic Review of the Prevalence and Measurement of Chronic Pain in Asian Adults" is presented here. This is followed by a literature review on the risk factors of chronic pain and review on chronic pain and healthcare utilization.

The research design and methodology adopted in this study is described in Chapter Three, which includes details on the source of dataset used in this study, selection of subjects and analysis techniques. The reliability of the questionnaire which is used as the survey instrument is also presented in this chapter.

The findings obtained from this study are presented in Chapter Four, and are laid out according to the research objectives outlined in Chapter One. Some sections of the author's journal article entitled "Chronic Pain and Healthcare Utilization among

Malaysian elderly population: Findings from NHMS III 2006" are presented in this chapter.

The findings of this study including a detailed discussion on differences and similarities of the findings are discussed in Chapter Five. The findings are summarized at the beginning of the chapter, followed by a comparison between the findings with those of previous studies. Implications of the findings towards public health practice and clinical practice are also discussed in this chapter. The strength and limitations of the study are also highlighted in this chapter. It shall be noted that some sections of the author's journal article entitled "Chronic Pain and Healthcare Utilization among Malaysian elderly population: Findings from NHMS III 2006" and manuscript under journal review entitled "Gender differences in the relationship between overweight/obesity and chronic pain among older people – Evidence from Malaysia's National Health Morbidity Survey III (NHMS III)" are presented in this chapter.

Finally, the conclusions of the study are presented in Chapter Six, followed by few recommendations of the study based on the thesis's findings. The chapter synthesizes the conclusions from findings in this thesis and makes recommendations for changes in health care practice. Relevant suggestions for future research in the area of chronic pain are also highlighted.

1.9 Summary

Ageing population are critical issues in both developed and developing countries. It is evident that with rapid changes in the structure of our population due to demographic transition, chronic pain will become a prevalent health condition among older people in Malaysia. Chronic pain not only has economic cost but also individual consequences as well. Hence, it is imperative for healthcare professionals in Malaysia to understand and have valid information on the prevalence and nature of chronic pain among older people in Malaysia and its association with important risk factors. Such information will be valuable for healthcare professionals to inform policy and prevention strategies. This will further improve our healthcare policies, facilities and infrastructure that are needed to cater to the specific needs of older people in Malaysia, specifically those who are suffering from chronic pain.

An introduction of this study is presented in this chapter, which provides an insight to the development of this thesis. The rationale of the study has also been provided and finally an overview of the format of the thesis has been given.

CHAPTER 2: LITERATURE REVIEW

2.1 About this chapter

This chapter provides detailed reviews on available literature pertinent to chronic pain. It starts with a published manuscript on systematic review of chronic pain among Asian adults. This article has been accepted by Pain Management Nursing Journal. The tables and references have also been renumbered to maintain consistency within this thesis. This is followed by prevalence of chronic pain in developed countries in section 2.3 as well as its prevalence in older people in section 2.4. Section 2.5 describes further details on the risk factors of chronic pain. Section 2.6 then elaborates on pain interference among older people. This is followed by impacts of chronic pain in section 2.7. Section 2.8 summarizes literatures pertinent to chronic pain and healthcare utilization. Section 2.9 describes the conceptual framework of the study. Finally, summary of this chapter is presented in Section 2.10.

2.2 Systematic Review of Chronic Pain in Asian Adult

2.2.1 Background

Chronic pain is a neurological and physiological experience affecting all levels of the population. It is defined as pain that has lasted for three months or more, or pain that persists beyond normal tissue healing (usually three months)(IASP, 1986b). It affects all groups in a population, regardless of age, sex, income and race/ethnicity. However, chronic pain is not distributed equally around the world (Goldberg, D. & McGee, S., 2011). A review of studies in western countries reported that the prevalence of chronic pain varies: ranging from 11.5 to 55.2% (Ospina, M. & Harstall, C., 2002). The ageing population in western countries is the main reason for this high prevalence. In Asian countries, epidemiological studies of chronic pain are very limited compared to western countries; thus, data on its prevalence is also sparse. It is impossible to extrapolate western data to Asian populations because studies have found that pain reporting practices and

manifestations are different among Asian and western people (Green, C. R., Baker, T. A., Sato, Y. et al., 2003).

It is worthwhile to note that there is a wide variation in the prevalence of chronic pain among western populations. Previous review by Maria et al (Ospina, M. & Harstall, C., 2002) reported that this wide variation was the result of differences in the pain definitions used and in the geographical settings of the study population, as well as inconsistencies in measurement tools. In the same review by Maria et al (Ospina, M. & Harstall, C., 2002) it was also concluded that differences in the demographic characteristics of participants and methodological approaches of the study should be taken into consideration when comparing findings. However to date, the only two published reviews on chronic pain (Ospina, M. & Harstall, C., 2002; Verhaak, P. F., Kerssens, J. J., Dekker, J. et al., 1998) did not include any studies from the Asian region, making it difficult to describe the prevalence rates of chronic pain in Asian adults. Thus, the aim of this current review is to answer the following questions:

i. What is the prevalence of chronic pain among Asian adults?
ii. What are the definitions of chronic pain used in these studies?
iii. Which instruments for measuring chronic pain can be found in the Asian literature?

2.2.2 General Objectives

The objectives of this review are:

i. To determine prevalence of chronic pain among Asian adults.
ii. To identify definition of chronic pain used in Asian literature.
iii. To determine instruments used for measuring chronic pain in Asian literature.

2.2.3 Methods

Literature Search Strategy

In April 2014, a literature search was conducted using six electronic databases: PubMed, Medline with full text, Embase, Cochrane Library, Psych INFO and Cumulative Index to Nursing and Allied Health Literature (CINAHL). Manual hand-searching of reference lists from studies identified as relevant was conducted to locate further articles of interest. To ensure maximum yield when retrieving articles, controlled terminologies such as subject headings, keywords, text words will be searched using a systematic process. The identified databases were searched using controlled term (e.g.: Medical Subject Headings in Medline). All search terms will be 'truncated' and 'exploded' to ensure all associated terms are included in the database search. The following search terms were used:

Search term for PubMed:

("chronic pain"[MeSH Terms] OR ("chronic"[All Fields] AND "pain"[All Fields]) OR "chronic pain"[All Fields]) AND ("Asian continental ancestry group"[MeSH Terms] OR ("Asian"[All Fields] AND "continental"[All Fields] AND "ancestry"[All Fields] AND "group"[All Fields]) OR "asian continental ancestry group"[All Fields] OR "Asian"[All Fields]) AND ("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms]).

Definition of Asian countries

Asian countries were defined as the countries of the World Health Organization (WHO) Western Pacific region and WHO Southeast Asian region: Bangladesh, Bhutan, Brunei, Burma, Cambodia, China, East Timor, India, Indonesia, Japan, Laos, Malaysia, Maldives, Mongolia, Nepal, North Korea, Pakistan, the Philippines, Singapore, South Korea, Sri Lanka, Thailand, and Vietnam. This definition was adapted from previous Asian Population Census (Hoeffel, E. M., Rastogi, S., Kim, M. O. et al., 2012) which defined Asian as people in countries of the Far East, Southeast Asia, or the Indian subcontinent.

2.2.4 Selection Criteria

The criteria for selection include:

i. A population-based studies of chronic pain with age group of 18 years and above.
ii. Contains information on estimation of prevalence of chronic pain, definition of chronic pain and measurement instrument used to measure chronic pain.
iii. A Cross-sectional study design.

Studies specifically on children and hospitalized patients were excluded. No language restrictions as well as the year of publication of the article were made. Titles, abstracts and keywords were assessed for inclusion independently by two authors. Any disagreement with regards to inclusion or exclusion of studies was resolved by consensus and/or discussion between the authors. The first author then subsequently screens the full text of all included articles. Data were extracted independently by two separate authors. An excel spreadsheet was used for extracting data and details from the publication that

meet the inclusion criteria. Disputes regarding data extraction were resolved by discussion between the authors.

2.2.5 Methodological Quality Assessment

All articles selected were critically appraised for methodological quality using critical appraisal tools by Leboeuf-Yde and Lauritsen (Leboeuf-Yde, C. & Lauritsen, J. M., 1995). Briefly, this set of criteria assesses the final sample of the target population, quality of data obtained from the study and the general description of the method and results, including definitions of pain prevalence. All articles were evaluated and reviewed independently by two authors. Each articles were scored using the appraisal tool. Overall, the quality of each articles were good and ranges of scores were between 15 and 16 out 19 points. Details of scoring for each articles were tabulated in Appendix G. Differences in the quality assessment were resolved by discussion between all authors. Table 2.1 illustrates these criteria for methodological quality assessment.

2.2.6 Results

The initial search resulted in 1064 titles (Figure 2.1). In PubMed, 86 articles were found, 43 articles in Embase, 860 articles in CINAHL, 74 articles in Medline with full text and 1 article in PsychINFO. Of these, 19 articles met the inclusion criteria for this review. This includes two studies on chronic pain among special populations i.e. among post-partum female and land mine accident survivors. Although, the inclusion of this two articles may overestimate the range of prevalence, the main objectives of this review were mainly to determine the definitions of chronic pain used in the population and to determine measurement strategy used to assess chronic pain in the population. The 19 articles that were selected are summarized in Table 2.2 and 2.3.

Table 2.1: Criteria for methodological quality assessment

Criteria	Descriptions
A. The final sample should be representative of the target population	1. At least one of the following should apply to the study: an entire target population, randomly selected sample or sample stated to represent the target population (2 points) 2. At least one of the following descriptions: reasons for nonresponse; nonresponders' characteristics; comparison of responders and nonresponders or comparison of sample and target population (2 points) 3. Response rate >90% (2points); 70-90% (1 point); <70% (0 point).
B. Quality of data	4. Were the data primarily from prevalence study (2 points) or was it taken from a survey not specifically designed for that purpose (1 point)? 5. The same mode of data collection was used for all subjects (2 points); if not (1 point). 6. The data were collected directly from the patient by means of a validated questionnaire/interview (3 points); no validated questionnaire/interview (2 points); data collected from proxies or retrospectively from medical record (1 point).
C. General description of the method and results should include definition of pain prevalence	7. Description of the target population and setting where patients were recruited (2 points). 8. Description of pain: severity, duration, intensity and associated disability. All 3 (2 points), 2 or 3: 1 point. 9. Final sample size stated (1 point) 10. Prevalence recall periods stated (1 point).

Source: Criteria for methodological quality assessment.(Leboeuf-Yde, C. & Lauritsen, J. M., 1995).

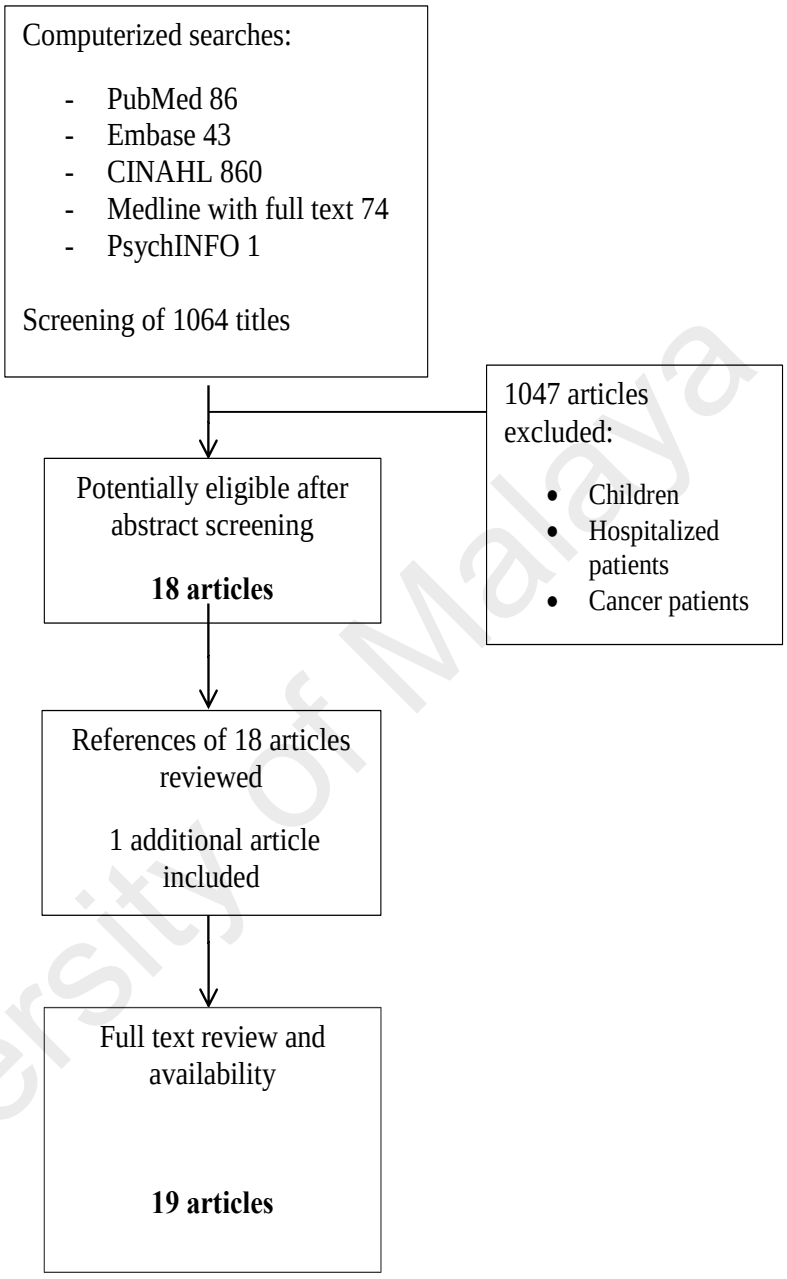

Figure 2.1: Results of literature search

Location of Studies

Eleven studies were conducted in China (Wong, W. S. & Fielding, R., 2011; Chung, J. W. Y. & Wong, T. K. S., 2007; Ng, K. F. J., Tsui, S. L., & Chan, W. S., 2002; Tse, M., Wan, V. T., & Wong, A. M., 2013; Lee, S., Tsang, A., Huang, Y. Q. et al., 2007; Chen, X., Cheng, H. G., Huang, Y. Q. et al., 2012; Fielding, R. & Wong, W. S., 2012; Yu, H. Y., Tang, F. I., Kuo, B. I. T. et al., 2006; Yu, H. Y., Tang, F. I., Yeh, M. C. et al., 2011; Wang, X., Wang, Y., Zhou, S. et al., 2009; Jackson, T., Chen, H., Iezzi, T. et al., 2014), two studies were from Japan (Hattori, S., 2004; Nakamura, M., Nishiwaki, Y., Ushida, T. et al., 2011), one each in Singapore (Yeo, S. N. & Tay, K. H., 2009), Nepal (Bhattarai, B., et al., 2007), Cambodia (Husum, H., Resell, K., Vorren, G. et al., 2002), Philippines (Lu, H. & Javier, F., 2011) and Malaysia (Institute for Public Health, 2008). One multinational study, by the World Health Organization (WHO) (Tsang, A., Von Korff, M., Lee, S. et al., 2008), a World Mental Health division in collaboration with developing countries (Ukraine, South Africa, China, Nigeria, Lebanon, Colombia and Mexico) and developed countries (France, United States, Italy, Belgium, New Zealand, Israel, Netherlands, Germany and Japan) was also included since Asian countries data were also available in the study.

Prevalence of Chronic Pain

The prevalence of chronic pain reported in Asian countries among adults aged 18 years and above varies from as low as 7.1% (Institute for Public Health, 2008) to as high as 61.0% (Husum, H., et al., 2002). All studies in this review reported a higher prevalence of chronic pain among females and elderly people. This statement is supported by studies specifically looking at Asian elderly (Tse, M., et al., 2013; Yu, H. Y., et al., 2006; Yu, H. Y., et al., 2011), where the prevalence was even higher ranging from 42.0 to 90.8%. Most

studies also reported that sufferers of chronic pain were those with low level of education, low income group as well as the unemployed.

Definitions of Chronic Pain

Fourteen out of nineteen studies (Bhattarai, B., et al., 2007; Chung, J. W. Y. & Wong, T. K. S., 2007; Ng, K. F. J., et al., 2002; Wong, W. S. & Fielding, R., 2011; Yeo, S. N. & Tay, K. H., 2009; Tse, M., et al., 2013; Fielding, R. & Wong, W. S., 2012; Wang, X., et al., 2009; Yu, H. Y., et al., 2006; Yu, H. Y., et al., 2011; Hattori, S., 2004; Lu, H. & Javier, F., 2011; Jackson, T., et al., 2014; Institute for Public Health, 2008) used the International Association for the Study of Pain (IASP) definition of chronic pain or a close approximation to it which considered chronic pain as a pain that has persisted for three months and more. One study (Nakamura, M., et al., 2011) used a cut-off score of six months duration, one study (Tsang, A., et al., 2008) used a non-specified set of criteria which was "any chronic pain conditions in the previous twelve months" and two studies (Lee, S., et al., 2007; Chen, X., et al., 2012) did not mention definition of chronic pain used.

Measurement Instrument Used to Measure Chronic Pain

Ten out of nineteen articles (Yeo, S. N. & Tay, K. H., 2009; Lee, S., et al., 2007; Tse, M., et al., 2013; Chen, X., et al., 2012; Wang, X., et al., 2009; Hattori, S., 2004; Nakamura, M., et al., 2011; Lu, H. & Javier, F., 2011; Yu, H. Y., et al., 2011; Institute for Public Health, 2008) used a single question to determine chronic pain. The question used was "have you had pain in any part of your body lasting for 3 months or more?" Six studies (Bhattarai, B., et al., 2007; Wong, W. S. & Fielding, R., 2011; Fielding, R. & Wong, W. S., 2012; Ng, K. F. J., et al., 2002; Chung, J. W. Y. & Wong, T. K. S., 2007;

Jackson, T., et al., 2014) used two questions to detect chronic pain. The first question determined the presence of pain and second question focused on the duration of pain.

Apart from screening of chronic pain, some studies also include other dimensions of chronic pain, such as pain intensity, pain site, pain consequences and source of pain. Only six (Bhattarai, B., et al., 2007; Ng, K. F. J., et al., 2002; Yeo, S. N. & Tay, K. H., 2009; Hattori, S., 2004; Husum, H., et al., 2002; Lu, H. & Javier, F., 2011) out of nineteen studies measured all the above mentioned parameters. Except for four studies (Tsang, A., et al., 2008; Fielding, R. & Wong, W. S., 2012; Yu, H. Y., et al., 2011; Institute for Public Health, 2008), all other studies included pain site as one of the dimensions of chronic pain measurement.

Pain intensity was included in all studies except in six studies (Chung, J. W. Y. & Wong, T. K. S., 2007; Fielding, R. & Wong, W. S., 2012; Tsang, A., et al., 2008; Yu, H. Y., et al., 2011; Jackson, T., et al., 2014; Husum, H., et al., 2002). Nine studies (Ng, K. F. J., et al., 2002; Yeo, S. N. & Tay, K. H., 2009; Wong, W. S. & Fielding, R., 2011; Tse, M., et al., 2013; Fielding, R. & Wong, W. S., 2012; Yu, H. Y., et al., 2006; Yu, H. Y., et al., 2011; Hattori, S., 2004; Lu, H. & Javier, F., 2011) used Numerical Rating Scale (NRS), three studies (Husum, H., et al., 2002; Nakamura, M., et al., 2011; Wang, X., et al., 2009) used Visual Analogue Score (VAS) and one study (Bhattarai, B., et al., 2007) used Verbal Descriptive Scale (VDS) to measure pain intensity.

All except for three studies (Tsang, A., et al., 2008; Wang, X., et al., 2009; Yu, H. Y., et al., 2011) measured pain consequences, such as interference with daily activities (Chung, J. W. Y. & Wong, T. K. S., 2007; Ng, K. F. J., et al., 2002; Wong, W. S. & Fielding, R., 2011; Yeo, S. N. & Tay, K. H., 2009; Husum, H., et al., 2002; Nakamura, M., et al., 2011; Yu, H. Y., et al., 2006; Jackson, T., et al., 2014; Institute for Public Health, 2008), agitation (Chung, J. W. Y. & Wong, T. K. S., 2007), sleeping difficulty

(Chung, J. W. Y. & Wong, T. K. S., 2007; Yu, H. Y., et al., 2006) and absence from work (Bhattarai, B., et al., 2007; Chung, J. W. Y. & Wong, T. K. S., 2007; Ng, K. F. J., et al., 2002; Wong, W. S. & Fielding, R., 2011; Yeo, S. N. & Tay, K. H., 2009; Nakamura, M., et al., 2011).

The validity and reliability of the measurement instruments were reported in eleven out of nineteen studies (Ng, K. F. J., et al., 2002; Bhattarai, B., et al., 2007; Wong, W. S. & Fielding, R., 2011; Chung, J. W. Y. & Wong, T. K. S., 2007; Tse, M., et al., 2013; Lee, S., et al., 2007; Chen, X., et al., 2012; Wang, X., et al., 2009; Yu, H. Y., et al., 2006; Yu, H. Y., et al., 2011; Lu, H. & Javier, F., 2011). Overall, the Cronbach alpha coefficients of the studies were moderate to good. It ranges between 0.58 (Wang, X., et al., 2009) to 0.89 (Yu, H. Y., et al., 2011). Three studies (Bhattarai, B., et al., 2007; Yeo, S. N. & Tay, K. H., 2009; Wang, X., et al., 2009) developed a questionnaire specifically for the study and were pilot tested. However, the validity and reliability of the questionnaire was not reported in the study.

Table 2.2: Comparative Descriptions of Study Characteristics in Asian Adults

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
1) Wong et al (Wong, W. S. & Fielding, R., 2011), Hong Kong 2011	5,001general population aged 18 years and above Male (45.2%) Female (54.8%)	Pain persisting for at least 3 months	Phone interview	Two questions: 1. Are you currently troubled by physical pain or discomfort, either all the time, or on and off? 2. Have you had this pain or discomfort for more than 3 months? Respondents who answered "yes" for both questions were classified as having chronic pain.	35% (33.3-35.9)
2) Chung et al (Chung, J. W. Y. & Wong, T. K. S., 2007), Hong Kong 2007	2,126 households Male (45.3%) Female (54.7%) Mean age: 32.14	Pain > 3 months. IASP criteria	Phone interview	Two questions: 1. Do you have pain now? 2. How long have you had the pain?	45.87% (43.60-48.14)

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
3) Ng et al (Ng, K. F. J., et al., 2002), Hong Kong 2002	1,051households Male (44.0%) Female (56.0%)	Pain > 3 months. IASP criteria	Phone interview	Two questions: 1. Have you had any of the following pain in the past 12 months? (headache, back pain, muscle pain, joint pain, toothache, stomach pain, menstrual pain) 2. The pain you just mentioned, for how many days was it present in the last 12 months? (answers coded as 1 to 5 days, 6 to 10 days, half month to one month, over three months) Those who answered over three months were recorded as chronic pain sufferers.	10.8% (8.9-12.7)
4) Yeo et al (Yeo, S. N. & Tay, K. H., 2009), Singapore 2009	4,141 households aged between 18 and 85 years Male (42.2%)	Pain lasting at least 3 months in duration for the last 6 months	Phone interview	Single question: 1. Do you have pain in the last 6 months lasting at least 3 months in duration?	8.7% (95% CI not mentioned)

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
	Female (57.8%) Chinese (73.8%) Malay (12.8%) Indian (9.7%) Others (3.7%)				
5) Bhattarai et al (Bhattarai, B., et al., 2007), Nepal 2007	1,730 households Male (828) Female (902)	Any painful condition lasting or recurring for a duration of 3 months or more	Face-to-face interview	Two questions: 1. Presence or absence of pain? 2. Duration of pain? Any painful condition lasting or recurring for duration of 3 months or more was considered as chronic pain.	50.1% (95% CI not mentioned)

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
	Mean age: 35.27 Median age: 31 years				
6) Tsang A et al (Tsang, A., et al., 2008), **America** (Colombia, Mexico, US), **Europe** (Belgium, France, Germany, Italy, Netherlands, Spain, Ukraine), **the Middle East** (Israel, Lebanon), **Africa** (Nigeria, South Africa), **Asia** (Japan, China:	42,249 of Households aged 18 years and above from 17 countries. *China (Beijing)* Mean age: 35.8 Female: 47.5% Male: 52.5% *China (Shanghai)* Mean age: 42.9	Any chronic pain conditions in the past 12 months	Face-to-face interview	Three questions: 1. The respondents were asked if they ever had "arthritis or rheumatism" in their lifetime 2. They were asked if this had been present in the past 12 months. 3. They were also asked whether they had ever had "chronic back or neck problems", "frequent or severe headache" and "other chronic pain" in the past12 months.	1.**China (Beijing)** 37.0%(31.5- 42.8) 2.**China (Shanghai)** 34.5%(29.0- 40.4) 3.**Japan** 28.1%(24.5- 31.9)

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
Beijing, Shanghai) and **New Zealand**.	Female: 48.0% Male : 52.0% *Japan* Mean age:51.4 Female: 53.7% Male : 46.3%				
7) Malaysia 2006 NHMS (Institute for Public Health, 2008)	33,733 households aged 18 years and above. Male: 44.8%	Pain > 3 months IASP criteria	Face-to-face interview	Single question: 1. Thinking back over the last 6 months, have you had persistent pain in any part of your body lasting for 3 months or more? Persistent pain means that the pain is felt every day, or most days, during that period.	7.1% (6.7-7.4)

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
	Female: 55.2% Mean age: 41.8 (male) 41.5 (female) Malay: 55.0% Chinese: 20.3% Indian: 8.2% Others: 16.5%				
8) Husum et al (Husum, H., et al., 2002), Cambodia, Kurdistan (Northern Iraq) 2002.	57 severely injured adult land mine accident survivors *Cambodia:*	Chronic Pain was diagnosed when self-rated global pain was more than 5 and presence of one of the three clinical signs (trigger points,	Face-to-face interview and medical examination by medical doctors	Visual Analogue Scale (VAS) was used to document self-rated global pain (scoring 0-10). Those with VAS of more than 5 and had any of the clinical signs such as trigger points, myofascial pain or dystrophy, were diagnosed as having chronic pain.	Overall: 61% (48-74) Cambodia: 48%

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
	Mean age: 36 Female (24%) Male (76%) *Northern Iraq:* Mean age: 32 Female (12%) Male (88%)	myofascial pain, dystrophy)			Northern Iraq: 72%
9) Lee et al (Lee, S., et al., 2007), China 2007	Household ages more than 18 years old. Beijing: 2,633 Shanghai: 2,568	Not mentioned in the article	Face-to-face interview	Single Question: 1. Have you at any time in the past 12 months, experienced any of the conditions listed in the chronic pain checklist which include chronic spinal/ neck pain, frequent/ severe headache or any chronic pain (general).	**Beijing:** Back/ neck pain: 20.4% (SE 2.6) Headache: 15.6 % (SE 2.6)

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
	Percentage of male and female respondents in the study was not specifically mentioned in the study.				Any Chronic Pain: 18.2 % (SE 2.1) **Shanghai:** Back/ neck pain: 40.0% (SE 5.5) Headache: 42.2 % (SE 5.4) Any Chronic Pain: 34.0% (SE 4.8)
10) Chen et al (Chen, X., et al., 2012), Beijing, China. 2012.	2,469 households aged 16 years and above.	Not mentioned	Face-to-face interview	Single question: Have you had [chronic back/ neck problem, arthritis/ rheumatism, frequent/severe headache or any of the pain problems] in the past 12 months?	Arthritis: 15.5% Back/Neck: 22.6% Headache: 5.10%

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
	Male: 967 (39.17%) Female: 1,502 (60.83%)				Other Chronic Pain: 3.97% 1 chronic pain: 26.33% 2 or more pain: 9.23%
11) Fielding et al (Fielding, R. & Wong, W. S., 2012), Hong Kong, China 2012.	5,001 adults aged 18 years old and above. Female (55.0%) Male (45.0%)	Pain persisted for at least 3 months	Telephone interview	Using 2 questions: 1. Are you currently troubled by physical pain or discomfort, either all the time or on and off? 2. Have you had this pain or discomfort for more than three months?	34.2% (95% CI not mentioned)
12) Wang et al (Wang, X., et al., 2009), Rural China 2008	1,741 post-partum women.	Pain or discomfort that persisted continuously or intermittently for longer than three months	Face-to-face interview	Single Question: Do you have any pain or discomfort that last for 6 months?	Overall: 55.8% (95% CI not mentioned)

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
	Age ranges from 24 to 53 years old. Mean age: 33.6 years				Site: Lower back pain: 23.4% Headache: 11.8% Leg pain: 9.9%
13) Nakamura et al (Nakamura, M., et al., 2011), Japan 2011.	11,507 individuals aged 18 years or older. Female (6365) Male (5142)	Pain symptom that was present within the past month and had continued for at least 6 months.	Mail-in survey	Single question: Have you ever had pain associated with bone, muscle, joints or nerves, such as neck pain, shoulder stiffness, lower back pain or extremity pain?	Overall: 15.4% (95% CI not mentioned)
14) Hattori et al (Hattori, S., 2004), Japan, 2006. [In Japanese]	18,000 individuals.	Respondents were considered to be suffering from chronic pain if they met the 5 criteria which were:	Internet survey	Single question: For how long have you suffered from pain due to your illness or medical condition? Chronic Pain was diagnosed if the duration of pain was more than 6 months.	Overall: 13.4% (95% CI not mentioned)

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
		1. They had suffered from pain in the last 6 months 2. They had pain for more than 3 months. 3. They had experienced pain in the last 1 month. 4. They had pain frequency of several times a week or more (chronic pain sufferers) 5. Their pain measured 4 or more on the 10-point pain scale.			

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
15) Lu et al (Lu, H. & Javier, F., 2011), Philippines 2011.	11,000 adults aged 18 to 85 years old.	Respondents were considered to be suffering from chronic pain if they met the 5 criteria which were: 1. They had suffered from pain in the last 6 months 2. They had pain for more than 3 months. 3. They had experienced pain in the last 1 month. 4. They had pain frequency of several times a week or more	Face-to-face interview	Single screening question: For how long have you suffered from pain due to your illness or medical condition? Chronic Pain was diagnosed if the duration of pain was more than 6 months.	Overall: 13.6% (95% CI not mentioned) Moderate + Severe Chronic Pain: 10.4% Annual incidence rate: 4.8%

Table 2.2 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
		(chronic pain sufferers) 5. Their pain measured 4 or more on the 10-point pain scale.			
16) Jackson et al (Jackson, T., et al., 2014), Chongqing, China 2014	1,003 households aged 18 and above Mean age: 36.9 Women: 401 Men: 602	Pain that has persisted for 3 months or more.	Telephone interview	Single question: Do you or other household members experienced the following types of pain for at least 1 full day during the past 6 months: Headache, neck/ shoulder, back, joint, stomach/abdomen, menstrual/genital, dental/face, and "other pain".	Overall : 25.8 % (95% CI not mentioned) Pain site: Head: 8.28% Back: 12.66% Neck/ shoulders: 5.98 Joints:7.38

Table 2.3: Comparative Description of Study Characteristics in Asian Geriatric Population

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Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
1) Tse et al (Tse, M., et al., 2013), Hong Kong 2013	173 cognitively intact community dwelling elderly aged over 60 in 2 elderly community centres in Hong Kong 25 men 148 women Mean age: 73.2 years	Pain in past 3 months	Face-to-face interview	Single Question: Do you have pain in the last 3 months	Overall: 90.8% (95% CI not mentioned)

Table 2.3 continued

Authors/ Country/ Publication Year	Sample Size (N)	Definition of Chronic Pain(duration)	Method of Data Collection	Instruments Used to Measure Chronic Pain	Prevalence Estimates (95%CI)
2) Yu et al (Yu, H. Y., et al., 2006), Taiwan 2006.	219 elderly aged 65 years or older from communities of Taipei City, Taiwan.	Pain lasted 3 months or longer	Face-to-face interview	Not mentioned	Overall: 42.0% (95% CI not mentioned)
3) Yu et al (Yu, H. Y., et al., 2011), Taiwan 2011.	219 elderly aged 65 years or older from communities of Taipei City, Taiwan	The frequency of suffering from pain is at least once a week in the past 3 months; it made the elderly feel unpleasant, and it might accompany existing or potential tissue injury.	Face-to-face interview	A single item was used to determine whether the elderly were suffering from chronic pain.	Overall: 42.0% (95% CI not mentioned)

2.2.7 Summary of Systematic Review of Chronic Pain in Asian Adult

To the best of my knowledge, this is the first systematic review describing the prevalence of chronic pain, the definitions of chronic pain and measurement strategy used to measure chronic pain among Asian adult. This review demonstrated that the IASP definition of chronic pain is widely used among the Asian countries. Despite similar or approximate definitions used to define chronic pain, estimates of prevalence still varied. The differences may probably reflect actual differences between countries or an artificial difference due to methodological variation. Furthermore, there were also differences between the studies in the measurement instruments used and the dimensions of pain measured. Clearly, a definite and uniform consensus on definition and measurement tools is needed for comparative purposes. The prevalence rates of chronic pain in Asian countries were found to be high, ranging from 7.1 to 61.0% and increasing over the period covered by this review.

2.3 Prevalence of chronic pain in developed countries

Estimates of the prevalence of chronic pain worldwide are inconsistent. In developed countries, chronic pain is reported to be highly prevalent. Numerous studies have sought to document chronic pain prevalence and estimates in developed countries. A multinational study by World Health Organization (WHO) (Tsang, A., et al., 2008) reported that the overall prevalence of chronic pain in developed countries was 38.9%, specifically France (49.6%) , United States (43.9%), Italy (45.5%), Belgium (40.5%), New Zealand (39.1%), Spain (34.9%), Israel (33.5%), Netherland (33.3%), Germany (32.4%) and Japan (28.1%). In the United States, the prevalence was slightly higher i.e. 43%, 33% and 30.7% (Arnow, B. A., Hunkeler, E. M., Blasey, C. M. et al., 2006; Portenoy, R. K., Ugarte, C., Fuller, I. et al., 2004; Johannes, C. B., Le, T. K., Zhou, X. et al., 2010).

In fact, earlier studies conducted among Scotland and Swedish population reported higher estimates, 50% (Elliott, A. M., Smith, B. H., Penny, K. I. et al., 1999) and 55% (Andersson, H. I., 1994) respectively. The high percentages of chronic pain in the later study were due to geographical variation of population sampled as the study was conducted among rural population. In another study where fifteen European countries were selected (Breivik, H., Collett, B., Ventafridda, V. et al., 2006), prevalence of chronic pain was reported between 12% (Spain) and 30% (Norway). Previous study (Rustoen, T., Wahl, A. K., Hanestad, B. R. et al., 2004) conducted in Norway reported lower estimates, 24%. Similar estimates are found in Denmark, 24% (Sjøgren, P., Ekholm, O., Peuckmann, V. et al., 2009) and lower than some other estimates from Ireland, 46% (Raftery, M. N., Sarma, K., Murphy, A. W. et al., 2011), United Kingdom, 46.5% (Elliott, A. M., et al., 1999) and Israel, 46% (Neville, A., Peleg, R., Singer, Y. et al., 2008).

Equally important, some studies focused on chronic disabling pain. Chronic disabling pain refers to chronic pain with the presence of interference with daily activities. The prevalence of chronic disabling pain is 26% in Scotland (Elliott, A. M., et al., 1999), 24% in Netherlands (Croft, P., Blyth, F. M., & Windt, D. V. D., 2010b) and Unites States of America (Covinsky, K. E., Lindquist, K., Dunlop, D. D. et al., 2009). Whereas, severe disabling chronic pain gave a lower estimates of 6% in Scotland (Elliott, A. M., et al., 1999), 9% in Netherlands (Croft, P., et al., 2010b), 10% in USA (Covinsky, K. E., et al., 2009), 12% in Australia (Blyth, F. M., March, L. M., Brnabic, A. J. M. et al., 2001) and 13% in Sweden (Andersson, H. I., 1994). These prevalence of chronic pain varies among developed countries due to variation in population sampled, different method of data collection used as well as different chronic pain definition used in the questionnaire.

2.4 Prevalence of chronic pain in older people

Among older people, prevalence of chronic pain was more prevalent than the younger population. The type of pain reported in the older population varies. Among the older people, common chronic pain conditions reported include musculoskeletal pain such as knee, hip and joint pain due to degenerative process of the cartilage as well as the bony thickening, post stroke pain, diabetic neuropathy and post herpetic neuralgia. In fact, chronic musculoskeletal pain conditions such as osteoarthritis is the commonest chronic pain experienced among the older people (Bergman, S., et al., 2001; Ferrell, B. A., et al., 1990). The underlying mechanism of chronic pain among older people is complex.

The global estimates of chronic pain among community-dwelling older people ranges between 18 and 57% based on self-report in a population survey (Croft, P., et al., 2010a). Most population studies reported that the prevalence of chronic pain increased with age (Bhattarai, B., et al., 2007; Blyth, F. M., et al., 2001; Boerlage, A. A., van Dijk, M., Stronks, D. L. et al., 2008; Breivik, H., et al., 2006; Fielding, R. & Wong, W. S., 2012; Raftery, M. N., et al., 2011; Rustoen, T., Wahl, A. K., Hanestad, B. R. et al., 2005; Tsang, A., et al., 2008; Yeo, S. N. & Tay, K. H., 2009; Dominick, C. H., Blyth, F. M., & Nicholas, M. K., 2012; Johannes, C. B., et al., 2010). In fact, individual studies among older people reported higher estimates of chronic pain prevalence such as 78% among older people in Sweden (Brattberg, G., Parker, M. G., & Thorslund, M., 1996), 73.5% in Catalonia, Spain (Miró, J., Paredes, S., Rull, M. et al., 2007) and 90.8% in Hong Kong (Tse, M., et al., 2013). The aforementioned estimates are higher than some other estimates from Brazil, 14.1% (Barsante Santos, A. M., Burti, J. S., Lopes, J. B. et al., 2010), Australia, 21.5% (Hairi, N. N., Cumming, R. G., Blyth, F. M. et al., 2013), Sweden, 40.4% (Jakobsson, U., Klevsgård, R., Westergren, A. et al., 2003) and Taiwan, 42% (Yu, H. Y., et al., 2006).

Whereas, if the focus is among older people in nursing homes, the prevalence estimates of chronic pain are much higher. These have been reported by studies from Rotterdam, the Netherlands (98%) (Boerlage, A. A., et al., 2008), Italy (82.9%) (Zanocchi, M., Maero, B., Nicola, E. et al., 2008) and 51% in nursing home within the United States (Ferrell, B. A., et al., 1990). It was reported in the later study that those older people who lived in nursing homes or other long-term institutional care tends to have poorer health status and complex health problems, thus increasing the likelihood of chronic pain condition.

2.5 Risk Factors of Chronic Pain

Certain populations are at higher risk of developing chronic pain. Many studies have found that advancing age, female gender, those with lower income level and with low educational status were highly correlated with chronic pain. This corresponds to the characteristics of the disease which have unequal distributions where those who were socially disadvantaged carried the greatest load.

2.5.1 Age

It has been widely reported that pain increases with age (Johannes, C. B., et al.; Blyth, F. M., et al., 2001; Raftery, M. N., et al., 2011; Boerlage, A. A., et al., 2008; Breivik, H., et al., 2006; Bhattarai, B., et al., 2007; Rustoen, T., et al., 2005; Yeo, S. N. & Tay, K. H., 2009; Tsang, A., et al., 2008; Dominick, C. H., et al., 2012; Wong, W. S. & Fielding, R., 2011) although some studies found no relationship between pain and age (Andersson, H. I., Ejlertsson, G., Leden, I. et al., 1993; Blyth, F. M., et al., 2001; Yu, H. Y., et al., 2006).

2.5.2 Gender

Many studies reported that prevalence of chronic pain was higher in female compared to male (Johannes, C. B., et al.; Blyth, F. M., et al., 2001; Tsang, A., et al., 2008; Rustoen, T., et al., 2004; Erikesen, J., Jensen, M., Sjogren, P. et al., 2003; Fielding, R. & Wong, W. S., 2012; Dominick, C. H., et al., 2012; Wong, W. S. & Fielding, R., 2011). The reasons why female reported pain more frequently than male remains unanswered in many studies. The possible explanation as reported by Special Interest Group on Sex, Gender and Pain(Greenspan, J. D., Craft, R. M., & LeResche, L., 2007) was that chronic pain was related to hormonal changes which occur as a result of age-related changes. This consensus reported that hormonal changes of menopause together with the pattern of pain seeking treatment among women allowed for greater prevalence of chronic pain among this group.

2.5.3 Low Socioeconomic status

Chronic Pain is also reported to have an inverse relationship with the socioeconomic status. A lot of markers in individual socioeconomic status such as income level, education level, type of occupation, employment status and area of residency were related to chronic pain. Many studies have found that the unemployed and those in the lowest income group have higher prevalence of chronic pain (Johannes, C. B., et al.; Blyth, F. M., et al., 2001; Rustoen, T., et al., 2004; Raftery, M. N., et al., 2011; Dominick, C. H., et al., 2012) compared to those with higher income level and were employed. A study by Tsang et al (Tsang, A., et al., 2008) also found that there were differences in the prevalence of chronic pain between developing and developed countries, as developing countries were synonymous with low socioeconomic status or poor countries. This study found that generally developing countries had higher prevalence of chronic pain compared to developed countries.

2.5.4 Obesity

The relationship between chronic pain and body mass index and waist circumference may be related partly due to increased weight-bearing on joints as well as reduced physical activity (Hitt, H. C., et al., 2007). However, the relationship is more complex than a simple mechanical overload, as reported by previous study where familial conditions such as genetic and environmental factors were significant contributors to the association between chronic pain and obesity(Wright, L. J., et al., 2010).

In particular, the two most common pain conditions which are frequently associated with obesity are low back pain (LBP) and osteoarthritis (OA). Many studies address the nature of these relationship (Han, T., Tajar, A., & Lean, M., 2011; Andersen, R. E., Crespo, C. J., Bartlett, S. J. et al., 2003; Han, T., Schouten, J., Lean, M. et al., 1997; Aro, S. & Leino, P., 1985; Leboeuf–Yde, C., Kyvik, K. O., & Bruun, N. H., 1999). However, there is still lack of conclusive evidence to elucidate the link between overweight and obesity with chronic pain although few studies have found positive associations between obesity and low back pain or osteoarthritis (Andersen, R. E., et al., 2003; Bener, A., Alwash, R., Gaber, T. et al., 2003; Han, T., et al., 1997; Han, T., et al., 2011). Few longitudinal studies that examined this association did not clarify the matter (Aro, S. & Leino, P., 1985; Leboeuf–Yde, C., et al., 1999).

2.5.5 Psychiatric Morbidity

Another important factor that is strongly associated with chronic pain is psychological factor. Many studies have found strong positive association between chronic pain and psychological diseases such as anxiety and depression (Johannes, C. B., et al., 2010; Blyth, F. M., et al., 2001; Tsang, A., et al., 2008; Raftery, M. N., et al., 2011). The temporal relationship between chronic pain and depression remains unclear. In a

systematic review conducted by Fishbain et al (Fishbain, D. A., Cutler, R., Rosomoff, H. L. et al., 1997), it was found that there was a greater support for depression as a result of chronic pain rather than depression precedes the onset of chronic pain. However, in this systematic review both directions of the association were reported. Since most of the studies were cross-sectional studies, therefore temporal relationship could not be ascertained.

2.5.6 Presence of Comorbidity

Prolonged life expectancy together with advancement and improvement of medical care has allowed many older people to survive medical conditions which used to be fatal previously. This in turn, leads to multiple concurrent medical conditions (Fortin, M., Lapointe, L., Hudon, C. et al., 2005). Previous study reported that there was a higher prevalence of chronic pain among the respondents with chronic diseases such as hypertension, diabetes and psychiatric diseases (Fielding, R. & Wong, W. S., 2012). In fact, previous study (Rustoen, T., et al., 2004) found that those with chronic pain were more likely to report Fibromyalgia (OR 14.44, 95% CI 4.49, 17.66), Rheumatoid Arthritis (OR 8.05, 95% CI 3.68,17.58), Musculoskeletal Problem (OR 7.7, 95% CI 5.03, 11.77), Osteoarthritis (OR 5.84, 95% CI 3.55, 9.61), Angina (OR 3.17, 95% CI 1.60, 9.25), Asthma (OR 1.70, 95% CI 1.06, 2.72). However, in another study by Rustoen et al (Rustoen, T., et al., 2005) reported that Diabetes Mellitus, Myocardial Infarct, Cancer and Ankylosing Spondylitis were not significant co-morbidity in chronic pain sufferers. This contradicts the findings of Dominick et al (Dominick, C. H., et al., 2012), as they reported that there were fifteen specific chronic physical conditions which were associated with chronic pain. These conditions are: osteoporosis, arthritis, neck or back disorders, heart disease, bronchitis or emphysema, stroke, diabetes mellitus, endometriosis, migraine, cancer, mental health problem, thyroid disease, gallbladder disease and bowel diseases.

However, being cross-sectional in design, this study was unable to measure the cause and effect. Furthermore, all the diseases were self-reported and no validation was done through review of medical records.

2.5.7 Cultural

Ethnic differences in pain perceptions have been documented in previous literatures. Most of the studies reported great disparities of pain perception between African-Americans and whites (Green, C. R., Anderson, K. O., Baker, T. A. et al., 2003; Klonoff, E. A., 2009; Green, Carmen Reneé, et al., 2003; Riley III, J. L., Wade, J. B., Myers, C. D. et al., 2002; Edwards, R. R., Moric, M., Husfeldt, B. et al., 2005). In few studies, African-Americans reported greater pain experience and disability in certain diseases such as glaucoma, AIDS, postoperative pain, arthritis and others (Green, C.R., et al., 2003; Klonoff, E. A., 2009) . A recent review in US also found a higher prevalence of pain symptoms among American Indians and Alaska natives compared with US general population (Jimenez, N., Garroutte, E., Kundu, A. et al., 2011).

Diversity of pain perception among ethnic group was also observed in other countries such as Singapore (Chan, A., Malhotra, C., Do, Y. K. et al., 2011), Australia and China (Zhu, X., Wong, F., Bensoussan, A. et al., 2010), Swedish (Sjölander, P., 2011) and in Australia (Stanaway, F. F., Blyth, F. M., Cumming, R. G. et al., 2011). For example, among Singaporean, it was reported that Malay have lower pain severity compared to Chinese ethnicity, and Indian reported greater pain severity compared to others (Chan, A., et al., 2011). There were also differences in term of menstrual pain among women recruited from Australia and China whereby Australian women reported more intense menstrual pain compared to Chinese women (Zhu, X., et al., 2010).

The mechanism for the above differences could be attributed to physiological and sociocultural mechanism (Campbell, C. M. & Edwards, R. R., 2012). Few factors has been identified with regards to physiological mechanism such as differential functioning of endogenous pain-regulatory system (Campbell, C., 2008; Campbell, C. M., Edwards, R. R., & Fillingim, R. B., 2005; Mechlin, B., Heymen, S., Edwards, C. L. et al., 2011) , different level of pain-related biomarkers among the ethnic group such as in a study by Mechlin et al (Mechlin, M. B., Maixner, W., Light, K. C. et al., 2005) whereby norepinephrine and cortisol functioned more effectively among Whites than African-Americans. Apart from that, it was also documented that a neuropeptide associated with social affiliation i.e. oxytocin also differs between ethnic group which has links to pain perception (Rahim-Williams, F. B., Riley, J. L., Herrera, D. et al., 2007). Other pain-related biomarker such as β-endorphin also differs among the ethnic groups (Mechlin, B., Morrow, A. L., Maixner, W. et al., 2007). This marker is an endogenous opioid neurotransmitter in the central and peripheral nervous system which modulates the hypothalamic-pituitary-axis (HPA). The greater the concentration the higher pain tolerance in the individual. The authors also found that higher norepinephrine and blood pressure were associated with reduced pain among non-Hispanic Whites, while higher norepinephrine were associated with increased pain among African-American, demonstrating ethnic differences in pain regulatory mechanism (Mechlin, B., et al., 2011).

Another component which also influences experience of and response to pain is sociocultural (patient, provider and system). Patient factors include family tradition, religious belief, previous experience to pain and education level of the patient (Edwards, R. R., Giles, J., Bingham III, C. O. et al., 2010; Edwards, R. R., Goble, L., Kwan, A. et al., 2006; Miettinen, T., Lindgren, K.-A., Airaksinen, O. et al., 2002). Provider perspectives includes inadequate care or treatment such as the minorities ethnicity were

less likely to receive pain medication and receive lower dose of pain medication (Shavers, V. L., Bakos, A., & Sheppard, V. B., 2010) including cancer patients (Cleeland, C. S., Gonin, R., Baez, L. et al., 1997). Language barrier among the provider also lead to disparities of treatment received (Harrison, A., Ahmed Busabir, A., ObeidAl-Kaabi, A. et al., 1996) as well as inadequate training of the providers in pain management (Anderson, K. O., Green, C. R., & Payne, R., 2009). Finally, the healthcare system also may cause ethnic differences in pain perception. As reported previously, experiences of mistreatment or discrimination may also contribute to experience and perception of pain (Williams, D. R., Neighbors, H. W., & Jackson, J. S., 2003; Johnson, R. L., Saha, S., Arbelaez, J. J. et al., 2004). For example, African-American reported greater perception of discrimination while receiving treatment and lead to greater predictors of back pain among them (Edwards, R. R., 2008).

2.6 Pain Interference among Older People

The pattern of pain prevalence in older people remains unclear. Some studies reported certain types of pain decrease with age while other types of pain such as joint pain increase with age (Gibson, S. J. & Helme, R. D., 2001; Helme, R. D. & Gibson, S. J., 2001; Sternbach, R. A., 1986; Dionne, C. E., et al., 2006). In some studies, prevalence of pain-related interference among older people are greater compared to younger adults (Thomas, E., Peat, G., Harris, L. et al., 2004; Yu, H. Y., et al., 2006; Przekop, P., Haviland, M. G., Oda, K. et al., 2014; Barry, L. C., Allore, H. G., Bruce, M. L. et al., 2009; Shi, Y., Hooten, W. M., Roberts, R. O. et al., 2010). The high prevalence of pain interference among older people may be due to duration of years in pain that they suffered, loss of muscle strength as well as its cumulative stress effects (Ayis, S. & Dieppe, P., 2009; Dominick, C. H., et al., 2012). Most literatures reported that female, low educational background, higher BMI

and poor sleeping quality were significantly associated with pain interference (Shi, Y., et al., 2010; Przekop, P., et al., 2014; Weiner, D. K., Rudy, T. E., Kim, Y. S. et al., 2004).

2.7 Impacts of Chronic Pain

The impacts of chronic pain on the individual as well as the population are devastating. It can be physical, psychological, social and economical as well. Among the sufferers, many studies have found that chronic pain affects their daily activities (Johannes, C. B., et al., 2010; Blyth, F. M., et al., 2001; Chung, J. W. Y. & Wong, T. K. S., 2007; Yeo, S. N. & Tay, K. H., 2009; Breivik, H., et al., 2006). A study (Breivik, H., et al., 2006) also reported that chronic pain severely affects the person's sleep, ability to exercise, attending social activities and walking. The study (Breivik, H., et al., 2006) also reported that chronic pain affected the person's employment status where the mean time lost from work due to chronic pain was between seven to eight days. Nineteen percent of the respondents in the study had lost job opportunities due to chronic pain itself. Apart from absenteeism from work, chronic pain also caused reduction in work effectiveness on those days where the person worked with pain (van Leeuwen, M. T., et al., 2006). Furthermore, many studies also found that presence of chronic pain led to poor self-rating of health conditions (Blyth, F. M., et al., 2001; Mallen, C., Peat, G., Thomas, E. et al., 2005; Yeo, S. N. & Tay, K. H., 2009).

Chronic pain also affects the family members of the chronic pain sufferers. There were studies which found that chronic pain could alter the traditional family roles, deterioration of sexual and marital relationship, causing financial difficulties and creating distress to other family members (Flor, H., et al., 1987). Both studies concluded that there were increases in the time spent in housekeeping and household maintenance of the family members and spouses since most of their time were directed towards the care of the chronic pain sufferers which later led to significant decrease in time spent for their own

personal needs and leisure activities. Thus, this can aggravate stress and depression among the family members or careers and worsen the conditions (Kemler, M. A. & Furnée, C. A., 2002).

Older people with persistent pain tend to limit their activities since any amount of activity may exacerbates the pain they suffered. Previous studies have reported that older people may limits activity as they are afraid of re-injury or falling (Hübscher, M., Vogt, L., Schmidt, K. et al., 2010; Crombie, I. K., Irvine, L., Williams, B. et al., 2004). Although it was shown in acute pain that rest or limitation of activities may heal pain, this does not apply to chronic pain. In chronic pain, limiting activity has been shown to cause restriction, as well as increase disability (Jensen, M. P., Moore, M. R., Bockow, T. B. et al., 2011). In fact, limitation of activity among those with pain may results in weight gain and obesity among adults (Strine, T. W., Hootman, J. M., Chapman, D. P. et al., 2005). Increase in weight will contribute more to pain at weight bearing joints such as knees, hips and lower back (Andersen, R. E., et al., 2003; McCarthy, L. H., Bigal, M. E., Katz, M. et al., 2009).

Sleep deprivation is another condition that often affects older people with chronic pain. About 42.0% of older people with chronic pain experience chronic sleep deprivation (Artner, J., Cakir, B., Spiekermann, J. A. et al., 2013). It was also reported that older people were twice likely to report difficulties in initiating sleeping, in staying asleep and problem with sleeping longer (Chen, Q., Hayman, L. L., Shmerling, R. H. et al., 2011). Sleep deprivation lead to a cycle of persistent fatigue among older people (Valentine, R. J., Woods, J. A., McAuley, E. et al., 2011) and fatigue lead to poor physical function and greater disability (Lin, C. W. C., McAuley, J. H., Macedo, L. et al., 2011).

2.8 Chronic pain and healthcare utilization

Chronic pain is not only common, but it is also very costly. Research has shown that healthcare costs associated with chronic pain are enormous. Costs of pain itself can be divided into two major components; the incremental costs of medical care due to pain (direct cost) and indirect costs of pain due to low economic productivity associated with loss of wages, disability days and fewer hours worked. Direct costs include the costs of running the health service (building), the cost of pharmaceutical and over-the-counter medications.

The treatment of chronic pain is expensive as reported by few studies on cost of pharmaceutical. In the United Kingdom, an estimated of 584 million pound is spent annually on pain prescriptions alone (Donaldson, L., 2009). Turk et al reported that the annual cost of pharmaceutical for pain management was 16.4 billion dollar in the United States (Turk, D. C. & Theodore, B. R., 2011). In fact, certain countries such as United States and Australia reported that chronic pain conditions are among the most costly health condition. In the United States for example, the National Institute of Health reported that the annual cost of pain, which was ranges between 560 to 635 billion dollar was greater than the annual cost of other diseases such as heart disease (309 billion), cancer (243 billion) and diabetes (188 billion) (Institute of Medicine, 2011). Whereas in Australia, chronic pain condition is the third most costly health condition after cardiovascular disease and musculoskeletal conditions, which is also associated with chronic pain. The total economic cost of chronic pain in 2007 was reported as 34 billion, including 11 billion of productivity costs and 7 billion of direct health care cost (Economics Access, 2007).

In addition to direct medical costs, indirect costs for chronic pain are also substantial. These include lost for productivity, missed days at work, activity limitations, functional impairments and physical disability as well as disability compensation. In a study by Melhorn et al, it was reported that 100 billion dollars is spent annually on healthcare cost, loss of wages, loss of work productivity and compensation from back pain alone (Melhorn, J. M., 2000). In Australia, Schofield et al (2012) reported about 40% of people aged between 45 and 64 years old (estimated around 280,000 people) had dropped out of workforce due to arthritis and back pain (Schofield, 2012). This has led to significant impact on workplace productivity which estimated to cost the economy over 4 billion dollars for compensation.

Additionally, as reviewed by Lalonde et al (2014), economic burden of chronic pain increases with severity of pain and pain disability (Lalonde, L., Choinière, M., Martin, É. et al., 2014). This was observed in a study conducted among the Swedish older people which reported that the more severe the chronic pain, the more extensive (and expensive) the use of resources thus increase the cost of society (Bernfort, L., Gerdle, B., Rahmqvist, M. et al., 2015) . Even though the older people rarely requires sick leave, however the cost related to informal care, municipal services and drugs must never be neglected. In fact, indirect costs constituted the majority of costs in chronic pain studies.

Pain is one of the cost common reasons that people seek healthcare. In a study by Mantyselka et al (2003), it was reported that 40% of primary healthcare visits were pain-related (Mäntyselkä, P. T., Turunen, J. H., Ahonen, R. S. et al., 2003). For individuals suffering from chronic pain, this is made worse due to the chronic nature of this condition. Many studies have found that chronic pain sufferers increased health service utilization (Eriksen, J., Sjøgren, P., Ekholm, O. et al., 2004; Miaskowski, C., 2000; Blyth, F. M., et al., 2004). In a study conducted in Denmark (Erikesen, J., et al., 2003; Eriksen, J., et al.,

2004) chronic pain groups utilized health care system twice as much when compared to non-chronic pain groups. Even though chronic pain groups used a lot of resources, a follow up study done in 2009 (Sjøgren, P., et al., 2009) in Denmark found that more than one-third of chronic pain patients were still unsatisfied with the examination, treatment and medications that they received for chronic pain. Thus, this will lead to further usage of health care system and a poor quality of life for the chronic pain sufferers. Previous study (Blyth, F. M., et al., 2004) also reported that chronic pain sufferers were associated with increased hospitalization and increase General Practitioners (GP) visits within the twelve months duration. It was reported that there were two-fold increase in General Practitioners visits, five-fold increase in Emergency Department visits among the chronic pain compared to non-chronic pain sufferers.

2.9 Conceptual Framework of Research

The primary outcome measure for this study was chronic pain. This is best conceptualized in a biopsychosocial model of chronic pain.

2.9.1 The Biopsychosocial model of Chronic Pain

The framework of the biopsychosocial model of chronic pain is shown in Figure 2.2. George Engel (Engel, G. L., 1980) is credited as the first person which calls for the need of new approach to the traditional biomedical concepts in the field of medicine at that time. This lead to major development and evolution of biopsychosocial model by Gatchel (Gatchel, R. J., 2005). The biopsychosocial model of chronic pain emphasizes the dynamic and complex interaction between physiological, psychological and social factors. This model focuses on disease and illness, where disease is defined as an objective biological event which involves disruption of specific body structure or organ system due to either anatomical, pathological or physiological changes, whereas, an illness refers to subjective experience or self-attribution that a disease is present, which

includes how sick person and family members live with and respond to pain and disability (Gatchel, R. J., 2004; Turk, D. C. & Monarch, E. S., 1996). Over the past 30-40 years, this model has become widely accepted in pain research.

This model demonstrates the role of important variables that influence the relationships between the physiological, psychological and social factors. According to the model, pain is influenced by the three factors, physiological, psychological and social factors. As reported by Gatchel, many psychological and socioeconomic factors interact with physiology of pain (Gatchel, R. J., 2004). It was concluded in this study that all the three factors need to be considered in the management of chronic pain, in order to understand patient's perception and response to illnesses. This, coincides with the nociceptive and affective pain pathways (Gatchel, R. J., 2004) as well as the important neurotransmitters responsible in pathophysiology of mood disorders and pain process, i.e. norepinephrine and serotonin.

All the risk factors and predictors of chronic pain discussed previously can be outlined in the biopsychosocial model of chronic pain. The biological factors include age, gender, ethnicity, comorbidities, overweight, and obesity. The psychological factors include severe depression, somatic function, social dysfunction, anxiety and insomnia. Finally, the social factors include education level, area of residency and marital status. This thesis will look into all the aforementioned factors in establishing prevalence of chronic pain and its association with healthcare utilization.

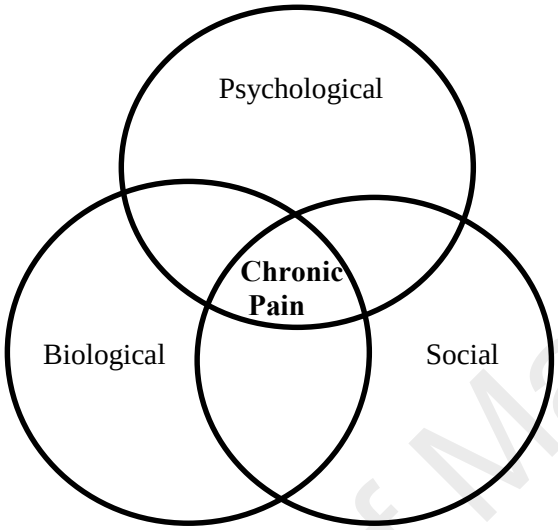

Figure 2.2: Biopsychosocial Model of Chronic Pain

(Gatchel, R. J. & Dersh, J., 2002)

2.9.2 Andersen and Newman Healthcare Utilization Model

To measure the association between chronic pain and health care utilization, a widely used behaviour model of health service utilization proposed by Andersen (Andersen, R. & Newman, J. F., 1973) that described three broad categories that affect health care utilization: societal determinants, health service system and individual determinants factors is used. The societal determinants factors include technology which are principles and tools used to bring about changes and norm which are ways or methods in which members of society comply. Health service system is a factor that includes health related services and goods such as physician care and drugs. The third broad category is individual factor and this is a distal major factor which influences health care utilization. This comprised of *predisposing*, *enabling* and *illness level*. Among all these factors, *illness level* has the largest influence on health care utilization and is the most researched topic. For the purpose of this study, only the distal major factor is evaluated i.e. the individual factor. In this study, the major direction of the causal pathway is such that chronic pain alone will increase the use of health care services since the pain is usually chronic thus causing repetition of seeking treatment. In fact, it is also worth noting that this model has been successfully used as a theoretical pathway for several pain research (Blyth, F. M., et al., 2004; Cook, A. J. & Thomas, M. R., 1994).

In the distal major factors, *illness level* which is a need factor is the most important factor that predict the health care utilization. These include perceived illness and disability, diagnosis and general state of the individual. *Enabling factor* are factors which influence the access to the health care services such as income level, health insurance, accessibility or time constraint. Whereas, *Predisposing factors* are factors which already exist in the individual prior to the onset of illness such as demographic characteristics which include age, gender, ethnicity and social class and this could influence attitude and beliefs of

individual towards the use of health care services. As studied earlier, within this framework, the health need factors have the largest influence on health care utilization (Blyth, F. M., et al., 2004; Korten, A., Jacomb, P., Jiao, Z. et al., 1998; McCallum, J., Simons, L., Simons, J. et al., 1996). Demographic factors have not been a strong predictors of health care use in pain studies (Chrubasik, S., Junck, H., Zappe, H. et al., 1998; Szpalski, M., Nordin, M., Skovron, M. et al., 1995; Von Korff, M., Wagner, E. H., Dworkin, S. F. et al., 1991). The framework in Figure 2.3 shows the interplay of factors.

This study concentrates on the three main individual determinants; predisposing, enabling and illness level, as highlighted in Figure 2.3. Predisposing factors studied includes age, gender, marital status and ethnicity. Enabling factors applied includes education level and area of residency. Whereas, illness level factors studied includes chronic pain itself, presence of comorbidities, and presence of psychiatric morbidity as well as obesity status.

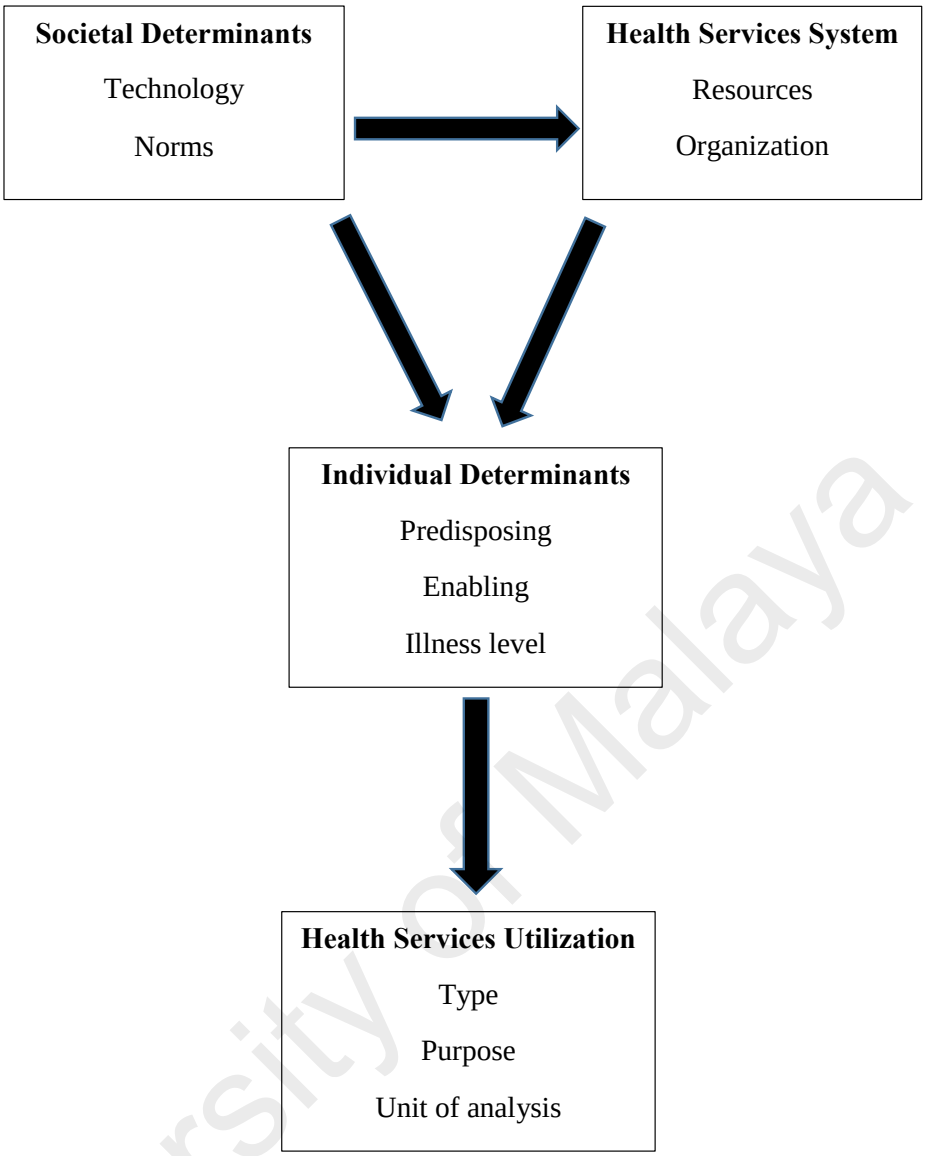

Figure 2.3: Andersen and Newman Healthcare Utilization Model

Source: Adapted from Andersen and Newman's (1973) Utilization framework (Aday, L. & Awe, W., 1997).

2.10 Summary

Chronic pain is a major public health problem, particularly among the older people. The first section of this chapter presented a systematic review on the prevalence of chronic pain, the definitions of chronic pain and measurement strategy used to measure chronic pain among Asian adult. The IASP definition of chronic pain is widely used among the Asian studies with high prevalence rate reported. Different measurement instruments used with different dimensions of pain measured.

In the second part of this chapter, an overview of chronic pain among older people, including the prevalence and risk factors such as age, gender, ethnicity, educational background, body mass index status and presence of abdominal obesity, psychiatric morbidity and other comorbidity were reviewed from many evidences of research that have been done in various parts of the world. The prevalence of chronic pain among older people in developed and developing countries were reported to be high.

The final part of this chapter highlighted literature about chronic pain and healthcare cost as well as patterns of healthcare utilization. Many studies in developed countries reported that chronic pain increased health service utilization tremendously.

This chapter also reviewed the risk factors of chronic pain that were found within the literature, as well as the healthcare cost and healthcare utilization use among chronic pain sufferers.

CHAPTER 3: METHODS

3.1 About this chapter

This chapter explains the methodological approach used for phase two of the study. The chapter starts with the design of the study which is in section 3.1 and this is followed by data source in section 3.2. Section 3.3 describes the sampling and data collection methods used by National Health and Morbidity Survey (NHMS III) 2006. Section 3.4 describes the quality control procedure of the dataset. Participants selected for phase two are described in section 3.5. This is followed by section 3.6 which describes the definition of selected variables of this study. Section 3.7 explains the statistical analysis of the data used. Ethical clearance for this study is described in section 3.8.

3.2 Study Design

The study uses a secondary data analysis from the NHMS 2006 dataset.

3.3 Data Source

The data for this study is obtained from the NHMS conducted in 2006. The NHMS was carried out by the Institute of Public Health (IPH), Malaysia since 1986. Since then, the survey has been conducted every ten years. The second and third surveys were conducted in 1996 and 2006 respectively. The data used for this study was obtained from the third NHMS. The survey described the health and morbidity of the Malaysian population. The target population included all household residents in Malaysia. Data collection was carried out for four months in 2006. Data collected included questions on health expenditure, oral health, load of illness (acute diarrhea illness, acute respiratory illness, recent illness, chronic illness and chronic pain), health utilization, injury and risk reduction practice, physical disability, dengue prevention practice, health information, physical activity, smoking, alcohol, hypertension and hypercholesterolemia, Diabetes Mellitus, infant feeding, nutritional status, women's health, psychiatric morbidity, asthma

and sexual behaviour. Data received was a raw data set and interpretation and transformation of the variables as well as analysis were conducted based on the objectives of this study.

Permission to use the dataset was obtained from the Director General of Health, Ministry of Health, Malaysia. (Appendix A).

3.4 Sampling and Data Collection Methods of the NHMS

The survey used a two-stage stratified random sampling, whereby Malaysia was divided into artificially created contiguous geographical areas called Enumeration Blocks (EBs). Each EB contained about 80 to 120 living quarters (LQs) with about 600 persons. The breakdown of EB strata is depicted in Table 3.1.

Table 3.1: Breakdown of Enumeration Block Strata

Stratum	Population of gazetted areas
Metropolitan	75000 and above
Urban large	10000 to 74999
Urban small	1000 to 9999
Rural	Less than 1000

Source: Adapted from the Third National and Health Morbidity Survey 2006 (Institute for Public Health, 2008).

First stage of sampling was done to randomly select the EB and second stage sampling was done to select the LQ. All persons in the selected LQ were included in the survey. There were 2150 EBs selected for this survey in which 1424 EBs were urban and 726 EBs were from rural area. Total numbers of LQs selected were 17,251 in which only 15,519 LQs were successfully visited. This gave a total sample size of 56,710.

For analysis purposes, all subjects selected from the population were weighted. Weightage variable in this study represents the probability that a case or subject was selected into the sample from a population. The weighting procedure was based on the design of the sampling of this study. First stage was a selection of EB which was further divided into rural and urban to ensure equal chance of selection. Therefore, the final weight of each subject selected was the probability of household being selected within the rural or urban stratification of EBs, multiplied by probability of LQ being selected for this study.

The NHMS III 2006 data was collected via a face-to-face interview. There were two parts involved in the survey. First part was a questionnaire on general households, socio-demographic profile, economic profile, load of illness, health utilization and consumption cost which was conducted by a trained non-medical or paramedical interviewer. Second part of the questionnaire was an objective measurement which involved blood and physical medical examination which was conducted by a trained nurse.

3.5 Quality Control of NHMS III 2006

In order to ensure good data collection, a Quality Control (QC) team was formed prior to the survey. The QC team was responsible to ensure validity of data collected at three stages: pre-data collection, during data collection and post data collection. The quality control procedures involved during pre-data collection were questionnaire preparation by expert in the field, test-retest of questionnaire, intensive training for interviewers, manual preparation, translation of questionnaires as well as pilot testing of the questionnaires. Pilot testing was conducted on a sample of EB i.e. Sepang, Klang and Bangsar which were not included in the actual survey.

During the actual data collection, the QC team continuously monitored the data collection process by frequent visits to the field. Every interviewer had to follow the guidelines produced by the QC team which required the filling up of "P Form" (result of blood investigation) and "Q Form" (result of interview session) after each interview. All interviewers were responsible to ensure that the questionnaire was completed. Upon completion of data collection, all data were entered into a computerized system using a double entry manual method and any discrepancies between both entries were verified by the supervisors.

3.6 Selected Participants

This study focused on chronic pain among the older people. Therefore, the analysis of the study were based on the older people aged 60 and above. In order to maintain the complex design of the survey data, an indicator variable which represented the older people population in this sample was developed. Using this indicator variable, a subpopulation analysis was then conducted throughout the study. The total of older people in the sample was 4954. Figure 3.1 shows the subpopulation sample of this study.

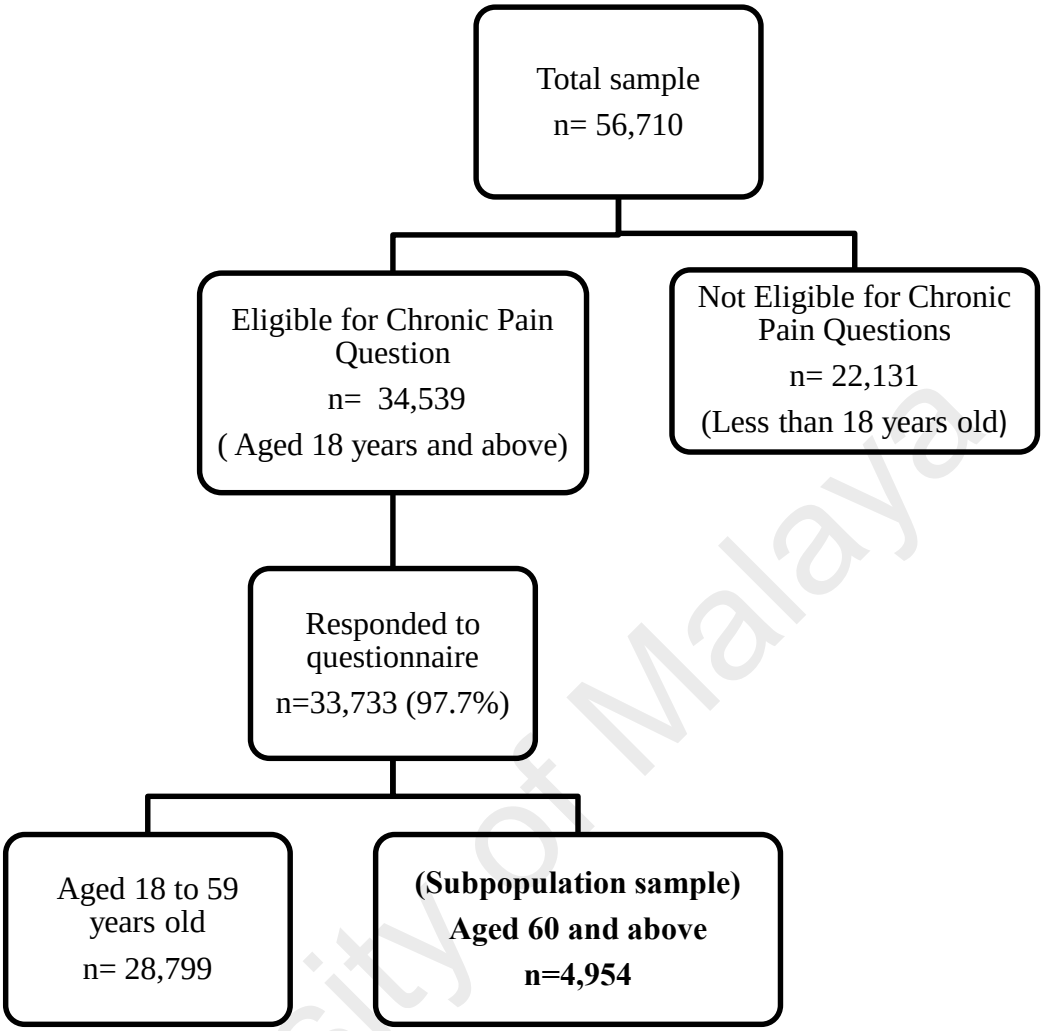

Figure 3.1: Flow of Selected Subpopulation

3.7 Definitions of Selected Variables Used in the Analyses

3.7.1 Independent Variables

Independent variables used in the analyses were age, gender, ethnicity, educational status, marital status, area of residency, body mass index (BMI), waist circumference, comorbidity and psychiatric morbidity. Definitions for selected independent variables are:

(a) ***Age***

Respondents aged 60 and above. The respondents were grouped into young-old (aged 60-74 years old) and old-old (aged 75 years and above) category.

(b) ***Gender***

Gender was classified into male and female.

(c) ***Ethnicity***

Ethnicity refers to a group's relative homogeneity with respect to biological inheritance. For the purpose of analysis, ethnicity was grouped into Malay, Chinese, Indian and Others.

(d) ***Education Level***

Education level is defined as the highest education level that the respondent had already attained. For analysis purposes, the education level was classified into no formal education, primary, secondary and tertiary level.

(e) ***Marital Status***

Marital status was classified into not married, married, widow/divorcee and widow/widower for the purpose of analysis.

(f) ***Area of Residency***

Area of residency was classified into urban and rural.

(g) ***Body Mass Index (BMI)***

Anthropometric measurement (height, weight, waist circumference and half arm span) were performed among participants aged 18 years and above in the NHMS III. All the measurements were carried out according to the World Health Organization (WHO) protocol (WHO, 1995). Body weight was measured in light indoor clothing without shoes to the nearest 0.1 kilogram using a Tania digital lithium weighing scale. Height was measured without shoes to the nearest 0.1 centimeter using a SECA portable body meter. The BMI classification recommended by the WHO/IASO/IOTF 2000 (WHO, 2000) was used to determine the nutritional status of the older people in this study (Table 3.2).

Table 3.2: Classification of Obesity

Classification	BMI cut-off points
Underweight	<18.5
Normal	18.5-22.9
Overweight	23.0-27.4
Pre-Obese	27.5-32.4
Obese Class I	32.5-37.4
Obese Class II	≥37.5

Note: The table is created by the author based on the data published by the WHO/IASO/IOTF 2000 (WHO, 2000)

For analysis purposes, BMI categories were grouped into three subgroups which were underweight, normal and those in overweight, pre-obese and obese class I and class II were grouped as overweight and obese group.

(h) ***Waist Circumference***

Apart from BMI classification, obesity was also recorded using waist circumference as abdominal obesity. Waist circumference was measured at the midpoint between the inferior margin of the last rib and the crest of the ilium, using SECA measurement tape to the nearest 0.1 centimeters. The cut-off points for waist circumference in male and female were based on WHO/IASO/IOTF 2000 (WHO, 2000) cut-off points.

Table 3.3: Classification of Abdominal Obesity

Classification	Cut-off points
Abdominal Obesity	Men : ≥ 90 cm
	Women: ≥ 80cm

Note: The table is created by the author based on the data published by the WHO/IASO/IOTF 2000 (WHO, 2000)

(i) ***Presence of Comorbidity***

The NHMS also included questions on the presence of any chronic disease among respondents. Respondents were categorized as having chronic disease (Yes) if they agreed on at least one of the seventeen diseases listed in the codebook, based on the following question: "have you ever been diagnosed by a doctor or medical staff as having…..?". The seventeen chronic diseases listed are hypertension, diabetes mellitus, stroke, arthritis, tuberculosis, asthma, kidney failure, heart disease, thyroid disease, anemia, blood disorders, migraine, cancers, backache, Systemic Lupus Erythematous (SLE), Parkinson's disease and skin diseases.

It was observed that arthritis, migraine, cancers and backache were also listed in the questionnaire. As these diseases may also cause chronic pain,therefore, in order to ensure no over-adjustment in the multivariate modelling, the variables were entered according to the block. Details on the mechanism of analysis were described further in section 3.8.4.

The numbers of comorbidities presence in each respondents were further grouped into three subgroups which were:

i. No Comorbidity

ii. At least One Comorbidity

iii. Two or More Comorbidities

(j) ***Psychiatric Morbidity***

Psychiatric morbidity was measured using a General Health Questionnaire (GHQ-28). This approach has been used previously in another study for detection and assessment of individuals with an increased likelihood of current psychiatric disorder. The GHQ-28 also incorporates four subscales of psychological state namely somatic symptoms, anxiety and insomnia, social dysfunction and severe depression. In GHQ-28, the respondent is asked to compare his or her recent psychological state with his or her usual state. For each item, four answer possibilities are available (1-not at all, 2-no more than usual, 3- rather more than usual, and 4- much more than usual). Each item was scored 0 if the response choice was ‘not at all’ and ‘no more than usual’; and scored 1 if the response choice was ‘rather more than usual’ and ‘much more than usual’. A total score

on the GHQ-28 represents likelihood of psychiatric disorders if the score was 6 and above. A score was also derived from all the four subscales of psychological state. A high score will increase the likelihood of a particular psychological state.

This GHQ-28 has been validated for use in the Malaysian population. There was a high degree of internal consistency with Cronbach's alpha value of 0.37 to 0.79, while total scores were 0.79. The test-retest correlation coefficient of GHQ-28 was also highly significant with intraclass correlation coefficient of 0.35-0.79 (Maniam, T., 1996).

3.7.2 Dependent/ Outcome Variables

Outcome/dependent variables used in the analysis were chronic pain, pain interference and healthcare utilization variables i.e. hospitalization and ambulatory care service (ACS) visits. Definitions for selected dependent variables are:

3.7.2.1 Chronic Pain and Pain interference

Chronic Pain is defined as pain which has lasted for 3 months or more. The presence of chronic pain was assessed by asking the respondents, "In the last six months prior to the interview, do you have pain every day, or most days, lasting for three months or more?". The responses were recorded into two categories:

i. Yes
ii. No

The respondents who reported having chronic pain were further asked about the impact of pain with the following question, "In the last six months, does the pain interfere with your ability to work, study or manage day to day activities?". Responses to this question were as follows:

i. Not At All

ii. A Little Bit

iii. Moderately

iv. Quite A Lot

v. Extremely

For the purpose of analysis of this study, responses were further grouped into:

1. Pain with interference: Those who answered 'A little bit', 'Moderately', 'Quite A Lot' and 'Extremely' for the above question.
2. Pain without interference: Those who answered 'Not at all' for the above question.

This approach had been used previously in other epidemiological studies of pain (Blyth, F. M., et al., 2001; Hairi, N. N., et al., 2013; Thomas, E., Mottram, S., Peat, G. et al., 2007).

1. Test-Retest Reliability Analysis of Chronic Pain Questionnaire

Prior to analysis of dataset, the chronic pain questionnaire was tested in another sample of older people in order to test its reliability. A test-retest reliability study has been conducted at two weeks of interval among Malaysian older people aged 60 and above in 2013. The questionnaire was tested in another study conducted for other objectives and not assessing chronic pain as its own outcome. Out of the 408 people who completed the baseline questionnaire, only 345 participants completed the retest questionnaire. Of these, 246 replied that the status of their chronic pain was unchanged during the two weeks interval. This gave a percentage agreement of 71.3%. The Kappa coefficient statistics was 0.236, which was considered to be fair agreement as proposed by Landis and Koch (Landis, J. R. & Koch, G. G., 1977).

3.7.2.2 Health care Utilization

(a) ***Hospital admission***

The main outcome variables measured were hospitalization and the use of ambulatory care services. Hospitalization was measured by asking, "In the last twelve months, have you ever been admitted to hospital?". The respondent who reported any hospitalization within that period were also asked about frequency of hospital admission, place of hospitalization and type of care received during hospital admission. Responses to place of hospitalization were divided into public, private or a combination for the purpose of analysis. Responses to type of care received were divided into in-patient nursing care, in-patient rehabilitative care and in-patient long term care.

(b) ***Ambulatory Care Service***

Another outcome variable was usage of ambulatory care services. It is defined as "any healthcare provided to persons in physician's office, hospital outpatient departments and hospital emergency department without their admission to health facility". The respondents were asked, "In the last one month, did you have any health problem (not including oral health) which required any health treatment or health care?". The respondent who reported "yes" for the above question was further asked on the type of facilities. Frequency of visits to healthcare facilities was also recorded for this section. These questions about the use of health care were not specifically related to the use of services for pain.

Table 3.4: Summary of Selected Variables as well as Scale Of Measurement Used in this Study.

No	Variable	Definition	Scale of Measurement
1	Age	Respondent age at the time of interview.	Continuous: mean Categorical : 1= 60 -74 years 2= 75 years and above
2	Gender	Sex as stated by respondent	Categorical: 1= Male 2= Female
3	Ethnicity	Ethnic group as stated by respondent	Categorical: 1= Malay 2= Chinese 3= Indian 4= Others
4	Marital status	Marital status as stated by respondent	Categorical: 1= Not married 2= Married 3= Divorcee 4= Widow/ widower
5	Highest Education Level	The complete highest level of formal education according to Malaysian education system **Primary**: Standard 1 to standard 6 **Secondary**: Awarded SRP/PMR/LCE and SPM (Form 1-6) **Tertiary**: University, Institute, College (Awarded Diploma or Bachelor degree or Post Graduate degree)	Categorical: 1= No formal education 2= Primary 3= Secondary 4= Tertiary

Table 3.4 Continued

No	Variable	Definition	Scale of Measurement
6	Residency	Place of residence	Categorical: 1= Urban 2= Rural
7	Chronic Pain	Pain every day or most days, lasting for three months or more	Categorical: 1= Yes 2= No
8	Pain interference	Pain which interfere with ability to work, study or manage day to day activities.	Categorical: 1= Pain without interference 2= Pain with interference
9	Number of Comorbidity	Number of chronic diseases present at the time of interview.	Categorical: 0= No comorbidity 1= At least one comorbidity 2 = Two or more comorbidities
10	Presence of Psychiatric Morbidity	Likelihood of psychiatric disorders based on total GHQ-28 score. A score of 6 and above indicate presence of illness.	Categorical : 0= No 1= Yes
11	BMI classification	Ratio of weight to squared height	Categorical: 1= Underweight 2= Normal weight 3= Overweight and obese
12	Presence of Abdominal Obesity	Waist circumference was measured at the midpoint between the inferior margin of the last rib and the crest of the ilium, using SECA measurement tape to the nearest 0.1 centimeters.	Continuous: mean Categorical: 1= Yes 2= No

Table 3.4 Continued

No	Variable	Definition	Scale of Measurement
13	Hospital Admission	Hospital admission not less than 24 hours for the past 1 year	Categorical 0= No 1= Yes
14	Frequency of hospitalization	Number of hospitalization in days	Count
15	Type of hospitals	Place of hospitalization either private, government or both	Categorical: 1= Public 2= Private 3= Combination
16	Types of treatment received	Types of treatment received while patient is hospitalized	Categorical: 1=In-patient nursing care 2=In-patient rehabilitative care 3=In-patient long-term care
17	Ambulatory Care Service usage	Health care provided to person in physician's office, hospital outpatient department and hospital emergency department without admission to health facility	Categorical: 1= Yes 2= No
18	Types of ACS facilities of ACS	Types of facilities used for ACS visits	Categorical: 1=Public 2=Private

3.8 Data Analysis

3.8.1 Preliminary and Exploratory Analyses

Analyses were performed using STATA, version 12.0 (StataCorp LP, College Station, Texas). Categorical data were explored using frequency distribution table in order to check whether all cells are adequate and sufficient in order to run further test. Continuous data were explored graphically using scatterplot matrix and quantitatively by its skewness and kurtosis values. All measures of central tendency such as mean, and median were also examined. A statistical significance cut-off of $p< 0.05$ was used in the analysis.

3.8.2 Missing Data Analysis

Prior to analysis, all dependent variables i.e. chronic pain and healthcare utilization variables and important independent variables such as psychiatric morbidity and obesity variables (BMI category and abdominal obesity) were checked for its missing values. Patterns of missing values were identified whether the missing values are missing completely at random (MCAR), missing at random (MAR) or missing not at random (MNAR) (Little, R. J. & Rubin, D. B., 1989).

Table 3.5: Missing Values Recorded for Selected Variables Among Older People in NHMS III 2006 (n=4954).

No	Variables	Respondents	Missing Values	
			n	%
1	Chronic Pain	4775	179	3.6
2	BMI Classification	4632	322	6.5
3	Abdominal Obesity	4916	38	0.7
4	Psychiatric Morbidity	4954	0	0
5	Hospitalization	4832	122	2.5
6	Ambulatory Care Services*	679	27	3.8

* Based on the 706 older people who responded to question of seeking treatment for recent illness.

Based on the missing values analysis, percentages of missing values varies from 0.7 to 6.5%. Further examination of the missing values revealed that it was missing completely at random (MCAR) since all missing values for the above variables were mainly non response item and not dependable on any other variables. Though the percentages may be 'small', there is no consistent definition of 'small amount of missing data' in the literatures (Little, R. J. & Rubin, D. B., 1989). It may range from 5% or less to 20% (Tabachnick, B. & Fidell, L., 2001). Few methods have been discussed in literatures with its pros and cons on how to deal with missing data (Little, R. J. & Rubin, D. B., 1989; Tabachnick, B. & Fidell, L., 2001; Little, R. J. & Rubin, D. B., 2002). According to previous study (Rubin, D. B., 1996), multiple imputation is a common and appropriate procedure for compensating missing data in a survey data. Therefore, multivariate imputation method was chosen in order to preserve the number of respondents in the sample.

3.8.3 Descriptive Statistics Analysis

Numerical data were described using mean and standard deviations (SD). Categorical data were described using weightage percentage and actual numbers. Bivariate analyses between demographic and other characteristics with chronic pain were described using prevalence ratio (PR). Prevalence ratio is defined as a ratio between prevalence in the exposed group and prevalence in the non-exposed group. PR was chosen since the prevalence of chronic pain among older people was relatively high (more than 10%). Many studies had discussed the advantages and disadvantages of using odds ratio and prevalence ratio in cross-sectional studies (Hairi, N. N., et al., 2013; Lee, J., 1994; Barros, A. & Hirakata, V., 2003; Mendoza-Sassi, R., Beria, J., & Barros, A., 2003). Use of odds ratio (OR) when the outcome is common (more than 10%) will overestimate the strength of relationships and yield an inaccurate measure of utilization rates and ratios.

3.8.4 Inferential Statistics Analysis

Regression analyses were conducted in order to evaluate the relationships of obesity and psychiatric morbidity with the prevalence of chronic pain. As discussed above, instead of OR, Prevalence Ratio (PR) was used using Log Binomial Regression for these results while Zero Inflated Poisson (ZIP) Regression was used to assess how chronic pain is associated with healthcare utilization. Details of how regression was conducted were discussed in the following section:

(a) ***Regression of Obesity with Chronic Pain as a Dependent Variable***

To assess the relationship of obesity and chronic pain, the prevalence ratio (univariate and multivariate) were calculated using Log Binomial Regression model. Log Binomial Regression was chosen since it directly models the prevalence ratio for dichotomous variables and there was no problem for lack of convergence during the analysis since variables used were all categorical variables (Coutinho, L., Scazufca, M., & Menezes, P. R., 2008). The roles of possible confounders were explored using a series of multiple regression. All potential confounders with a p value of less than 0.25 in the univariate analysis were included in multivariate regression. Potential confounders included in Model 2 were ethnicity and educational level. This was followed by additional adjustment for presence of comorbidity in Model 3 and additional adjustment for psychiatric morbidity in Model 4. The above relationship was examined separately for male and female.

(b) ***Regression of Psychiatric Morbidity with Chronic Pain as Dependent Variable***

To assess the relationship of psychiatric morbidity and chronic pain, the prevalence ratio (univariate and multivariate) were calculated using Log Binomial Regression model. As discussed above, Prevalence ratio was chosen instead of Odds Ratio (OR). The roles of possible confounders were explored using a series of multiple regression. All potential confounders with a p value of less than 0.25 in the univariate analysis were included in multivariate regression. Potential confounders included in Model 2 were gender, ethnicity, marital status and educational level. This was followed by additional adjustment for BMI categories in Model 3 and additional adjustment for presence of comorbidity in Model 4.

(c) ***Regression of Chronic Pain and Pain Interference with Health Care Utilization Variables (hospitalization and ACS) as a Dependent Variable***

In this study, the utilization of healthcare was measured as the number of hospitalization and number of ambulatory care facilities visits. Analysis of healthcare utilization is trivial. Most of the time, a large fraction of population are without any utilization of healthcare services during the period of observation. The main statistical issues and potential problems that may arise following data analysis are skewness and excess of zero in the dataset. Poisson regression is the standard count model used to deal with the number of occurrence of an event, in this case the number of hospitalization and ambulatory care visits. However, Poisson only allows equality of mean and variance in its distribution. In this study, exploration analysis of the healthcare utilization data shows that the data violate this assumption. There were presence of under dispersion and excess of zeroes in the data. Therefore, a specification test was conducted to verify the hypothesis

that a modified count model is adequate for the analysis instead of standard count model. In this case, the Vuong test (Vuong, Q. H., 1989) of the standard count model was conducted against the zero-inflated count model. Vuong test showed that Z value was 20.05 with p value of less than 0.001. Therefore, based on this finding it was concluded that ZIP regression was adequate for the analysis.

Zero Inflated Poisson (ZIP) Regression was then used to model the number of hospitalization and visits to ambulatory care facilities over a given period. A series of multiple regression analyses using ZIP regression were used based on the hierarchical level of determination as proposed by Andersen and Newman (Andersen, R. & Newman, J. F., 1973). For each outcome i.e. rate of hospitalization and frequency of visits to Ambulatory Care facilities, three models were created in hierarchical stages entering (1) predisposition, (2) need factors and (3) access factors. For this, the incidence rate ratio (IRR) was used to measure the effect of an explanatory variable on an outcome of interest per unit-person time. IRRs can be interpreted in the same way as odds ratios in logistic regression modelling.

3.9 Ethical Consideration

Ethical approval was obtained from the University of Malaya Medical Centre (UMMC) Medical Ethics Committee (Appendix B). The study was also registered with the National Medical Research Registry (NMRR) at https://www.nmrr.gov.my/. (Appendix C)

3.10 Summary

This chapter elaborates on the methodology used in this thesis particularly on the data used and statistical analysis applied. This study used the NHMS III dataset. Prior to the analysis, the dataset were explored and examined for various issues such as its quality and missing values. The pattern of missing data is examined and treated accordingly. In view of the complex sampling method used in NHMS III, analysis was conducted using a Survey Analysis procedure, which is available in the STATA program. Analysis was conducted based on the objectives of this study. Results were presented as actual numbers, weightage percentages and Prevalence Ratio. The 95% Confidence Interval was also presented where appropriate in the results section. This study has obtained its ethical clearance from UMMC Medical Ethics Committee and is registered with the National Medical Research Registry (NMRR) (NMRR ID: NMRR-12-1411-13581).

CHAPTER 4: RESULTS

4.1 About This Chapter

The purpose of this thesis is to determine the prevalence and correlates of chronic pain among older people, its association with obesity and psychiatric morbidity as well as to investigate whether chronic pain influences health care utilization, namely hospitalization and ambulatory care facilities visits. This chapter is divided into five sections. Section 4.1 describes response rate and demographic characteristics of the respondents. Section 4.2 shows result of the prevalence and correlates of chronic pain among older people. This is followed by Section 4.3 which describes the results of gender difference in the relationship between chronic pain and obesity. Section 4.4 describes the results of chronic pain and psychiatric morbidity. This is followed by Section 4.5, which shows results of the impact of chronic pain on health care utilization. Lastly, section 4.6 concludes chapter four.

Part of this chapter contains results from published journal article for "Chronic pain and Pattern of Health Care Utilization among Malaysian Elderly Population: National Health and Morbidity Survey III (NHMS III, 2006)". Changes have been made according to the guidelines for thesis at the University of Malaya. The tables and references have also been renumbered to maintain consistency within this thesis.

4.2 Response Rate and Demographic Characteristics of Study Sample

There were 4954 respondents aged 60 years and above as part of the national study. Of this, 4780 respondents completed the interviews on chronic pain giving an overall response rate of 96.5%. This sample of older people represents the Malaysian older people population as shown in Table 4.1.

Table 4.1: Comparison of selected demographic characteristics of Malaysian older people according to the National Health and Morbidity Survey (NHMS, 2006) and the Older People Census (2012) of Malaysia.

	NHMS 2006	Older People Census 2012*
60-74 years	82%	79%
75 and above	18%	21%
Male	46%	49%
Female	54%	51%
Malay	53%	46%
Chinese	28%	35%
Indian	6%	7%

**Source: Author's tabulation based on published census data from the Department of Statistics Malaysia (DOSM) in 2010.*

Table 4.2 shows characteristics of the study sample by gender. Majority of the older people are between the ages of 60 to 74 years old (81.7%) and known as young-old population. The mean age for older people in this study is 68.5 years old (± 0.11). Majority are female (53.8%), Malay ethnicity (51.0%), attained at least primary education level (46.5%) and 68.5 % are married at the time of the interview. More than half of the samples (56.5%) were from the urban residential areas. Other characteristics of the study sample are shown in Table 4.2.

Table 4.2: Baseline characteristics of Malaysian older people in the National Health and Morbidity Survey (NHMS 2006), its actual number (n) and weighted percentages (%).

Variables	Men		Women		All	
	Number	(%)	Number	(%)	Number	(%)
Age group						
60-74	1909	(83.8)	2105	(79.9)	4014	(81.7)
75 and above	371	(16.2)	531	(20.1)	902	(18.3)
Ethnicity						
Malay	1185	(50.5)	1399	(51.5)	2584	(51.0)
Chinese	660	(31.1)	744	(30.5)	1404	(30.9)
Indian	132	(6.4)	180	(7.4)	312	(6.9)
Others	303	(12.0)	313	(10.6)	616	(11.2)
Highest level of education						
No formal education	501	(21.0)	1477	(54.7)	1978	(39.1)
Primary	1312	(57.6)	947	(36.9)	2259	(46.5)
Secondary	390	(18.4)	181	(7.7)	571	(12.6)
Tertiary	62	(3.0)	18	(0.7)	80	(1.8)
Marital status						
Not married	31	(1.4)	59	(2.3)	90	(1.9)
Married	2023	(88.7)	1546	(51.0)	3369	(68.5)
Divorcee	101	(4.3)	144	(5.7)	245	(5.0)
Widow/ widower	125	(5.5)	1087	(41.0)	1212	(24.6)
Residency						
Urban	1132	(55.5)	1365	(57.4)	2497	(56.5)
Rural	1148	(44.5)	1271	(42.6)	2419	(43.5)
Presence of Chronic Pain						
Yes	280	(12.3)	475	(18.5)	755	(15.6)
No	1926	(87.7)	2072	(81.5)	3998	(84.4)
Chronic Pain Interference						
Pain without interference	45	(16.6)	40	(9.0)	85	(11.7)
Pain with interference	228	(83.4)	424	(91.0)	652	(88.3)

Table 4.2 Continued

Variables	Men		Women		All	
	Number	(%)	Number	(%)	Number	(%)
Presence of comorbidity						
Present	1023	(45.2)	1342	(51.2)	2365	(48.4)
Absent	1257	(54.8)	1294	(48.8)	2551	(51.6)
Number of comorbidity						
No comorbidity	1279	(55.8)	1307	(49.4)	2586	(52.3)
At least one	652	(28.4)	844	(31.9)	1496	(30.3)
Two or more	362	(15.8)	496	(18.7)	858	(17.4)
Presence of psychiatric Morbidity						
Yes	340	(15.5)	167	(6.8)	507	(10.9)
No	1940	(84.5)	2469	(93.2)	4409	(89.1)
Body Mass Index (BMI) Classification						
Underweight	240	(10.8)	290	(11.4)	530	(11.1)
Normal weight	728	(33.4)	706	(28.8)	1434	(30.9)
Overweight and obesity	1171	(55.8)	1454	(59.8)	2625	(58.0)
Presence of Abdominal Obesity						
Yes	899	(40.1)	1599	(60.7)	2498	(51.2)
No	1396	(59.9)	1060	(39.3)	2456	(48.8)
Hospitalization in 1 year						
Overnight hospital admission in last 12 months	211	(9.4)	255	(8.8)	466	(9.1)
Types of facilities used						
Public	183	(89.2)	183	(84.8)	366	(87.0)
Private	20	(9.8)	30	(14.2)	50	(12.0)
Combination	2	(1.0)	2	(1.0)	4	(1.0)

Table 4.2 Continued

Variables	Men		Women		All	
	Number	(%)	Number	(%)	Number	(%)
Ambulatory care Usage in previous 1 month						
Visited ACS facilities in last 1 month	227	(81.0)	344	(86.9)	571	(84.5)
Type of facilities visited						
Public	95	(62.4)	44	(59.8)	139	(61.5)
Private	57	(37.6)	29	(40.2)	86	(38.5)
Frequency of visits						
Single	151	(99.3)	73	(100.0)	224	(99.5)
Multiple	1	(0.7)	0	(0.0)	1	(0.5)

4.3 Prevalence and Correlates of Chronic Pain among Malaysian older people

The overall prevalence of self-reported chronic pain (pain lasting at least 3 months) among Malaysian older people was 15.6% (95% CI: 14.5, 16.8). Overall, the prevalence of chronic pain increased with advancing age, young-old (60-74 years old, 14.3%) and old-old (75 and above years old, 21.5%) and higher prevalence was seen in females (18.5%) than males (12.3%), among the Indian ethnic group with 23.8% and in rural residency compared to urban (16.8% and 14.7% respectively). A higher prevalence of chronic pain was also observed in those who have no educational background (19.5%) compared to those who attained primary (14.5%) and secondary education (8.7%). Chronic pain prevalence was also highest among overweight and obese group. Prevalence of chronic pain also increased as the number of comorbidities increased (Table 4.3).

Table 4.3: Prevalence of Chronic Pain among older people based on demographic and health characteristics variables.

Characteristics	Number With Chronic Pain	Number of Respondents	Weighted Prevalence	(95% CI)
Overall	755	4954	15.6	(14.5,16.8)
Age group				
60-74(Young-old)	567	3921	14.3	(13.1,15.6)
75 & above (old-old)	188	854	21.5	(18.8,24.4)
Gender				
Male	280	2206	12.3	(10.9,13.8)
Female	471	2543	18.5	(16.9,20.1)
Ethnicity				
Malay	415	2495	16.4	(14.8,18.1)
Chinese	155	1362	11.5	(9.7,13.5)
Indian	70	294	23.8	(18.9,29.4)
Others	111	598	18.5	(15.44,22.0)
Marital Status				
Not Married	6	86	7.4	(3.5,15.5)
Married	474	3268	14.3	(13.0,15.7)
Divorcee	37	232	15.8	(11.5,21.2)
Widow/ widower	234	1163	20.0	(17.7,22.5)
Residency				
Urban	357	2418	14.7	(13.2,16.3)
Rural	394	2331	16.8	(15.1,18.6)
Highest level of education				
No formal education	369	1891	19.5	(17.6,21.5)
Primary	319	2191	14.5	(13.0,16.1)
Secondary	55	633	8.7	(6.7,11.1)
Tertiary*	-	-	-	-

Table 4.3 Continued

Characteristics	Number With Chronic Pain	Number of Respondents	Weighted Prevalence	(95% CI)
Presence of comorbidity				
No comorbidity	313	2419	12.8	(11.4,14.28)
At least one	252	1484	16.8	(14.8,18.8)
Two or more	186	846	21.6	(18.9,24.6)
BMI Classification				
Underweight	75	513	14.4	(11.5,17.9)
Normal	191	1388	13.5	(11.8,15.5)
Overweight & Obese	394	2545	15.4	(13.9,16.9)
Presence of abdominal obesity				
Yes	429	2386	17.8	(16.2,19.5)
No	326	2389	13.4	(12.0,15.0)
Presence of Psychiatric Morbidity				
Yes	62	496	12.3	(9.6,15.6)
No	689	4253	16.0	(14.8,17.3)

* None of the respondents attained tertiary level of education in this sample.

4.3.1 Prevalence of chronic pain by older people categories.

Following stratification of the older people by age group, the number of oldest-old (older people aged 85 and above) was very small (n= 134), thus for analytical purposes, the oldest-old category was grouped into the old-old group. The following analysis used the young-old and old-old group for comparison purposes. Overall, across both young-old and old-old categories, the pattern of chronic pain remained the same except for marital status among the young-old category. Prevalence of chronic pain was highest among the widow/ widower group, whereas in the old-old category, chronic pain was more prevalent among the married group. As can be seen in Table 4.4, across both categories of young-old and old-old, prevalence of chronic pain was significantly higher among female gender, Indian ethnicity, those living in rural areas and those with no educational background. Chronic pain prevalence was also higher among the older people with more two or more comorbidities and those who were overweight, obese and have abdominal obesity.

Table 4.4: Prevalence of chronic pain among elderly based on elderly categories

Characteristics	Number With Chronic Pain	Number of Respondents	Weighted Prevalence	(95% CI)
Young- Old (n=3921)				
Gender				
Male	215	1864	11.3	(9.9,12.9)
Female	352	2057	17.1	(15.5,18.9)
Ethnicity				
Malay	311	2039	15.1	(13.4,16.9)
Chinese	116	1128	10.2	(8.6,12.6)
Indian	53	241	22.2	(17.0,28.3)
Others	84	491	17.1	(13.9,20.9)
Marital status				
Not Married	6	80	6.7	(2.8,15.2)
Married	377	2844	13.1	(11.8,14.5)
Divorcee	26	170	15.0	(10.3,21.3)
Widow/ widower	156	807	19.3	(16.6,22.3)
Residency				
Urban	280	2014	13.9	(12.3,15.6)
Rural	287	1907	14.9	(13.2,16.9)
Highest education level				
No formal education	240	1361	17.7	(15.6,20.0)
Primary	272	1934	14.0	(12.5,15.8)
Secondary	47	522	9.0	(6.8,11.8)
Tertiary	2	75	2.8	(0.8,9.4)
Presence of comorbidity				
Yes	340	1967	17.3	(15.6,19.2)
No	224	1954	11.3	(9.9,12.9)
Number of comorbidity				
No comorbidity	224	1954	11.3	(9.9,12.9)
At least one	184	1217	15.0	(13.1,17.2)
Two or more	156	728	20.9	(18.0,24.2)
BMI classification				
Underweight	42	348	12.2	(9.0,16.2)
Normal weight	131	1094	11.8	(9.9,13.9)

Table 4.4 Continued

Characteristics	Number With Chronic Pain	Number of Respondents	Weighted Prevalence	(95% CI)
Overweight & Obese	339	2277	14.8	(13.3,16.4)
Presence of abdominal obesity				
Yes	340	2005	16.8	(15.1,18.6)
No	227	1916	11.7	(10.3,13.3)
Presence of psychiatric morbidity				
Yes	59	466	12.5	(9.7,15.9)
No	505	3433	14.6	(13.3,15.9)
Old-Old (n=854)				
Gender				
Male	68	353	18.3	(14.7,22.6)
Female	120	501	23.8	(20.2,27.7)
Ethnicity				
Malay	104	456	22.4	(18.8,26.5)
Chinese	39	234	16.6	(12.3,22.0)
Indian	17	53	31.2	(20.3,44.6)
Others	27	107	24.7	(17.1,34.2)
Marital status				
Not Married	1	8	14.1	(2.0,57.2)
Married	97	424	22.1	(18.3,26.5)
Divorcee	11	62	17.8	(10.0,29.6)
Widow/ widower	78	356	21.6	(17.6,26.1)
Residency				
Urban	80	414	19.0	(15.6,23.1)
Rural	108	440	24.4	(20.5,28.8)
Highest education level				
No formal education	131	544	23.8	(20.4,27.6)
Primary	48	263	17.7	(13.4,22.9)
Secondary	6	34	16.5	(7.4,32.8)
Tertiary*	0	0	-	-
Presence of comorbidity				
Yes	99	391	24.9	(20.8,29.5)
No	89	463	18.6	(15.2,22.6)

Table 4.4 Continued

Characteristics	Number With Chronic Pain	Number of Respondents	Weighted Prevalence	(95% CI)
Number of comorbidity				
No comorbidity	89	463	18.6	(15.1,22.6)
At least one	69	270	24.5	(19.9,30.3)
Two or more	30	121	25.7	(18.6,34.5)
BMI classification				
Underweight	33	165	19.1	(13.9,25.7)
Normal weight	60	294	19.9	(15.7,25.1)
Overweight & Obese	55	268	20.6	(16.1,25.9)
Presence of abdominal obesity				
Yes	89	381	22.8	(18.9,27.3)
No	99	473	20.4	(16.8,24.4)
Presence of psychiatric morbidity				
Yes	3	30	9.9	(3.2,26.8)
No	184	820	21.9	(19.2,25.0)

* None of the respondents attained tertiary level of education in this sample.

4.3.2 Socio-demographic correlates of chronic pain among Malaysian older people

In univariate analysis as in Table 4.5 , chronic pain was significantly associated with female gender (PR= 1.50, 95% CI= 1.31, 1.72), Indian ethnicity (PR= 1.45, 95% CI= 1.14, 1.84), widow or widower group (PR= 2.70, 95% CI= 1.24, 5.91) and those with lower educational background i.e. primary (PR= 1.67, 95% CI=1.28, 2.19) and no education (PR=2.25, 95% CI= 1.72, 2.95).

Table 4.5: Univariate analysis of Socio-demographic variables with chronic pain among older people.

Variables	Chronic Pain Present		Chronic Pain Absent		Unadjusted Prevalence Ratio	
	n	(%)	n	(%)	PR	(95% CI)
Gender						
Male	280	(36.5)	1926	(48.2)	1.00	(Reference)
Female	471	(63.5)	2072	(51.8)	1.50	(1.31, 1.72)
Ethnicity						
Malay	415	(53.6)	2080	(50.5)	1.00	(Reference)
Chinese	155	(22.8)	1207	(32.5)	0.69	(0.58, 0.85)
Indian	70	(10.2)	224	(6.1)	1.45	(1.14,1.84)
Others	111	(13.4)	487	(10.9)	1.13	(0.92, 1.38)
Marital status						
Not married	6	(1.0)	80	(2.0)	1.00	(Reference)
Married	474	(62.8)	2794	(70.0)	1.93	(0.89, 4.18)
Divorcee	37	(4.9)	195	(4.8)	2.13	(0.93, 4.89)
Widow/ widower	234	(31.3)	929	(23.2)	2.70	(1.24, 5.91)
Highest level of education						
No formal education	369	(48.5)	1522	(37.0)	2.25	(1.72, 2.95)
Primary	319	(43.4)	1872	(47.3)	1.67	(1.28, 2.19)
Secondary	55	(8.1)	578	(15.7)	1.00	(Reference)
Tertiary*	-		-	-	-	-
Area of residency						
Rural	394	(46.7)	1937	(42.8)	1.00	(Reference)
Urban	357	(53.3)	2061	(57.2)	1.02	(1.00, 1.04)

* None of the respondents attained tertiary level of education in this sample.

4.3.3 Health-related correlates of chronic pain among Malaysian older people

Chronic Pain was also significantly associated with multiple comorbidities (PR=1.69, 95% CI= 1.44, 1.99). Presence of at least one comorbidity (PR= 1.31, 95% CI= 1.12, 1.54) and two or more comorbidities (PR: 1.69, 95% CI: 1.44, 1.99) were significantly associated with Chronic Pain. Chronic Pain was also significantly correlated with abdominal obesity (PR=1.62, 95% CI=1.42, 1.86) as well as overweight and obese individuals (PR=1.23, 95% CI=1.06, 1.44). Presence of psychiatric morbidity was also negatively associated with chronic pain (PR: 0.77, 95% CI: 0.60, 0.92). Presence of psychiatric morbidity alone, protects older people from chronic pain. Table 4.6 illustrate further.

Table 4.6: Univariate analysis of Health-related variables with chronic pain among older people.

Variables	Chronic Pain Present		Chronic Pain Absent		Unadjusted Prevalence Ratio	
	n	(%)	n	(%)	PR	95% CI
Number of comorbidity						
No comorbidity	313	(41.4)	2106	(52.3)	1.00	(Reference)
At least one	252	(33.6)	1232	(30.9)	1.31	(1.12, 1.54)
Two or more	186	(25.0)	660	(16.8)	1.69	(1.44, 1.99)
BMI classification						
Normal	74	(10.7)	433	(11.0)	1.00	(Reference)
Underweight	293	(43.9)	1874	(49.3)	1.08	(0.85, 1.38)
Overweight & Obese	294	(45.4)	1493	(39.7)	1.23	(1.06, 1.44)
Presence of abdominal obesity						
Yes	277	(37.4)	988	(24.9)	1.62	(1.42, 1.86)
No	474	(62.6)	3010	(75.1)	1.00	(Reference)
Presence of psychiatric morbidity						
Yes	62	(8.7)	434	(11.4)	0.77	(0.60, 0.92)
No	689	(91.3)	3564	(88.6)	1.00	(Reference)

A multivariate binomial regression model was then used to determine which variable was independently associated with the prevalence of chronic pain among elderly. Several variables were associated with chronic pain in the multivariate model, including female gender (PR= 1.25, 95% CI=1.06, 1.48), Indian ethnic group (PR= 1.52, 95% CI=1.17, 1.97), Chinese ethnic group (PR: 0.69, 95% CI: 0.56, 0.86), those with no educational background (PR= 2.21, 95% CI= 1.60, 3.05), primary educational background (PR= 1.77, 95% CI= 1.31, 2.39), those with at least one comorbidity (PR= 1.26, 95% CI= 1.06, 1.49), those with two or more comorbidities (PR=1.45, 95% CI= 1.20, 1.74), overweight and obese individuals (PR= 1.19, 95% CI= 1.02, 1.39) and those with abdominal obesity (PR= 1.25, 95% CI= 1.04,1.51) . Other factors, including marital status and psychiatric morbidity, were not significantly associated with chronic pain after adjustment. The results are as shown in Table 4.7.

Table 4.7: Sociodemographic and health-related correlates of chronic pain among older people using the National Health and Morbidity Survey data (NHMS, 2006)

Characteristics	Chronic Pain (%)	Unadjusted Prevalence Ratio PR	(95% CI)	*Adjusted Prevalence Ratio PR	(95% CI)
Gender					
Male	36.5	1.00	(Reference)	1.00	(Reference)
Female	63.5	1.50	(1.31, 1.72)	1.19	(1.03, 1.42)
Ethnicity					
Malay	53.6	1.00	(Reference)	1.00	(Reference)
Chinese	22.8	0.69	(0.58, 0.85)	0.69	(0.56, 0.86)
Indian	10.2	1.45	(1.14, 1.84)	1.50	(1.16, 1.93)
Others	13.4	1.13	(0.92, 1.38)	1.09	(0.88, 1.35)
Marital status					
Not married	1.0	1.00	(Reference)	1.00	(Reference)
Married	62.8	1.93	(0.89, 4.18)	1.64	(0.76, 3.56)
Divorcee	4.9	2.13	(0.93, 4.89)	1.61	(0.69, 3.70)
Widow/ widower	31.1	2.70	(1.24, 5.91)	1.68	(0.77, 3.69)
Residency					
Rural	46.7	1.00	(Reference)	1.00	(Reference)
Urban	53.3	1.02	(1.00, 1.04)	1.01	(0.99, 1.04)
Highest level of education					
No formal education	48.5	2.25	(1.72, 2.95)	2.19	(1.59, 3.01)
Primary	43.4	1.67	(1.28, 2.19)	1.76	(1.30, 2.37)
Secondary	8.1	1.00	(Reference)	1.00	(Reference)
Tertiary	-	-	-	-	-

Table 4.7 Continued

Characteristics	Chronic Pain (%)	Unadjusted Prevalence Ratio PR	(95% CI)	*Adjusted Prevalence Ratio PR	(95% CI)
Number of comorbidity					
No comorbidity	41.4	1.00	(Reference)	1.00	(Reference)
At least one	33.6	1.31	(1.12, 1.54)	1.24	(1.05, 1.48)
Two or more	25.0	1.69	(1.44, 1.99)	1.42	(1.18, 1.71)
BMI classification					
Normal	10.7	1.00	(Reference)	1.00	(Reference)
Underweight	43.9	1.08	(0.85, 1.38)	1.06	(0.83, 1.35)
Overweight & obese	45.4	1.23	(1.06, 1.44)	1.08	(1.02, 1.29)
Presence of abdominal obesity					
Yes	37.4	1.62	(1.42, 1.86)	1.25	(1.04,1.51)
No	62.6	1.00	(Reference)	1.00	(Reference)
Presence of psychiatric morbidity					
Yes	8.7	0.77	(0.60, 0.92)	1.12	(0.86, 1.47)
No	91.3	1.00	(Reference)	1.00	(Reference)

* Adjusted for variables with p value less than 0.25 in univariate analysis

4.4 Prevalence and Correlates of Pain Interference among Malaysian Older People

Among 755 older people with chronic pain, 655 (88.3%) reported some level of interference on their daily activities. Those who reported pain interference were young-old people, age between 60 to 74 years old (73.2%), female gender (65.6%), Malay ethnicity (51.9%), those with no formal educational background (51.3%) as well as those who lives in rural settings (52.1%). Married older people also reported highest interference (60.6%) compared to others and pain interference were more likely among those who were overweight and obese (60.7%) and those with presence of abdominal obesity (58.7%). Table 4.8 elaborates further on characteristics of older people with pain interference.

Univariate association of pain interference among older people with demographic and health-related variables revealed significant association between pain interference with aged group 75 years and above, the old-old category (PR: 1.22, 95% CI: 1.17, 1.27), female gender (PR: 1.09, 95% CI: 1.03, 1.16), Others ethnic group (PR: 1.10, 95% CI: 1.05, 1.16), married (PR: 0.87, 95% CI: 0.84, 0.89), widow/ widower (PR: 0.93, 95% CI: 0.89, 0.96) and those with at least one comorbidity (PR: 1.05, 95% CI: 1.01, 1.10). Other factors such as area of residency, level of highest education attained, BMI classification, abdominal obesity status as well as psychiatric morbidity status were not significantly associated with pain interference. However, upon adjustment in multivariate analysis, the only variables that remained significant were aged group of 75 years and above, other ethnic group, married and widow/ widower group (Table 4.9). Married and widow/widower older people tend to be protective against pain interference compared to unmarried older people.

Table 4.8 : Characteristics of Older People with Pain Interference

Variables	Pain Interference	
	n	%
Age group		
60 - 74	478	73.2
75 and above	177	26.8
Gender		
Male	230	34.4
Female	425	65.6
Ethnicity		
Malay	350	51.9
Chinese	137	23.1
Indian	63	10.5
Others	105	14.5
Highest level of education		
No formal education	340	51.3
Primary	260	40.6
Secondary	48	8.1
Tertiary	0	0
Marital status		
Not married	6	1.0
Married	397	60.6
Divorcee	36	5.6
Widow/ widower	213	32.8
Residency		
Rural	340	46.4
Urban	312	53.6
Number of comorbidity		
No comorbidity	262	40.1
At least one	227	34.8
Two or more	163	25.1
BMI Classification		
Underweight	66	11.0
Normal	163	28.3
Overweight & Obese	339	60.7
Abdominal Obesity		
Yes	379	58.7
No	276	41.3
Presence of psychiatric morbidity		
Yes	53	8.5
No	602	91.5

Table 4.9: Unadjusted and adjusted Prevalence Ratio of Pain Interference among Malaysian Older People

Characteristics	Pain Interference (%)	Unadjusted Prevalence Ratio		*Adjusted Prevalence Ratio	
		PR	(95% CI)	PR	(95% CI)
Age group					
60-74	73.2	1.00	(Reference)	1.00	(Reference)
75 and above	26.8	1.22	(1.17, 1.27)	1.11	(1.05, 1.17)
Gender					
Male	34.4	1.00	(Reference)	1.00	(Reference)
Female	65.6	1.09	(1.03, 1.16)	1.04	(0.97, 1.11)
Ethnicity					
Malay	51.9	1.00	(Reference)	1.00	(Reference)
Chinese	23.1	1.04	(0.98, 1.10)	1.04	(0.97, 1.11)
Indian	10.5	1.04	(0.96, 1.12)	1.02	(0.92, 1.13)
Others	14.5	1.10	(1.05, 1.16)	1.10	(1.03, 1.18)
Marital status					
Not married	1.0	1.00	(Reference)	1.00	(Reference)
Married	60.6	0.87	(0.84, 0.89)	0.85	(0.79, 0.91)
Divorcee	5.6	0.97	(0.92, 1.03)	0.94	(0.86, 1.03)
Widow/ widower	32.8	0.93	(0.89, 0.96)	0.88	(0.82, 0.94)
Residency					
Rural	46.4	1.00	(Reference)	1.00	(Reference)
Urban	53.6	0.97	(0.92, 1.02)	0.99	(0.93, 1.05)

Characteristics	Pain Interference (%)	Unadjusted Prevalence Ratio		*Adjusted Prevalence Ratio	
		PR	(95% CI)	PR	(95% CI)
Highest level of education					
No formal education	51.3	1.07	(0.97, 1.17)	1.03	(0.92, 1.15)
Primary	40.6	0.96	(0.87, 1.05)	0.95	(0.85, 1.07)
Secondary	8.1	1.00	(Reference)	1.00	(Reference)
Tertiary	-	-	-	-	-
Number of comorbidity					
No comorbidity	40.1	1.00	(Reference)	1.00	(Reference)
At least one	34.8	1.05	(1.01, 1.10)	1.03	(0.97, 1.09)
Two or more	25.1	1.03	(0.97, 1.09)	1.05	(0.97, 1.12)
BMI classification					
Normal	11.0	1.00	(Reference)	1.00	(Reference)
Underweight	28.3	1.04	(0.96, 1.13)	1.03	(0.94, 1.13)
Overweight & obese	60.7	1.02	(0.96, 1.08)	1.06	(0.99, 1.13)
Presence of abdominal obesity					
Yes	58.7	1.04	(1.00, 1.09)	1.04	(0.97, 1.11)
No	41.3	1.00	(Reference)	1.00	(Reference)
Presence of psychiatric morbidity					
Yes	8.5	0.95	(0.87, 1.05)	1.05	(0.94, 1.16)
No	91.5	1.00	(Reference)	1.00	(Reference)

* Adjusted for variables with p value less than 0.25 in univariate analysis

4.5 Chronic Pain and Obesity among Malaysian Older People

As reported earlier, overall prevalence of chronic pain was greater in the higher BMI category. About 13.5% of normal weight individuals reported chronic pain, 14.4% of underweight and 15.4% of overweight and obese individuals reported chronic pain (Table 4.3). This pattern remained after stratification of elderly by age categories. It can be concluded that there was a significant dose-response relationship between higher BMI categories with chronic pain; as BMI category increased, so did the prevalence of chronic pain, even after adjusting for several confounders (Table 4.7). Another measurement of obesity in this study was by abdominal circumferences. Prevalence of chronic pain was higher among those with abdominal obesity (17.8%, 95%CI: 16.2, 19.5) compared to those with no abdominal obesity (13.4%, 95%CI: 12.0, 15.0). Overall, presence of abdominal obesity was significantly associated with chronic pain with crude PR of 1.62 (95% CI=1.42, 1.86) and adjusted PR of 1.25 (1.04, 1.51) (Table 4.7).

4.5.1 Gender difference in association between chronic pain, BMI categories and abdominal obesity among Malaysian older people

As discussed earlier, a higher proportion of women than men reported chronic pain if they were overweight and obese or having abdominal obesity. The stratification of older people based on gender is presented in Table 4.10. In men, the crude PR for overweight and obesity with chronic pain was 1.01 (95% CI: 0.77, 1.28). The inclusion of socio demographic variables, presence of comorbidities and psychiatric morbidity showed no change in the association between overweight and obesity with chronic pain among men. Similar pattern was observed in the relationship between abdominal obesity and chronic pain among men. The crude PR for abdominal obesity and chronic pain was 1.17 (95% CI: 0.94, 1.47). After adjustment for important confounders, the relationship remained non-significant with an adjusted PR of 1.16 (95% CI: 0.93, 1.45).

The pattern was different among older women. The crude PR for overweight and obese with chronic pain was 1.20 (95% CI: 1.02, 1.48). After controlling for important confounders the association remained significant with an adjusted PR of 1.23 (95% CI: 1.01, 1.51). Similarly with abdominal obesity, the crude PR for abdominal obesity and chronic pain among women was 1.27 (95% CI: 1.07, 1.52). This association was reduced in magnitude (fully adjusted PR 1.23 (95% CI: 1.03, 1.47) in the multivariate analysis. However, there was no significant relationship found between overweight and obesity with presence of pain interference among older people as shown in Table 4.11.

Table 4.10: Estimated prevalence and prevalence ratios for chronic pain by gender, BMI categories and abdominal obesity

Variables	Chronic Pain		Crude Prevalence Ratio		Adjusted Prevalence Ratio					
					Model 2		Model 3		Model 4	
	n	(%)	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)	PR	(95%CI)
Overall										
Body Mass Index										
Normal weight	**196**	**25.5**	1.00		1.00		1.00		1.00	
Underweight	**75**	**9.5**	1.06	(0.83,1.37)	1.04	(0.81,1.33)	1.08	(0.85,1.39)	1.08	(0.85,1.39)
Overweight & Obese	**484**	**65.0**	1.14	(1.01,1.34)	1.23	(1.04,1.45)	1.16	(1.03,1.37)	1.16	(1.03,1.36)
Abdominal Obesity	**429**	**57.1**	1.33	(1.16,1.52)	1.34	(1.17,1.53)	1.24	(1.08, 1.43)	1.24	(1.08,1.43)
Male (n=2078)										
Normal weight	**87**	**33.4**	1.00		1.00		1.00		1.00	
Underweight	**30**	**11.5**	1.05	(0.71,1.55)	1.04	(0.70,1.54)	1.06	(0.72, 1.56)	1.06	(0.72,1.56)
Overweight & Obese	**134**	**55.1**	1.01	(0.77,1.28)	1.09	(0.84,1.43)	1.01	(0.76,1.32)	1.01	(0.76,1.31)
Abdominal Obesity	**119**	**43.4**	1.17	(0.94,1.47)	1.26	(1.01,1.58)	1.16	(0.93, 1.45)	1.16	(0.93,1.45)
Female (n=2368)										
Normal weight	**104**	**25.4**	1.00		1.00		1.00		1.00	
Underweight	**45**	**10.5**	1.06	(0.77,1.44)	1.03	(0.76,1.41)	1.08	(0.79, 1.48)	1.07	(0.79,1.48)
Overweight & Obese	**260**	**64.1**	1.20	(1.02,1.48)	1.27	(1.03,1.56)	1.23	(1.01,1.51)	1.23	(1.01,1.51)
Abdominal Obesity	**310**	**66.1**	1.27	(1.07,1.52)	1.30	(1.09,1.54)	1.23	(1.03, 1.47)	1.23	(1.03,1.47)

Model 2: Controlled for ethnicity, education level, marital status + BMI category + Abdominal Obesity
Model 3: Controlled for ethnicity, education level, marital status, **presence of comorbidity +** BMI category + Abdominal Obesity
Model 4: Controlled for ethnicity, education level, presence of comorbidity, **psychiatric morbidity** + BMI category + Abdominal Obesity

Table 4.11: Estimated prevalence ratio for presence of interference by BMI category and abdominal obesity

Variables	Presence of pain interference		Crude Prevalence Ratio		Adjusted Prevalence Ratio Model 2		Model 3		Model 4	
	n	(%)	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)	PR	(95%CI)
Overall										
Body Mass Index										
Normal weight	**163**	**28.4**	1.00		1.00		1.00		1.00	
Underweight	**66**	**11.0**	1.03	(0.94,1.12)	1.00	(0.91,1.09)	1.00	(0.91,1.10)	1.01	(0.92,1.11)
Overweight & Obese	**339**	**60.6**	1.01	(0.95,1.08)	1.02	(0.96,1.09)	1.02	(0.96,1.08)	1.02	(0.95,1.08)
Abdominal Obesity	**379**	**58.7**	1.04	(0.99,1.52)	1.04	(0.99,1.09)	1.03	(0.98, 1.09)	1.03	(0.98,1.09)

Model 2: Controlled for ethnicity, education level, marital status
Model 3: Controlled for ethnicity, education level, marital status, **presence of comorbidity**
Model 4: Controlled for ethnicity, education level, presence of comorbidity, **psychiatric morbidity**
Unweighted count, weighted percentages

4.6 Chronic Pain and Psychiatric Morbidity among Malaysian Older People.

A total of 4916 elderly responded to GHQ questionnaire with an overall response rate of 99.2%. The national prevalence of psychiatric morbidity (total GHQ score of 6 and above) among elderly was 10.9% (95% CI: 9.9, 12.0) (Table 4.12). Table 4.13 shows further stratification of older people with and without psychiatric morbidity by chronic pain status. From Table 4.13, it can be summarized that about 8.7% (n=62) of older people with chronic pain were also noted to have psychiatric morbidity.

Table 4.12: Number (n) and percentages (%) of older people by psychiatric morbidity status in Malaysia

	Number of older people n	Percentages %	95% CI
Presence of Psychiatric Morbidity			
Yes	507	10.9	(9.9, 12.0)
No	4409	89.1	(88.1, 90.1)

n= actual numbers
%= weighted percentages

Table 4.13: Number (n) and percentages (%) of older people with and without presence of psychiatric morbidity by chronic pain status in Malaysia

	Chronic Pain Status				Total	
	Yes		No			
	n	%	n	%	n	%
Psychiatric Morbidity Status						
Yes	62	(8.7)	434	(11.4)	496	(11.0)
No	689	(91.3)	3564	(88.6)	4253	(89.0)

n= actual numbers
%= weighted percentages

4.6.1 Somatic Symptoms, Anxiety, Social Dysfunction and Depression among Malaysian older people with Chronic Pain

Apart from the above finding, GHQ also measured other psychiatric illness such as depression, anxiety, somatic symptoms and social dysfunction status. Since presence of psychiatric morbidity status using categorical variable was not significantly associated with chronic pain as reported previously, further exploration using these subscales was conducted. Table 4.14 illustrate further on the mean of GHQ subscales score by chronic pain status.

Overall, the mean scores of individuals with chronic pain for all three psychiatric symptoms which were somatic, anxiety and depression were higher than individuals with no chronic pain. The result suggested that there was a statistically significant difference between the distribution of somatic symptoms score of those with chronic pain and those without chronic pain ($Z= 2.587$, $p=0.0097$). Those with chronic pain are more likely to report somatic symptoms compared to those without chronic pain problem. Somatic symptoms reported include feeling run down and out of sorts, feeling ill, pain and tightness in the head and having hot or cold spells. Other differences were not significant.

Table 4.14: Distribution of mean of GHQ subscales scores by chronic pain status

Variables	Chronic pain		No Chronic Pain		z-value	p-value
	Mean	SE	Mean	SE		
Somatic Symptoms score	4.40	0.29	3.69	0.11	2.587	0.009
Anxiety symptoms score	3.19	0.33	2.93	0.13	1.317	0.188
Social dysfunction score	5.57	0.23	5.98	0.10	-0.833	0.405
Depression score	1.41	0.25	1.02	0.07	1.631	0.103

4.6.2 Association between somatic, anxiety, depression and social dysfunction symptoms with Malaysian older people with chronic pain

In order to observe whether an increase in the score for the above parameters would increase the prevalence of chronic pain, regression analysis was performed using Log-Binomial Regression. Table 4.15 shows the results for crude analysis between chronic pain and somatic, anxiety, depression and social dysfunction symptoms respectively.

From the table, it can be concluded that an increase in somatic and depression symptoms scores by one point, significantly increased the prevalence of chronic pain by a factor of 1.06 (z-value: 2.36, p-value: 0.018) and 1.07 (z-value: 2.11, p-value: 0.035). However, anxiety and social dysfunction symptoms scores did not significantly associate with prevalence of chronic pain.

Table 4.15: Crude Prevalence Ratio of Chronic Pain by Psychiatric Illness Symptoms among older people in Malaysia.

Psychiatric Illness	Crude Prevalence Ratio (PR)	Standard Error (SE)	z-value	p-value	95% Confidence Interval (CI)
Somatic symptoms	1.06	0.027	2.36	0.018	(1.01, 1.12)
Anxiety symptoms	1.01	0.023	0.74	0.460	(0.97, 1.06)
Social dysfunction	0.95	0.031	-1.41	0.160	(0.89, 1.01)
Depression symptoms	1.07	0.036	2.11	0.035	(1.01, 1.15)

In multivariable model (Table 4.16), the effect of somatic symptoms on chronic pain increased when gender, ethnicity, highest educational level attained and marital status variables were added to the model: the prevalence ratio of chronic pain increased from 1.06 (95% CI: 1.02, 1.11) to 1.09 (95% CI: 1.04, 1.14) following an increase in one Standard Deviation (SD) of somatic symptoms score in Model 2. Further addition of BMI categories variable in Model 3 did not change the effect of somatic symptoms on chronic pain. However, upon additional number of comorbidities present, the effect of somatic symptoms on prevalence ratio of chronic pain slightly decreased to1.08 (95% CI: 1.03, 1.14).

Whereas, for anxiety symptoms, even though the initial analysis showed that it had no significant effect on chronic pain, however, upon adjustment for multiple variables (gender, ethnicity, highest educational level, marital status, BMI categories and number of comorbidities present) in Model 4, the effect of anxiety symptoms on chronic pain increased, where the prevalence ratio of chronic pain increased from 1.02 (95% CI: 0.97, 1.06) to 1.05 (95% CI: 1.01, 1.10) for one SD increase in anxiety symptoms.

As for depression symptoms, its effect on chronic pain increased when gender, ethnicity, highest educational level attained and marital status variables were added to Model 2, where the prevalence ratio of chronic pain for an SD increase in depression symptoms increased from 1.07 (95% CI: 1.00, 1.15) to 1.11 (1.03, 1.19), and further increased to 1.12 (1.02, 1.23) as BMI categories variables were added in Model 3, but slightly reduced to 1.11 (95% CI: 1.02, 1.22) when number of comorbidities variable was added in Model 4. However, Social dysfunction variable remained insignificant even after further adjustment in Model 4.

Table 4.16: Crude and Adjusted Prevalence Ratio for Chronic Pain by Psychiatric Symptoms status.

Variables	Crude Prevalence Ratio (95% CI)		Adjusted Prevalence Ratio (95% CI)					
			Model 2		Model 3		Model 4	
Somatic symptoms	1.06	(1.02, 1.11)	1.09	(1.04, 1.14)	1.09	(1.04, 1.14)	1.08	(1.03,1.14)
Anxiety symptoms	1.01	(0.97, 1.06)	1.05	(1.00, 1.10)	1.05	(1.00, 1.10)	1.05	(1.01, 1.10)
Social dysfunction symptoms	0.95	(0.89, 1.01)	0.97	(0.90, 1.04)	0.97	(0.90, 1.04)	0.97	(0.90, 1.05)
Depression symptoms	1.07	(1.00, 1.15)	1.11	(1.03, 1.19)	1.12	(1.02, 1.23)	1.11	(1.02, 1.22)

Model 2: Controlled for gender, ethnicity, education level, marital status
Model 3: Controlled for gender, ethnicity, education level, marital status + BMI categories
Model 4**:** Controlled for gender, ethnicity, education level, marital status, BMI categories + **Presence of comorbidity**

4.7 Chronic Pain and Health Care Utilization among Malaysian Older People

A total of 4804 elderly responded to questions on health care utilization with an overall response rate of 96.9%. About 440 (9.1%) elderly had at least one overnight hospital admission within the duration of 12 months and 224 (4.6%) elderly had at least one visit to ambulatory facilities within the 2 weeks period (Table 4.2). Table 4.17 show the crude and adjusted IRR for different categories of chronic pain with health service usage.

In this study, it was found that having chronic pain alone was significantly related to higher frequency of hospitalization with crude IRR of 1.74 (95% CI: 1.32, 2.30). The inclusion of predisposing variables in Model 2 did not change the magnitude of association between chronic pain and frequency of hospitalization. However, the addition of health needs variables (comorbidities, psychiatric morbidity and BMI) in Model 3 resulted in a slight decrease in the magnitude of association between chronic pain and frequency of hospitalization (Adjusted IRR 1.69, 95% CI: 1.24, 2.28). Further adjustment for access variables (residency and education) did not change the magnitude of association between chronic pain and frequency of hospitalization (Adjusted IRR 1.69, 95% CI: 1.24, 2.31). Among those with Chronic Pain, presence of interference and level of interference did not significantly associate with frequency of hospitalization.

Table 4.17 also shows that chronic pain with a high level of interference with daily activities is associated with reduced visits to ambulatory care facilities compared to those with no interference with daily activities. However, none of the association was significant for chronic pain and visits to ACS facilities as shown in Table 4.18.

Table 4.17: Crude and Adjusted Incidence Rate Ratio (IRR) for different categories of chronic pain, with hospitalization as dependent variable.

Hospitalization in 1 year	Crude IRR for Hospitalization (95% CI)		Adjusted IRR for hospitalization (95% CI) Model 2[a]		Model 3[b]		Model 4[c]	
Chronic Pain								
No	1.00		1.00		1.00		1.00	
Yes	1.74	(1.32,2.30)	1.76	(1.33,2.34)	1.69	(1.24,2.28)	1.69	(1.24,2.31)
Interference								
Absent	1.00		1.00		1.00		1.00	
Present	1.47	(0.62,3.49)	1.49	(0.61,3.63)	1.36	(0.55,3.40)	1.35	(0.54,3.34)
Level of Interference								
No Interference	1.00		1.00		1.00		1.00	
A bit/Little	1.22	(0.51,2.93)	1.24	(0.50,3.06)	1.16	(0.47,2.91)	1.16	(0.47,2.87)
Moderate/Extreme	2.19	(0.84,5.74)	2.22	(0.84,5.88)	1.97	(0.71,5.52)	1.95	(0.70,5.44)

[a] Adjusted for **Predisposing variables**: age, sex, race
[b] Adjusted for **Health Needs variables**: Presence of comorbidity, Psychiatric Morbidity, BMI + Predisposing variables
[c] Adjusted for **Access factors variables**: Residency, Education + Predisposing + Health Need

Table 4.18: Crude and Adjusted Incidence Rate Ratio (IRR) for different categories of chronic pain, with ambulatory care services (ACS) as dependent variable.

Hospitalization in 1 year	Crude IRR for Hospitalization (95% CI)		Adjusted IRR for ACS (95% CI) Model 2[a]		Model 3[b]		Model 4[c]	
Chronic Pain								
No	1.00		1.00		1.00		1.00	
Yes	0.94	(0.64,1.37)	0.95	(0.65,1.39)	1.07	(0.76,1.50)	1.15	(0.81,1.64)
Interference								
Absent	1.00		1.00		1.00		1.00	
Present	0.50	(0.25,1.02)	0.49	(0.29,0.84)	0.53	(0.28,0.99)	0.54	(0.32,0.92)
Level of Interference								
No Interference	1.00		1.00		1.00		1.00	
A bit/Little	0.58	(0.27,1.25)	0.59	(0.33,1.07)	0.59	(0.32,1.08)	0.61	(0.36,1.04)
Moderate/Extreme	0.26	(0.11,0.64)	0.22	(0.09,0.52)	0.27	(0.09,0.84)	0.35	(0.12,0.99)

[a] Adjusted for **Predisposing variables**: age, sex, race
[b] Adjusted for **Health Needs variables**: Presence of comorbidity, Psychiatric Morbidity, BMI + Predisposing variables
[c] Adjusted for **Access factors variables**: Residency, Education + Predisposing + Health Need

A majority (86.3%) of elderly with chronic pain, who had been hospitalized, utilized public hospitals while 11.3% of the elderly relied solely on private hospitals. Only about 2.3% of the elderly used both public and private hospitals for hospitalization purposes (Figure 4.1). In terms of type of treatment received during hospitalization, majority of the elderly received in-patient care (72.2%), followed by in-patient rehabilitative care (17.7%) and in-patient long term nursing care (10.0%) (Figure 4.2). In this study, it was also found that majority of the elderly with chronic pain (99.5%) had at least a single visit to the ambulatory care facilities and only less than 1% (0.5%) had multiple visits for duration of one month. Still, majority (62.3%) of the elderly preferred to use public facilities of ambulatory care and only 37.7% of them utilized private ambulatory facilities (Figure 4.3).

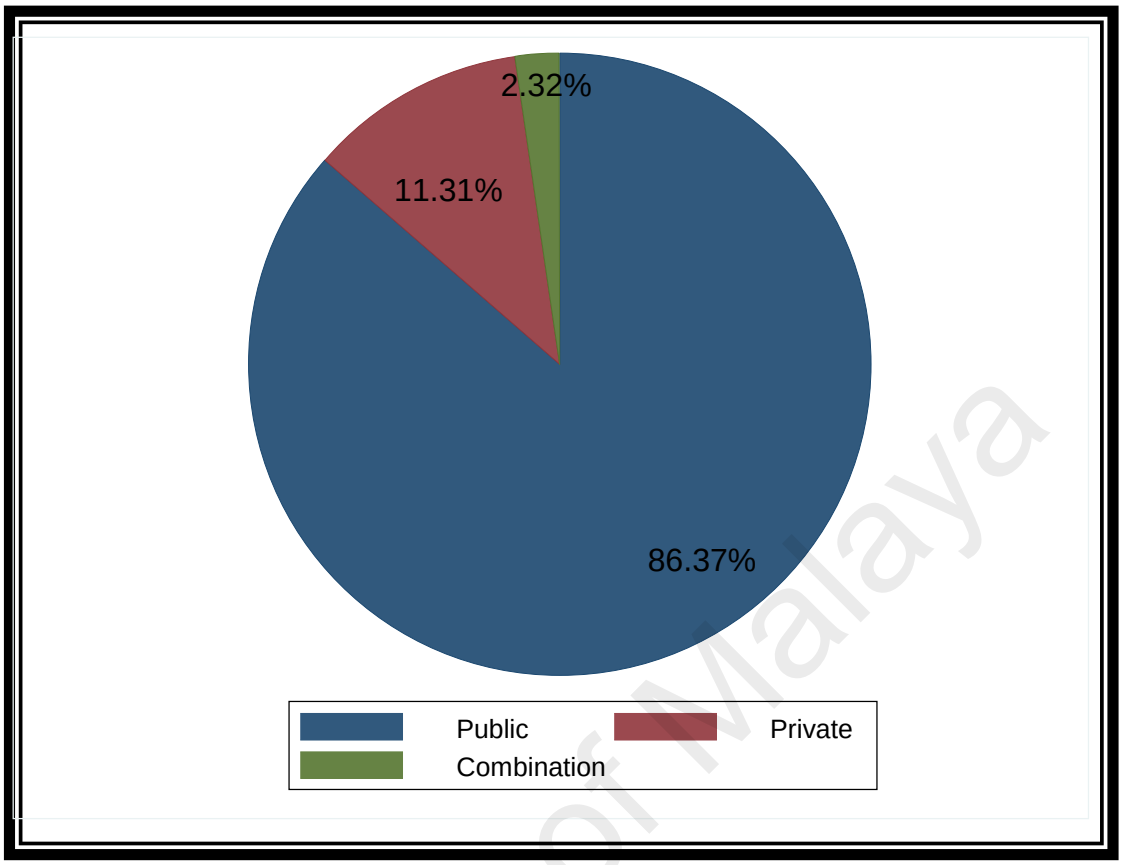

Figure 4.1: Type of facilities used for hospitalization among elderly with chronic pain

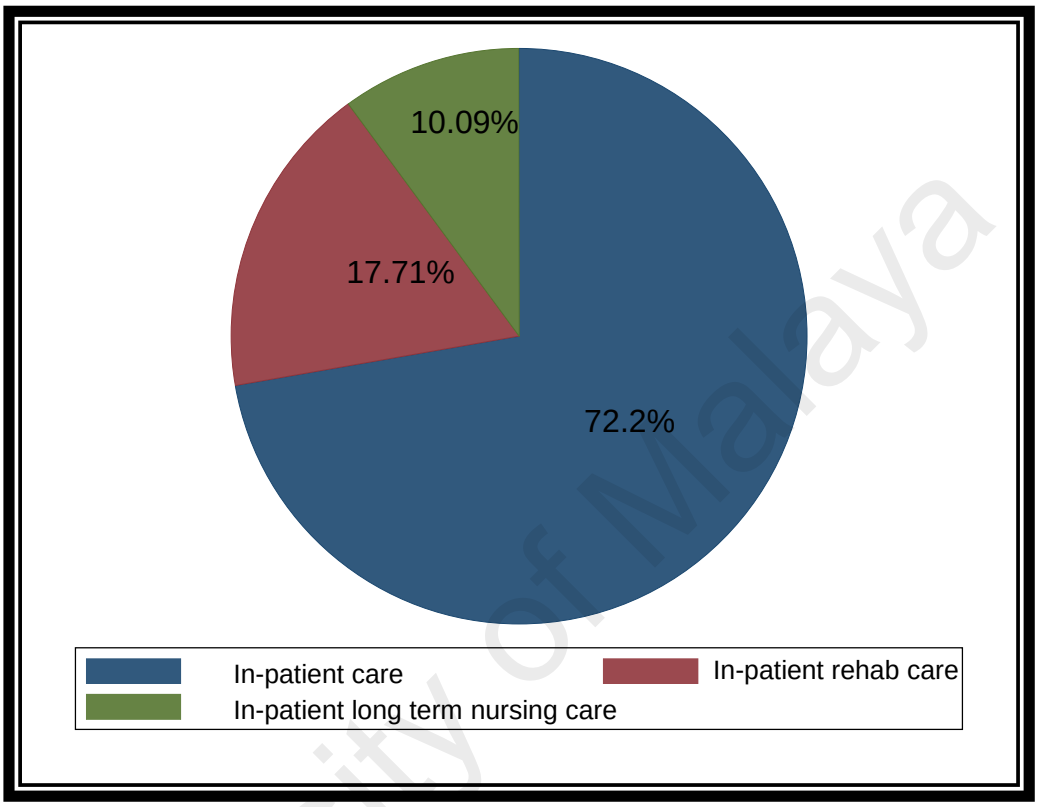

Figure 4.2: Type of treatments received during hospitalization among patient with chronic pain

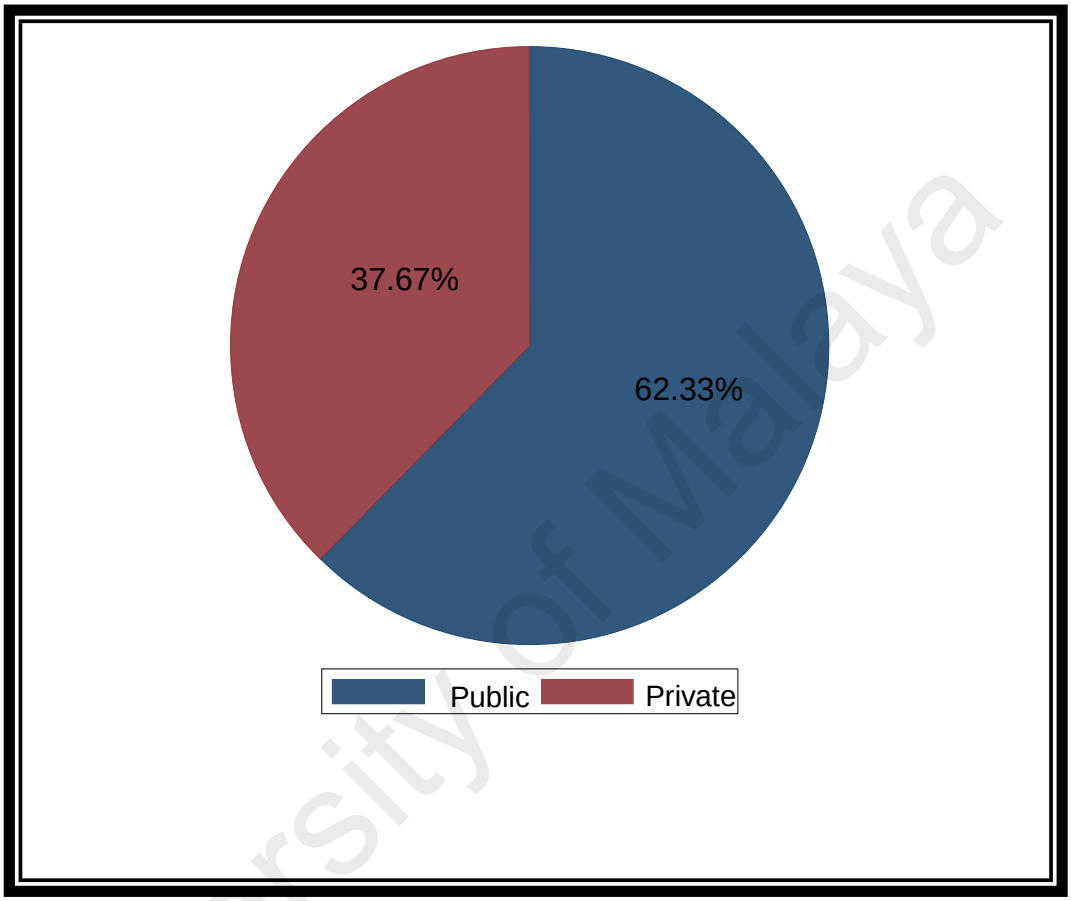

Figure 4.3: Type of facilities used for ambulatory care service (ACS) visits among elderly with chronic pain

4.8 Summary

This chapter provides a full description of results found from this study, using a national dataset which is representative of older people in Malaysia. This study found that the prevalence of self-reported chronic pain (pain lasting at least 3 months) among older people in Malaysia was 15.6% (95% CI: 14.5, 16.8). In this study, chronic pain was significantly associated with advancing age, female gender, Indian ethnicity, those with no formal educational background as well as those with presence of obesity and higher number of comorbidities. Furthermore, certain psychological symptoms among older people were also significantly associated with chronic pain. This study also found a significant association between chronic pain and health care utilization among older people in Malaysia, in terms of hospitalization. However, no significant positive association was found between chronic pain and ambulatory care services. Instead, this study found that chronic pain reduced the number of visits to ACS facilities among older people in Malaysia.

CHAPTER 5: DISCUSSION

5.1 About this Chapter

This chapter discusses the findings of this study. In this chapter, an overall discussion of the study findings is provided. This chapter starts with a summary of the research objectives in section 5.1. This is followed by details of the major findings of the study and its comparison with previous studies in Section 5.2. Sections 5.3 discuss the implications of research findings. Section 5.4 elaborates on the strength and limitations of the study and section 5.5 summarize this chapter. Part of this chapter contains discussions of published journal articles entitled " A Systematic Review of Prevalence and Measurement of Chronic Pain in Asian Adults" and "Chronic Pain and Pattern of Health Care Utilization among Malaysian Elderly Population: National Health and Morbidity Survey III (NHMS III, 2006)". Changes have been made in this thesis according to University of Malaya's guidelines to maintain consistency of this thesis.

5.2 Summary of Research Objectives

Pain is very subjective and may only ever be completely understood on an individual level by the person suffering from pain. Pain has many aspects and can be describe as comprising of several elements; sensory dimension – the feeling of pain, the affective dimension – referring to the emotions and perceptions of pain and finally the impact of pain. Chronic pain among older people is a widespread phenomenon. Chronic Pain among older people in developed countries such as United Kingdom, United States and Australia have been well documented in previous research. However, in developing countries such as Malaysia, information is still scarce. Thus, the purpose of this research is to describe the prevalence and identify correlates of chronic pain among older people in Malaysia as well as to determine its association with obesity, psychiatric morbidity and healthcare utilization. This thesis aims to answer the following questions:

1. What is the definition, measurements used and prevalence of chronic pain among Asian adult population?
2. What is the prevalence and correlates of chronic pain among older people in Malaysia?
3. Does gender influences the association between chronic pain and obesity among older people in Malaysia?
4. Is there an association between chronic pain and psychiatric morbidity among older people in Malaysia?
5. Is there an association between chronic pain and health care utilization among older people in Malaysia?

In order to answer the first research question, a systematic review of chronic pain among Asian adults was conducted. The rest of the questions were answered through secondary analysis of the NHMS (III) 2006 dataset.

5.3 Major Findings and Comparison with Other Literature

5.3.1 Definition, Prevalence and Measurement of Chronic Pain among Asian Adults

The aims of the systematic review entitled "A Systematic Review of Prevalence and Measurement of Chronic Pain in Asian Adults" were to describe the definition, measurements and prevalence of chronic pain among Asian adults. Prior systematic reviews (Ospina, M. & Harstall, C., 2002; Verhaak, P. F., et al., 1998) on similar research question did not include articles on Asian countries since data was not available at that time. To the author's knowledge, this is the first review of epidemiological studies of chronic pain in Asian adults.

This review found that various definitions of chronic pain have been used in Asian literature; it is similar to the previous review by Ospina, M. et al (Ospina, M. & Harstall, C., 2002). Consistent with previous review, this current review also found that the International Association for Study of Pain (IASP) definition is a widely acceptable definition used in Asian studies. According to IASP, chronic pain is defined as a pain which has persisted beyond the normal healing of tissue time. In a normal person without immunosuppressive condition, any wound condition will take about three months to heal. Any pain that persists beyond three months is considered as chronic pain.

The prevalence of chronic pain is high, ranging from 7.1 to 90.8% among adult population in Asian countries and is expected to increase in the near future due to the ageing phenomenon. This finding is consistent with prevalence estimates in western countries reported by the previous review (Ospina, M. & Harstall, C., 2002) (11.5% to 55.2%) although the lower limits is slightly lower among Asians. It is still possible that the social and cultural differences in the acceptance and reporting of pain are an important variable to consider. Several studies had found higher prevalence of chronic pain among

Asian ethnicity living in western countries compared to its local population such as Whites, Hispanic and African-Americans (Webb R, Brammah T, Lunt M et al., 2003; Allison, T., Symmons, D., Brammah, T. et al., 2002; Palmer, B., Macfarlane, G., Afzal, C. et al., 2007). In fact, one study (Palmer, B., et al., 2007) reported that the degree of acculturation may have influenced the pain reporting mechanism; the greater the degree of acculturation the lower the prevalence of pain. Other factor such as pain threshold disparity among ethnics should also be considered although some studies (Yosipovitch, G., Meredith, G., Chan, Y. H. et al., 2004; Zatzick, D. F. & Dimsdale, J. E., 1990) have reported no such difference.

The large differences in prevalence show that other factors may contribute to the variation, such as method of data collection, demographic characteristics of the population studied as well as geographical variation. In this review, it is found that all the above factors may contribute to the large differences in the prevalence of chronic pain. Studies that used phone interview had lower prevalence rates, 35% (Wong, W. S. & Fielding, R., 2011), 45.9% (Chung, J. W. Y. & Wong, T. K. S., 2007), 34.2% (Fielding, R. & Wong, W. S., 2012), than those that used face to face interview, 50.1% (Bhattarai, B., et al., 2007), 61.0% (Husum, H., et al., 2002), 55.8% (Wang, X., et al., 2009), except for one study in Malaysia (7.1%) (Institute for Public Health, 2008) where it is believed that the lower prevalence was due to its young population.

Apart from that, type of population studied also determines prevalence rate of chronic pain whereby prevalence among elderly were higher compared to young adults. Furthermore, geographical variation, as seen in this review, may also contribute to the differences as reported in a study in China (Wang, X., et al., 2009) where the rural area had higher prevalence (55.8%) than the urban area, 34.2% as reported by Fielding et al (Fielding, R. & Wong, W. S., 2012) and 25.8% as reported by Jackson et al (Jackson, T.,

et al., 2014).The findings of this review are consistent with two other reviews (Ospina, M. & Harstall, C., 2002; Verhaak, P. F., et al., 1998) conducted in different part of the world; the North-West Europe, North America and Australia.

All studies included in this review measured chronic pain by means of interviews and questionnaires, which relied on self-report. This method of measurement is acceptable as pain is a subjective, internal, and personal experience which cannot be directly observed by others and thus limits the ability to assess it with objective methods (Buenaver, L. & Edwards, R., 2007). Most studies in the Asian region used one single question to detect chronic pain such as "Are you currently troubled by physical pain or discomfort, either all the time, or on and off?"(Wong, W. S. & Fielding, R., 2011) or "Thinking back over the last 6 months, have you had persistent pain in any part of your body lasting for 3 months or more?" (McCarthy, L. H., et al., 2009). There is no clear evidence as to the choice of wording for symptoms of pain as long as it fits the definition criteria for the respective study.

Furthermore, pain is also a multidimensional condition which can be characterized by its intensity, number of pain sites, duration, frequency, source of pain, severity, as well as time frame of reference. In this review it is found that six out of nineteen studies measured all the above mentioned dimensions. From this, it can be concluded that the instruments measuring chronic pain do not necessarily measure all the dimensions of chronic pain. However, to facilitate comparisons of findings between studies, a more stringent and uniform measurement tool is clearly needed. This is consistent with the recommendation by Maria Ospina (Ospina, M. & Harstall, C., 2002) in her review, for a uniform methodological approach to study chronic pain which include the use of formal criteria to define chronic pain, type of questions used, method of data collection, and the consideration of chronic pain measures as a primary or secondary outcome.

5.3.2 Prevalence and Correlates of Chronic Pain among Older People in Malaysia

In this study, the prevalence of self-reported chronic pain among older people in Malaysia is 15.6% (95% CI: 14.5, 16.8). Although the prevalence is lower than that in other studies (Yu, H. Y., et al., 2006; Brattberg, G., et al., 1996; Hairi, N. N., et al., 2013; Harris, L., 2004; Thomas, E., et al., 2007; Yu, H. Y., et al., 2011; Tse, M., et al., 2013), the estimate fell very closely into the range reported in developed countries ranges between 18-57% (Harris, L., 2004).

The possible explanation on the low prevalence of chronic pain in Malaysia could be due to its young population (Zawawi, R., 2013). To date, Malaysia's older people (60 year and above) is about 8.3% of its total population (United Nations, 2013) compared to developed countries such as United States, where about 40 million (14%) of its total population are over 65 years old (Molton, I. R. & Terrill, A. L., 2014). This study shows that majority of the older people in Malaysia are between the age of 60 and 74 years old (81.7%), the young-old group (Table 4.2). However, upon comparing with findings from Singapore which has similar population make-up as Malaysia (Yeo, S. N. & Tay, K. H., 2009), the prevalence of chronic pain among older people in Malaysia is still low. In Singapore, although the study was not specifically for older people, it was reported that the prevalence of chronic pain increased with age, reaching an average of 19.7% in those above 65 years old (Yeo, S. N. & Tay, K. H., 2009).

Although the population setting is similar to Malaysia whereby Singapore has three major ethnic groups i.e. Chinese, Malays and Indians, the major ethnic group in Singapore is Chinese which accounts for 75.2% of its total population, according to their census (Yeo, S. N. & Tay, K. H., 2009). Whereas in Malaysia, the major ethnic group is Malays which accounts for about 50% of its total population and Chinese accounts for

about 35.0% of its total population (Malaysia. Department of Statistics, 2010). Therefore, it is possible that the differences observed in the prevalence rate of chronic pain could be due to ethnicity difference as reported previously (Hastie, B. A., Riley, J. L., & Fillingim, R. B., 2005; Portenoy, R. K., et al., 2004; Riley III, J. L., et al., 2002) even though some studies reported no significant ethnic differences (Edwards, R. R., et al., 2005; Yosipovitch, G., et al., 2004).

Furthermore, the survey in Singapore was conducted via a computer-assisted telephone interviews, which according to previous studies (Hastie, B. A., et al., 2005; Portenoy, R. K., et al., 2004), telephone surveys of pain experiences revealed ethnic differences in pain prevalence and pattern. Thus, the method of data collection may also contributed to the differences observed in the prevalence of chronic pain between Malaysia and Singapore.

Comparison with similar studies conducted in Asian countries such as Hong Kong (Tse, M., et al., 2013) and Taiwan (Yu, H. Y., et al., 2006; Yu, H. Y., et al., 2011) revealed very large differences in the prevalence estimation . In Hong Kong, the overall prevalence of chronic pain among 219 older people aged 60 years and above was 90.8%, whereas in Taiwan, the prevalence of chronic pain among older people aged 65 years and above was 42.0%. It is believed that the large difference is due to the population setting of both countries. Although both countries are within the Asia regions which consists of four sub-regions i.e. Eastern Asia, South-Central Asia, South-Eastern Asia and Western Asia, the older population among these sub-regions differs much. As an Eastern-Asia region, Hong Kong and China have the largest number of older people aged 60 and above compared to other sub-regions in Asia (Refer Table 1.1). According to the report, about 15.0% of their total population aged 60 years and above, compared to Malaysia which only has 8.0% of its total population aged 60 and above (United Nations, 2013) .

Therefore, clearly it is impossible to extrapolate neighboring country or regional data of chronic pain to certain country due to differences discussed above. Thus, prevalence data of chronic pain, especially among older people are still needed in every country, in order to estimate future burden of the disease and to enable appropriate distribution of resources to particular departments for prevention and management strategies.

This study also describes the correlates of chronic pain among older people in Malaysia. Similar to findings from developed and developing countries, chronic pain among older people significantly correlates with advancing age, female gender, older people with multiple comorbidities and those who were overweight and obese. In this study it was found that chronic pain prevalence among older people increased with advancing age, which was similar to findings conducted among older people around the world (Jakobsson, U., et al., 2003; Thomas, E., et al., 2004; Brochet, B., Michel, P., Barberger-Gateau, P. et al., 1998; Brattberg, G., et al., 1996; Scudds, R. J. & Østbye, T., 2001).

Among older people, it is expected that pain prevalence is higher due to the pathological load experienced by older people. As discussed in Chapter One, older people often experience pain in the joints especially in the knee and hip area due to the process of cartilage degeneration and bony thickening of osteoarthritic changes. In fact, musculoskeletal problem is the main cause of chronic pain among older people (Bergman, S., et al., 2001). The commonest group of musculoskeletal problem among older people is osteoarthritis of knee, hip, hand and foot (Ferrell, B. A., et al., 1990; Dawson, J., Linsell, L., Zondervan, K. et al., 2004; O'Reilly, S., Muir, K., & Doherty, M., 1998; McAlindon, T., et al., 1992). Majority of older people with knee pain showed some evidence of radiographic changes in the X-ray views (Duncan, R., et al., 2007). Therefore, it is common for older people to report pain due to musculoskeletal problems and it is

expected that pain complaints increase with advancing age. However, the causes of chronic pain among older people in Malaysia is not known since the data used was a general health survey and does not contain other pain information such as pain causes, pain sites as well as pain intensity.

The role of female gender in chronic pain is no longer doubtful. Consistent with other individual and review's findings (Unruh, A. M., 1996; LeResche, L., 1999; Fillingim, R. B., King, C. D., Ribeiro-Dasilva, M. C. et al., 2009; Craft, R. M., Mogil, J. S., & Aloisi, A. M., 2004; Greenspan, J. D., et al., 2007), this study also found significant association between female gender and chronic pain. As reported in Chapter Four, prevalence of chronic pain was higher among older women compared to older men. Many researchers have tried to explain the mechanism of this association. An extensive review by Picavet et al (Picavet, H. S. J., 2010) explained three possible mechanisms for the observed gender differences in musculoskeletal pain. Firstly, a gender-role theory which refers to a socially learned behavior on how men and women react to pain. It is demonstrated in many clinical experiments (Ellermeier, W. & Westphal, W., 1995; Robinson, M. E., Gagnon, C. M., Riley III, J. L. et al., 2003; Fillingim, R. B., et al., 2009) that men and women react differently to pain stimulus. For instance, healthy women reported more intense pain compared to men, and men have a higher pain threshold and pain tolerance compared to women.

Secondly, an exposure theory refers to sex-differences in exposure to risk factors for musculoskeletal pain such as type of work. Previous reports suggested that there is a sex-difference in exposure to risk factors such as musculoskeletal pain for different jobs or professions (Messing, K., Dumais, L., Courville, J. et al., 1994; Van der Beek, A., Kluver, B., Frings-Dresen, M. et al., 2000; Hooftman, W. E., van der Beek, A. J., Bongers, P. M. et al., 2005).

Lastly, the vulnerability theory which refers to sex-specific risk factors affecting pain experiences and pain perceptions. These could be explained by sex hormones such as oestrogen and sex-related psychological differences that may affect pain. Previous study (Wijnhoven, H. A., de Vet, H. C., Smit, H. A. et al., 2006) has reported that hormones and reproductive-related characteristics such as parity, a young age at first childbirth, long duration of pill use, oestrogen supplementation during menopause, early menarche, unusual menstrual cycle and hysterectomy were associated with low back pain in a sample of Dutch women aged 20 to 60 years old. In fact, some pathophysiological explanation was also observed whereby oestrogen affects some forms of neurotransmission pathway in which low level of oestrogen is associated with lower activity of neurotransmission which result in lower level of pain being reported (Smith, Y. R., Stohler, C. S., Nichols, T. E. et al., 2006). Therefore, sex hormones may probably have an effect on pain nociception. Based on the above explanations, gender role theory as well as vulnerability theory may play a role in this study in explaining why prevalence of chronic pain is higher among the older women.

The findings of significant association between chronic pain and Indian ethnicity further demonstrates the ethnicity difference in chronic pain as discussed earlier in Chapter Two. In Malaysia, there is a common perception that Indian has lower pain threshold compared to other ethnic group. However, no studies managed to demonstrate this so far. An experimental study conducted in 2009, reported no significance difference in pain tolerance among Malays, India and Chines ethnic group in Malaysia (Gupta, E. D., Zailinawati, A., Chan, J. et al., 2009). In a study conducted in Singapore, there was no difference in term of pain prevalence among ethnic group, however they found that non-Chinese reported significantly more frequent and intense pain (Ho, K. H. & Ong, B. K., 2001). The finding of our study is consistent with research conducted beyond Asian region. For example, few studies concluded that prevalence of chronic pain were higher

among American Indians compared to U.S general population (Barnabe, C., Elias, B., Bartlett, J. et al., 2008; Barnes, P. M., Powell-Griner, E., & Adams, P. F., 2005; Bernabei, R., et al., 1998; Chowdhury, P. P., Balluz, L., & Strine, T. W., 2008; Deyo, R. A., Mirza, S. K., & Martin, B. I., 2006; Ferucci, E. D., Templin, D. W., & Lanier, A. P., 2005; Rhee, H., 2000). As discussed in Chapter 2, the possible cause of the ethnic difference may be due to few factors including patient, provider as well as healthcare system factors.

The presence of multiple comorbidities is also significantly associated with chronic pain among older people in Malaysia. This is aligned with the literature discussed in Chapter Two of this thesis. In fact, this study has shown dose-response relationship between chronic pain and number of comorbidities. As reported in Chapter Four, the prevalence ratio of chronic pain among older people were significantly higher among those with more than one disease (PR: 1.42, 95% CI: 1.18, 1.71) compared to those with no presence of disease. These findings are consistent with a model that describes allostatic load (AL). In line with the AL model, accumulated wear and tear over a lifetime will alter individual's ability to accommodate current stressors thus increasing his or her health risk. Being older, will increase the likelihood of comorbidities thus increasing the risk of pain-related diseases. The association between chronic pain and accumulated comorbid load (allostatic load) has been researched previously and it was found that two or more additional comorbid conditions are associated with a 1.6 increase in the adjusted odds of reporting chronic pain (Dominick, C. H., et al., 2012).

Another interesting finding which corresponds with other literature is the significant association between chronic pain and obesity among older people in Malaysia. The findings are discussed further in the following section, which also describes the role of gender in the association between chronic pain and obesity among older people in Malaysia. Not only obesity was classified using Body Mass Index (BMI) categories, this

study also used waist circumference as a proxy of abdominal obesity since this measurement is deemed more appropriate among older people when discussing obesity in older people (Cetin, D. C. & Nasr, G., 2014). However, unlike other studies which found positive association between chronic pain and psychiatric morbidity (Blyth, F. M., et al., 2001; Raftery, M. N., et al., 2011; Tsang, A., et al., 2008; Johannes, C. B., et al., 2010), the study is not able to determine the association when using categorical approach of General Health Questionnaire (GHQ). Instead, the significant positive association of chronic pain with psychological symptoms was found when GHQs score was used in this study. The findings are discussed further in section 5.2.4.

5.3.3 Chronic Pain and Obesity among Older People in Malaysia

In this study, obesity among older people is measured using BMI as well as their waist circumference. Generally, BMI correlates fairly well with body fat and is used to classify medical risks among healthy individuals. However, among older people this may not be true. BMI is not the best measure of body fat distribution among older people as measurement of height becomes unreliable due to shrinkage and vertebral collapse (Srikanthan, P., Seeman, T. E., & Karlamangla, A. S.). Older people tend to have particular fat distributions i.e. visceral, subcutaneous, intramuscular and intrahepatic since these fatty tissue deposition increases with age (Beaufrere, B. & Morio, B., 2000). Additionally, with age, changes in body composition including loss of muscle (sarcopenia) and increase in fat may not be reflected in the BMI (Horani, M. & Mooradian, A., 2002). Therefore, BMI is not able to differentiate between fat and lean body mass, but waist circumference provides a more reliable measure. In this study both measurements of obesity are included. The BMI and abdominal obesity cut-off points used in this study (WHO/IASO/IOTF 2000) was also appropriate for Asian populations (WHO, E. C., 2004).

In large community based population studies of older people, it was observed that overall, older people with chronic pain were more likely to have higher BMI (were overweight and obese) and have abdominal obesity. This pattern is more prevalent among the females than the males. The association between overweight and obesity with chronic pain is however, only significant among older women. The independent positive association found between chronic pain and both types of obesity among older people in Malaysia aligned with previous research conducted elsewhere (McCarthy, L. H., et al., 2009; Heim, N., Snijder, M. B., Deeg, D. J. et al., 2008; Hitt, H. C., et al., 2007; Andersen, R. E., et al., 2003).

However, upon assessing the role of gender in this association, it was found that the association between obesity and chronic pain, is gender dependent. It was found in this study that older women who were overweight and obese significantly reported chronic pain compared to older men. Thus, there is a gender difference in the association between chronic pain and obesity among older people in Malaysia. This is similar to a study conducted among Neurology Clinic attendees in the United States (Aaron, M., 2012). It was shown in the study that no significant association was detected between chronic pain and obesity among the male patients. Therefore, the role of female gender in the relationship between chronic pain and obesity must not be neglected and this information will be of interest to medical practitioners treating patients with obesity and chronic pain.

Understanding the relationship between obesity and chronic pain is essential to effectively break the cycle. Nevertheless, the relationship between overweight and obesity with chronic pain remains unclear. It is not known if obesity causes chronic pain, or chronic pain causes obesity or other factors which cause both concurrently. Mechanism explaining the relationship between obesity and chronic pain is likely to be multifactorial. The hypothesized mechanism includes mechanical overload, pro-inflammatory state of

obesity, metabolic syndrome and behavioural factors (sedentary lifestyle and eating analgesia) (McVinnie, D. S., 2013). The mechanism is more complex and not completely explained by an obesity-induced increased mechanical load on weight bearing joints particularly lower limb pain. Overloading the hip and knee joints will result in injury and osteoarthritis. As studies have also reported positive associations between increasing BMI and upper limb pain (Oliveria, S. A., Felson, D. T., Cirillo, P. A. et al., 1999; Hart, D. J. & Spector, T. D., 1993), this is difficult to explain with the mechanical overload hypothesis. Additional to mechanical overload explanation, obesity is also a pro-inflammatory state, where levels of inflammatory markers such as C-reactive protein, Interleukin-6, TNF-alpha are increased (Wellen, K. E. & Hotamisligil, G. S., 2003). These inflammations subsequently contribute to the development of pain among these individuals. Studies have also reported that prevalence of metabolic syndrome increases with increasing BMI and with chronic pain (Loevinger, B. L., Muller, D., Alonso, C. et al., 2007; Ray, L., Lipton, R. B., Zimmerman, M. E. et al., 2011). The systemic explanation between metabolic syndrome and pain revolves around altered metabolism and inflammation (McVinnie, D. S., 2013). Although sedentary lifestyle reduces pain exacerbation, this eventually contributes to reduce physical performance and obesity. Here, obesity is not necessarily a causal of pain, but rather is secondary to lifestyle adaptations associated with presence of pain. Eating pleasurable foods or 'hedonic eating' is used both as a coping mechanism as it confers analgesic effect (Janke, E. A. & Kozak, A. T., 2012).

5.3.4 Chronic Pain and Psychiatric Morbidity among Older People in Malaysia

This study also investigated the association between chronic pain and psychiatric morbidity and psychological symptoms in a sample which was representative of older people in Malaysia. As stated earlier in Chapter 4, this study did not find a positive association between chronic pain and psychiatric morbidity when the GHQ scores were

in categorical variables. Instead, a positive association between chronic pain and psychiatric morbidity was found when psychological scores were used. It is recommended for all studies in future to take into consideration of using the scoring system of psychiatric morbidity instead of categorical variables. This is due to the fact that upon categorizing the scores, there is loss of information about individual differences and havoc with estimation and interpretation of relationships among variables (MacCallum, R. C., Zhang, S., Preacher, K. J. et al., 2002). Consistent with previous research, psychological symptoms such as somatic symptoms, anxiety as well as depression symptoms were independently associated with chronic pain among older people in Malaysia. Thus, this study showed similar positive findings on the association between chronic pain and depression (Blyth, F. M., et al., 2001; Raftery, M. N., et al., 2011; Tsang, A., et al., 2008; Johannes, C. B., et al., 2010).

The temporal relationship between chronic pain and psychiatric morbidity remains unclear although previous systematic review of this topic (Fishbain, D. A., et al., 1997; Kuch, K., 2001) found strong evidence of depression as a result of chronic pain. However, since studies reviewed were cross sectional in design, therefore cause and effect remains unanswered. In fact, the mechanisms of these associations are much more complex among older people. Among older people, pain alone is not a strong and sufficient condition for the development of depressive symptomatology. According to previous research (Kerns, R. D. & Haythornthwaite, J. A., 1988; Rudy, T. E., Kerns, R. D., & Turk, D. C., 1988) which introduced a cognitive-behavioural model between pain and depression, few mediating factors play a role on these relationships among older people which differ from the younger population including presence of chronic illness as well as changes in the social support.

Older people tend to have multiple chronic diseases. Previous literature reviews have shown that presence of chronic diseases significantly correlated with depression among

older people (Black, S. A., Goodwin, J. S., & Markides, K. S., 1998; Penninx, B. W. J. H., Beekman, A. T. F., Ormel, J. et al., 1996; Bisschop, M. I., Kriegsman, D. M., Deeg, D. J. et al., 2004; Zivin, K., Llewellyn, D. J., Lang, I. A. et al., 2010). Presence of chronic diseases, either one or multiple diseases, magnifies the magnitude of association between chronic pain and depression among older people (Windt, D. V. D., 2012; Dominick, C. H., et al., 2012). This corresponds to allostatic load discussed earlier in section 5.2.2 in which accumulation of load (multiple chronic diseases) increased the risk of chronic pain and further magnify the risk of psychiatric morbidity among older people.

Apart from that, changes in social support such as loss of significant other who usually provide support during sickness, may also contribute to depressive symptoms among older people. Few studies have found positive association between lack of social support with depression (Chi, I. & Chou, K.-L., 2001; Lee, M. S., Crittenden, K. S., & Yu, E., 1996). Previous study (Potts, M. K., 1997) also reported that older adults who lived alone were more likely to report depressive symptoms compared to those living with friends nearby. Therefore, among older people it can be concluded that the burden of chronic pain which resulted from degenerative changes coupled with chronic diseases and lack of social support availability may magnify depressive symptoms among older people.

5.3.5 Chronic Pain and Health Care Utilization among Older People in Malaysia

The secondary outcome that was studied in this thesis was the association of chronic pain with the use of health services in terms of hospitalization and ambulatory care facilities. It was found that chronic pain was a significant predictor for hospitalization even after controlling of other predisposing factors following the Andersen and Newman model (Andersen, R. & Newman, J. F., 1973). In the regression model, presence of chronic pain alone was the strongest predictor for hospitalization but not visits to Ambulatory Care Services facilities. However, presence of pain interference as well as

level of pain interference was not associated with frequency of hospitalization. The role of pain interference in determining hospitalization must be carefully interpreted in this study. Few possible factors may have resulted in the above findings. Firstly, it is possible that in a non-clinical sample, as seen in this study, the presence of interference is less important compared to studies in clinical setting. Although pain may interfere with elderly daily activities, they may still be able to perform their daily activities. In this study, elderly disability status remains unknown.

Another possible explanation is the elderly's acceptance of chronic pain. Understanding acceptance of chronic pain is important, as some elderly may remain engaged with valued aspects of their life, even with the presence of chronic pain. Several studies (McCracken, 1998; McCracken, C. E., 2003; I. Viane, G. C., C. Eccleston, C. Poppe, J. Devulder, B. Van Houdenhove, W. De Corte, 2003) have shown that greater acceptance of chronic pain was associated with less healthcare and medication use, better emotional, physical as well as social functioning level. Nevertheless, acceptance of pain was not measured in this study. Finally, a small sample size after stratification based on pain interference level may lead to a non-significant association between pain interference and hospitalization.

One of the interesting findings in this study was a higher level of pain interference reduced the frequency of visits to ambulatory care facilities. This finding does not corresponds with findings from developed countries. In a larger sample and markedly different health care system such as in Australia, United Kingdom and United States of America, severely disabling chronic pain have higher average use of health care services (Eriksen, J., et al., 2004; Blyth, F. M., et al., 2004; Von Korff, M., et al., 1991). It is believed that the above differences were due to differences in the health care system especially in terms of chronic pain management. In Malaysia, chronic pain services are

offered only at the hospital-level unlike in the developed countries. In Australia and the United Kingdom, chronic pain services have been integrated at the Primary Care Level. Therefore, in Malaysia, chronic pain patients are more likely to be treated in the hospital rather than at the ambulatory facilities such as General Practitioner's Clinic or Government health clinics thus reducing the number of visits to ambulatory facilities. This also explains why Malaysian chronic pain patients with higher level of interference were hospitalized more frequently and used less ambulatory facilities.

Majority of the older people in Malaysia chooses public facilities compared to private hospitals for hospitalization and usage of ambulatory care facilities. This will increase the burden on our public health care system. It is well known that the public health care facilities in Malaysia are fully subsidized by the government of Malaysia (Kananatu, K., 2002). Being elderly with limited income explains why the elderly utilize more public facilities rather than private facilities. With the upcoming increase in the older people population in Malaysia, there is a large segment of the population who are at potential risk of developing the chronic pain condition. This will result in a greater usage of health care services. The healthcare providers should be alerted on these findings and be prepared to cater the future health needs by the elderly group.

5.4 Implications of thesis's findings

5.4.1 Public Health Implications – implications for policy makers

Pain is typically 'under-recognised and under-treated in older people' (Collett, B., O'Mahoney, S., Schofield, P. et al., 2007). This is often due to the perception of pain being a part of aging and something that is "expected in later life" (Gagliese, L., 2009; Kumar, A. & Allcock, N., 2008). The high prevalence of chronic pain among older people as found in this study (15.7%) implies that chronic pain is one of the commonest diseases among older people in Malaysia apart from other chronic diseases. This estimation of

disease burden should be considered by policy makers when planning of older people's health services. Thus, all healthcare practitioners should be alerted on this condition in order for the disease to be diagnosed and managed adequately. Previous studies have shown that poor management of chronic pain can lead to devastating conditions such as physical disability as well as social dysfunction (Breivik, H., et al., 2006; McAlindon, T., et al., 1992; Arnow, B. A., et al., 2006; Raftery, M. N., et al., 2011). In Malaysia, pain has been recognized as the fifth vital sign in every Ministry of Health's hospital in 2008 as a strategy to improve the management of pain among hospitalized patients. Even though the pain guidelines have been established as early as in 2004, however pain management was still in its early stages and deficiencies in pain management due to multifactorial reason such as cultural, societal, attitudes as well as lack of awareness and limited access to pain services. These are some of the issues that needs to be dealt with.

Inadequate management of acute pain lead to persistence of pain, thus chronic pain condition occurs. In Malaysia, chronic pain is mostly recognized and treated by pain specialist at hospital level. Chronic pain has yet to be addressed by other healthcare practitioners such as General Practitioners or Family Medicine Physicians. The lack of attention by health policy makers in this chronic pain problems will further jeopardized this condition. For example, any budget submitted by the Pain Service to the government for service expansion or purchase of equipment will often be overlooked.

Chronic pain services in terms of Pain Specialists as well as Pain Clinics are also still limited in Malaysia. The shortage of pain specialist, lack of funding as well as facilities are the most prominent challenges encountered not only in Malaysia but also world-wide as reported by IASP (IASP, 2010) where 29 out of 85 countries were found to have shortage of pain specialists, insufficient training for specialists and primary care providers in pain management, as well as lack of government involvement and insufficient

prioritization on pain management, thus making it difficult to resolve the above challenges.

Up to 2012, within the Ministry of Health (MOH) Malaysia, there were only ten Pain Specialists trained and twelve Pain Clinics available in Malaysia. The discrepancies between the number of Pain Specialist and the number of Pain Clinics have resulted in the ministry taking an initiative to do an outreach program for certain hospitals which do not have Pain Specialist. For example, a Pain Specialist from Hospital Ipoh will provide the consultant service to run the clinic in Hospital Pulau Pinang. Furthermore, the number of clinical psychologist in the field is also limited, hence there is no integration of multimodal management for chronic pain patient. The only way to highlight these issues to policy makers is by conducting research on the problems of chronic pain disease and suggesting the appropriate mechanism to be introduced to overcome the above issues. It is hoped that this finding will help to increase the healthcare practitioners and policy makers' knowledge of this disease.

In this study, older people with chronic pain were found to use a great deal of healthcare resources in terms of hospitalization which burden the healthcare system. Older people with chronic pain were more likely to be hospitalized compared to those with no chronic pain. With projected growth of older people in Malaysia as well as prolonged life expectancy of older people due to advances in medical care, it is expected that the number of older people with chronic pain will also increase. If no further improvement is done to the chronic pain services among older people in terms of management of chronic pain as well as prevention activities, this will definitely lead to overcrowding at the hospitals and burdening the healthcare system. The recent report of NHMS 2011 (Institute of Public Health, 2011) reported that older people aged more than 75 years had significantly higher utilization of healthcare compared to other groups

(22.0%, 95% CI: 17.8, 26.8). Therefore, the high utilization of healthcare services by older people calls for enhanced geriatric care in order to lessen the burden on the healthcare system.

5.4.2 Public Health Implications – Potential for prevention

Establishing and altering any risk factors of a condition or disease at an early point in time will prevent the development of the said disease or condition. Identifying determinants of chronic pain that are modifiable and can be targeted at a population level is another major public health aim. The results of this study particularly on the risk factors of chronic pain among older people in Malaysia would encourage prevention strategies at primary, secondary and tertiary level.

At primary level of prevention, the risk factors of chronic pain among older people identified in this study would be able to help guide the healthcare practitioners in identifying those older people who may be at risk of developing chronic pain, such as female gender, Indian ethnicity, those with no formal educational background, older people who are overweight and obese as well as those with multiple comorbidities. Thus, screening of chronic pain among older people with the aforementioned risk factors will help to identify chronic pain disease and allow early institution of treatment and prevent occurrence of complications of chronic pain disease such as physical disability, social dysfunction and depression.

At secondary level of prevention, older people who are diagnosed to have chronic pain disease, will be referred to appropriate healthcare professionals for early management and prompt treatment of chronic pain in terms of pharmacological treatment as well as behavioural modification such as weight reduction for overweight and obese older people and healthy eating behaviour. Promoting weight loss as a strategy appears to reduce and

prevent chronic pain (Kraschnewski, J. L., Sciamanna, C. N., Ciccolo, J. T. et al., 2014; Mathus Vliegen, E. M., 2012).

Lastly, at tertiary level of prevention, older people with chronic pain complications should also be referred for rehabilitation at tertiary care centre in order to minimize the complications of chronic pain as well as to improve their physical function, social function and emotional status. Rehabilitation also includes physiotherapies as well as counselling by trained psychologist in order to minimize the impacts of chronic pain on emotional status.

5.5 Strengths and Limitations

An important strength of this study is that this is a population based study with our sample consist of relatively healthy community dwelling older people, using rigorous sampling methods. Thus, our results can be extrapolated to Malaysian general older people. Furthermore, this study has a high response rate and results were adjusted for important confounding variables. The risk of differential memory bias was also minimized as the information on health care use was collected with no reference to subject's pain status (hypothesis was not known). In term of analysis, this study also utilized an advanced statistical modelling i.e. Zero Inflated Poisson Regression to account for excess zero in the main outcome measures of health care utilization which is often neglected by many researchers. This study also used a cut-off points which is appropriate for the Malaysian population such as BMI and abdominal circumferences, and the results can be generalized to Malaysian older people. Apart from that, this study also utilized a better scoring for psychiatric morbidity from GHQ-28 (Goldberg, D. P., Gater, R., Sartorius, N. et al., 1997), in order to evaluate the association between chronic pain and psychiatric morbidity among older people in Malaysia. Many studies have reported the validity and reliability of GHQ-28. The GHQ-28 have shown an excellent interrater and

intrarater reliability with Cronbach's Alpha of 0.9 to 0.95, apart from its high internal consistency (Failde, I., Ramos, I., & Fernandez-Palacin, F., 2000).

There were also few limitations to the study. A limitation of this study is as with all cross sectional study, the study design does not allow evaluation of the direction of the association. This limits the ability to make causal inferences nor statements about temporal processes and causality. For example, with regards to overweight and obesity with chronic pain, it is possible that overweight and obesity might have led to chronic pain or chronic pain causes obesity or other factors causes both concurrently. It also cannot provide data on the progression of chronic pain or other risk behaviours over the duration of pain. There is a need for longitudinal studies on chronic pain to be conducted in middle income developing country like ours. As with many national surveys, a limitation of the NHMS is that it did not have a detailed pain assessment that included information on origin of pain, duration, pain sites as well as other relevant pain characteristics. Data on chronic pain and comorbidity status were also based on self-report, thus no external validation to confirm the findings. Ideally, medical report should be examined to diagnose chronic illness. Nevertheless, many studies have found that self-reported data corresponds well with medical records (Okura, Y., Urban, L. H., Mahoney, D. W. et al., 2004).

Apart from that, data on healthcare utilization was also self-reported. Self-reported data on healthcare utilization has a substantial risks of inaccuracy. Many factors may contribute to the inaccuracy such as recall timeframe, memory decay, older age, education level as well as gender (Short, M. E., Goetzel, R. Z., Pei, X. et al., 2009; Cleary, P. D. & Jette, A. M., 1984; Raina, P., Torrance-Rynard, V., Wong, M. et al., 2002; Wallihan, D. B., Stump, T. E., & Callahan, C. M., 1999). However, inpatient hospital admission or Emergency department visits which is rare and highly memorable to the individual are

likely to be reported accurately (Petrou, S., Murray, L., Cooper, P. et al., 2002; Roberts, R. O., Bergstralh, E. J., Schmidt, L. et al., 1996). It was also recommended by few studies on the optimal recall period to be six months or less, but longer up to 12 months for a rarely used healthcare utilization such as hospitalization(Bhandari, A. & Wagner, T., 2006; Ritter, P. L., Stewart, A. L., Kaymaz, H. et al., 2001). As for this study, the healthcare utilization recall timeframe was adequate and appropriate, i.e. one month for ambulatory care visits and 12 months for hospitalization.

Another limitation which may influence the findings of this study is the absence of cognitive function of older people in the study, since older people may have some issues with cognitive function such as memory loss and dementia. Looking at the demographic characteristics of older people in this study where the mean age in the sample is 68.5 years, memory loss and dementia may not be major issues since previous studies reported that older people aged between 65 to 74 years old have the lowest prevalence of dementia (14.3%) compared to those aged 80 and above (26.3%) (Hamid, T. A., Krishnaswamy, S., Abdullah, S. S. et al., 2010; Kalaria, R. N., Maestre, G. E., Arizaga, R. et al., 2008; Alzheimer's Association, 2014). The measurement of body fat was analyzed using BMI and waist circumference. While BMI is not the best measure of body fat distribution as measurement of height becomes unreliable because of shrinkage and vertebral collapse and BMI is not able to differentiate between fat and lean body mass, waist circumference provides a more reliable measure. Data on drug usage among older people and physical activity were also not available in the dataset since older people probably has taken some medications of analgesia prior to survey which may cause under-reporting of chronic pain during the survey.

5.6 Summary

Chronic pain is a prevalent health problem among older people in Malaysia with a prevalence rate of 15.6% (95% CI: 14.5, 16.8). Among older people, chronic pain was found to be significantly associated with advancing age, females, Indian ethnicity, those with no formal educational background as well as those with presence of obesity and higher number of comorbidities. This study also highlighted the role of gender in the association between chronic pain and obesity among older people. The association between chronic pain and psychological symptoms among older people were also examined and confirmed previous positive association. Chronic pain among older people was also found to be associated with higher hospitalization rate independent of other variables. It is hoped that these findings will provide an insight into the distribution of chronic pain among older people and its relationship with the patterns of healthcare utilization in Malaysia. Thus, further action can be forwarded to relevant organization based on these findings in order to improve the older people services in Malaysia particularly.

CHAPTER 6: CONCLUSION

6.1 About This Chapter

This final chapter will summarize the main conclusion of this study and relate all of the findings to the initial aims of the research and will show information on how the results from the study have extended knowledge within this area. This chapter starts off with a summary of research objectives, research methodology and research findings. This is followed by recommendations based on thesis's findings on health services and policy as well as future research directions in this area. Section 6.5 provides summary for chapter 6.

6.2 Conclusion of thesis

This thesis was designed to describe the prevalence and correlates of chronic pain among older people in Malaysia as well as its association with obesity, psychiatric morbidity and healthcare utilization. Older people were the focus of this study since previous research has documented its high prevalence. Asian countries, as part of developing countries, are the most populous region in the world with expected rapid rise in the number of older people. Therefore, chronic pain among older people is one of the most noteworthy conditions to consider in order to improve older people health services. A national representative data from the third National Health and Morbidity Survey (NHMS III) was analyzed to answer the objectives of this study.

Prior to this thesis, information from Asian countries on chronic pain was scarce and not highlighted. Many previous research on chronic pain concentrated on developed countries such as United Kingdom and Australia. In order to understand the burden of chronic pain in Asian region including Malaysia, a systematic review was conducted prior to the aforementioned study. The systematic review conducted sought to identify the

prevalence of chronic pain among Asian adults, chronic pain definition used in other research as well as its measurement strategy.

The results of the systematic review have found that the prevalence of chronic pain among Asian adults is high and differs between countries involved due to several factors including definition of chronic pain used, methodological approach of individual studies, population characteristics as well as its geographical variations of studies involved. These findings are consistent with previous review conducted in developed countries (Ospina, M. & Harstall, C., 2002; Verhaak, P. F., et al., 1998). These findings justify the need to conduct chronic pain studies in Malaysia in order to ascertain the burden of chronic pain problem locally.

Upon focusing on older people in Asian countries, the prevalence of chronic pain is even higher and it ranges between 42.0 to 90.8%. This is consistent with previous findings conducted elsewhere where chronic pain prevalence significantly increased with advancing age. This finding suggests that chronic pain is a prevalent condition among older people. It was also found in the review of the IASP definition of chronic pain, which is defined as a persistent pain that has lasted for three months or more, is the most widely used definition in Asian countries which is consistent with the recommendation by the International Association for the Study of Pain (IASP). Furthermore, the review concluded that chronic pain is easily measured and does not require advanced tools in measuring chronic pain among the general population. Chronic pain among general population can be measured by using one or two questions. Up to now, there is no uniform methodological approach of studying chronic pain available in the research field, including formal criteria to define chronic pain, type of questions used, method of data collection, as well as, consideration of chronic pain measures whether as a primary or secondary outcomes.

Meanwhile, analyzing the NHMS III data on chronic pain among older people in Malaysia revealed that the prevalence of chronic pain among older people in Malaysia is high amounting to 15.6% (95% CI: 14.5, 16.8). This finding indicates that chronic pain is a prevalent condition among older people in Malaysia. Certain socio-demographic characteristics were also found to be significantly associated with chronic pain among older people. This includes advancing age, female gender, Indian ethnicity as well as those with no formal education background. It was also identified in this study that certain health-related factors such as overweight and obesity, presence of psychiatric morbidity including depression, anxiety and somatic symptoms, as well as number of comorbidities were significantly related to chronic pain among older people in Malaysia. Further exploration of the association between chronic pain with overweight, obesity and abdominal obesity revealed gender differences. This finding is important as overweight and obesity is a prevalent condition among older people and female gender accounts for majority of older people.

The final objective of this thesis which aimed to measure the association between chronic pain and healthcare utilization in terms of hospitalization and visits to ambulatory facilities revealed that chronic pain was significantly associated with hospitalization among older people. However, no positive association was found between chronic pain and visits to ambulatory care facilities. Instead, higher level of chronic pain interference among older people was found to reduce the number of visits to ambulatory care facilities which contrasted with studies conducted elsewhere (Blyth, F. M., et al., 2004; Eriksen, J., et al., 2004; Von Korff, M., et al., 1991) .

6.3 Recommendations based on thesis's findings

6.3.1 Establishment of Chronic Pain Guidelines for Older People in Malaysia

The findings of this study showing high prevalence of chronic pain among older people in Malaysia, together with its association with obesity among older female and higher health service utilization should be considered by policy makers when planning for pain services. To date, chronic pain guideline was developed as part of the Anesthesia and Intensive Care Services by the Surgical and Emergency Services Section, Medical Development Division, Ministry of Health, Malaysia. Briefly, this documentation described the structure and functional aspect of chronic pain treatment services in Malaysia. However, the prevention aspects are greatly missing.

World Health Organization (WHO) states that an explicit health policy will help to achieve several things since it defines a vision for the future, outlines priorities and the expected roles of stakeholders involved and also builds consensus and inform people. Although Ministry of Health Malaysia has introduced a Clinical Practice Guideline (CPG) of Pain Management, more can be done towards chronic pain disease especially among older people since the CPG is only applicable at the clinical settings. An explicit chronic pain policy will help to establish and expand the chronic pain service in Malaysia in future. This is in line with the recommendations by the International Associations for The Study of Pain (IASP) where every nation should have its own policies on the management of pain that describes the burden of pain, its impact and what should be done in terms of policy interventions. This recommendation accompanies the Declaration of Montreal which asserts the human rights of those in pain (IASP, 2011).

Based on the recommendation by IASP, any national pain strategies should consider the core elements of areas including pain education, patient access and care coordination, monitoring and quality improvement as well as pain research. Each of the core elements

has its own specific policy development areas to strengthen chronic pain management in a particular country. By adopting the strategies, it is hope that chronic pain will be recognized as a disease on its own by the healthcare practitioners and policy makers as well. Chronic pain among older people will also be emphasized and recognized. This will enable appropriate management and to prevent further complications. General public will also learn about the issues of chronic pain thus increase the awareness on the importance of this disease among the public.

Implementing recommended IASP strategies to chronic pain policy in Malaysia will also help to establish a surveillance system and quality-improvement programme of chronic pain in Malaysia. This will enable monitoring the burden of chronic pain disease generally and specifically among older people in Malaysia. A national designated Centre for chronic pain research should also be established to coordinate policies and research related to pain.

6.3.2 Expansion of Chronic Pain Service to Primary Care Level

To date, chronic pain service is only available at designated hospitals and pain clinics in Malaysia. As this study found positive association between chronic pain and hospitalization, therefore, it is time to expand the pain service to primary care level, thus reducing the burden of pain clinics and emergency department visits due to chronic pain. Recent data has shown that there is an increasing number of chronic pain patients in designated Pain Clinics (Ministry of Health Malaysia, 2012) since 2006 until 2012 with an increase of 21.53% from year 2010 to 2012 (Figure 6.1).

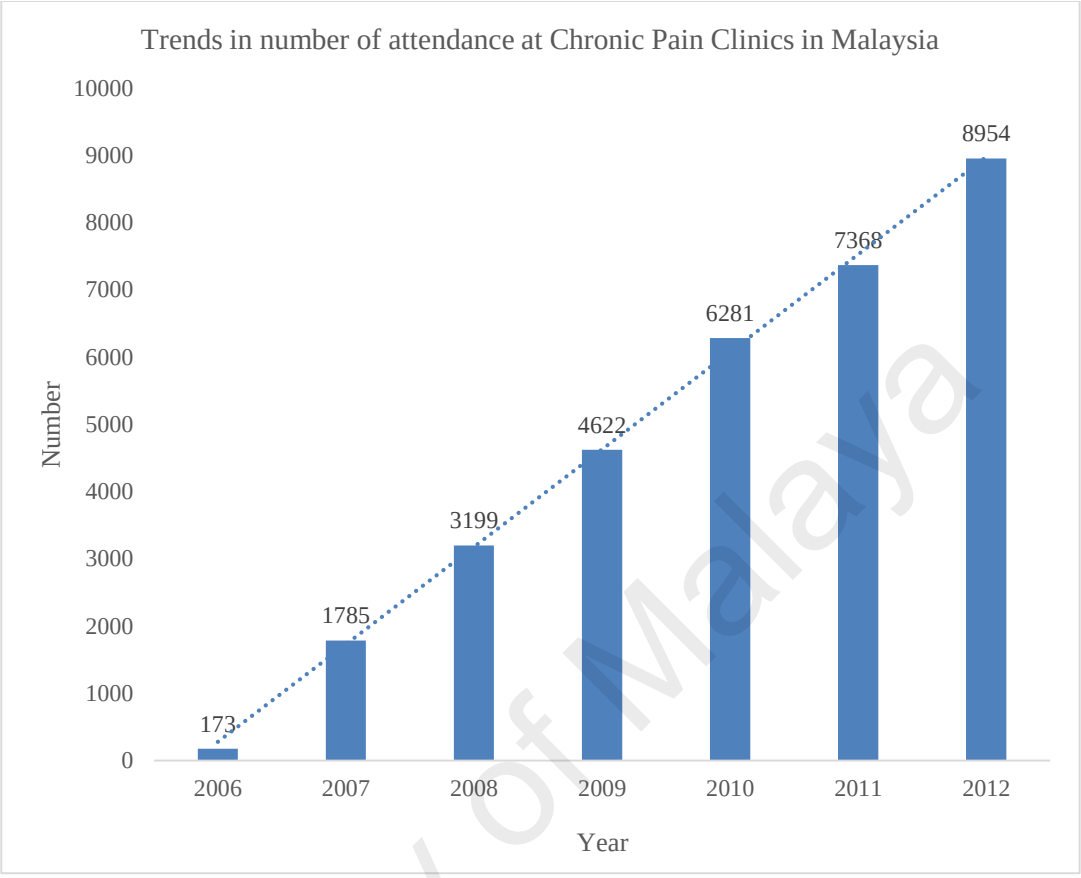

Figure 6.1: Trends in number of attendance at Chronic Pain Clinics in Malaysia, 2006-2012

Source: Census Report 2012, Anesthesiology Program, Ministry of Health Malaysia. Available from www.moh.gov.my/images/gallery/Report

Introduction of pain service at primary care level will ensure chronic pain is detected and treated earlier thus reducing the complications of the disease. In Australia, a General Practitioner (GP) or Family Medicine Specialist (FMS) with Special Interest in Pain (SIP) was also introduced in order to overcome the problem of manpower. The role of GP/FMS with SIP is not only to help pain specialist manage chronic pain at primary care level but also act as a gate-keeper in identifying and referring chronic pain patients to hospital level for further intensive therapy (Australia, 2010). All nurses and midwives at primary care level should also be trained for chronic pain management so that they can help in managing chronic pain among the community during their home visits. This will further help to reduce the burden of healthcare system at primary care level. With proper training, these healthcare workers can provide the foundation for chronic pain service at community setting and contribute to the chronic pain programme in the future.

Apart from that, community pharmacists and other allied healthcare professionals such as community nurse should be trained to screen older people and to refer patients with poorly controlled pain to hospital level in order to ensure that the pain is properly managed. An exploratory randomized controlled trial has shown the benefits of community pharmacists on management of chronic pain (Bruhn, H., Bond, C. M., Elliott, A. M. et al., 2013). A proper triage procedures or tools must also be established in order to identify appropriate referral system according to complexity of case at primary care level.

6.3.3 Screening of Chronic Pain among All People Aged 60 and Above.

The findings of high prevalence of chronic pain among older people in Malaysia warrants for general screening of chronic pain for all older people either at community level or those who attend healthcare facilities. By screening, older people with chronic pain will be identified and treated promptly and this will reduce the complications that

may arise if the condition is left untreated. Early detection of chronic pain may also help to prevent the occurrence of disabling chronic pain and ultimately reduce the burden of healthcare system. . The vast majorities of older men and women with chronic pain are overweight and obese and have abdominal obesity. This findings also revealed that there is a gender difference in the relationship between overweight and obesity as well as central obesity with chronic pain. This suggests that the assessment of chronic pain should be part of the routine examination of overweight or obese older people. Identification of these vulnerable groups of people is important not only for gender-specific interventions but also for pain management program. Promoting weight loss as a strategy appears to reduce and prevent chronic pain (Kraschnewski, J. L., et al., 2014; Mathus Vliegen, E. M., 2012). Although, this may seem a logical approach, previous studies results have not been encouraging. Individuals with obesity and chronic pain in these studies showed reduced treatment success (Decaria, J., Sharp, C., & Petrella, R., 2012).

Recommendations to restrict calorie intake is also not appropriate among older people, as it might result in the losing of lean body mass along with fat mass (Han, T., et al., 2011). This in turn increases the risk of developing sarcopenia and frailty in older people. Hence, promoting healthy lifestyle modifications to reduce inflammatory markers and increase older people's physical function should be encouraged. More importantly, development of successful weight loss interventions with minimum loss of lean mass among obese older people is urgently warranted.

Therefore, early identification of the disease will help to prevent serious complications of chronic pain such as physical limitation, emotional distress and social inactivity.

6.3.4 Preventive Strategies of Chronic Pain among Older People.

The result of this study could also be used in the prevention strategies of chronic pain among older people. The aim of the primary level prevention is to reduce the occurrence of chronic pain disease which includes weight reduction, adequate management of multiple comorbidities and increase the knowledge and awareness of chronic pain disease among older people with low educational background.

The secondary level of prevention aims for early detection of chronic pain disease among older people in Malaysia. This can be achieved by screening of all older people especially to those with risk factors of chronic pain as discussed earlier. Once detected, older people with chronic pain should be referred to healthcare practitioners in order to treat the symptoms of chronic pain and ultimately reduce the complications and disability caused by chronic pain, which is the tertiary level of prevention. Furthermore, appropriate management of chronic pain among older people can also help to reduce the burden on the healthcare system.

6.3.5 Screening of Mental Health among Older People with Chronic Pain.

The positive association between chronic pain and psychiatric morbidity among older people as observed in this study calls for more vigilant assessment of older people with chronic pain. Although the direction of the cause and effects remains unclear, many studies found positive associations for both direction. Therefore, it can be concluded that psychiatric morbidity remained as an important factor associated with chronic pain and must never be neglected in studying chronic pain among older people.

Findings of this study suggest the need for early detection and diagnosis of psychiatric morbidity among older people with chronic pain. Presence of depression among older

people with chronic pain not only magnifies the pain problem but also increase the likelihood of physical and social dysfunction among older people. Presence of psychiatric morbidity among older people with chronic pain will increase the pharmacotherapy usage to manage psychiatric morbidity and this will increase utilization of health services. The need for early detection and management of psychiatric morbidity, particularly depression, is aligned with previous study (Lin, E. H., Katon, W., Von Korff, M. et al., 2003) which reported that proper management of depression among older people could reduce the arthritis pain as well as improve quality of life of the individuals. Therefore, it is recommended for older people with chronic pain to undergo mental health screening for early identification of psychiatric morbidity which will initiate early treatment and ultimately reduce the impacts of psychiatric morbidity on the patient and his or her family members.

6.3.6 Recommendations for future research

Many recommendations could be made from this study. There are several pertinent areas on which to focus future research of chronic pain among older people in Malaysia. There is a need to determine the causes and site of chronic pain among older people in order to enable more targeted approach in the management of chronic pain. The functional limitation and disability caused by chronic pain should also be assessed in order to estimate future resources needed for rehabilitation purposes among older people with chronic pain. Future epidemiological studies should aim to be prospective, representative of older people in the general population and identifying targets for the management of chronic pain at both the individual as well as the population level. Lastly, the impact of comorbidities on treatment of chronic pain is also an important issue among older people as a consequence of polypharmacy as potential drug interactions may occur in older people with chronic pain. Future research on this issue will enable medical professionals to treat older people with chronic pain more effectively.

6.4 Summary

This study has presented an overview of chronic pain among older people in Malaysia including its prevalence, risk factors as well as its positive association with obesity, psychiatric morbidity and healthcare utilization. Despite the high chronic pain prevalence among older people, the disease is still under-recognized by healthcare practitioners, policy makers as well as the general public in Malaysia. The results of this study have implications for public health practice in Malaysia. Health care professionals can target these higher risk groups of older people to prevent and provide appropriate treatment options to alleviate the pain. It is hoped that the findings of this thesis is used for the development of a comprehensive chronic pain policy in Malaysia.

REFERENCES

Aaron, M. (2012). Effects of Obesity and Gender on Chronic Pain Severity in a Community Based Cohort. *Journal of Obesity & Weight loss Therapy*.

Aartsen, M. J., Van Tilburg, T., Smits, C. H., & Knipscheer, K. C. (2004). A longitudinal study of the impact of physical and cognitive decline on the personal network in old age. *Journal of Social and Personal Relationships*, *21*(2), 249-266.

Aday, L., & Awe, W. (1997). Health services utilization models. *Handbook of health behavior research I: Personal and social determinants*, 153-172.

Ahmad, W. I. W., & Ismail, Z. (2011). Population ageing and religious participation among rural elderly in Terengganu, Malaysia. *Journal of US-China Public Administration, 8*(9), 968-977.

Aldwin, C. M. (1991). Does age affect the stress and coping process? Implications of age differences in perceived control. *Journal of Gerontology*, *46*(4), P174-P180.

Allison, T., Symmons, D., Brammah, T., Haynes, P., Rogers, A., Roxby, M., & Urwin, M. (2002). Musculoskeletal pain is more generalised among people from ethnic minorities than among white people in Greater Manchester. *Annals of the rheumatic diseases*, *61*(2), 151-156.

Alzheimer's Association. (2014). Alzheimer's Disease Facts and Figures (March 2014).

Ambigga, K. S., Ramli, A. S., Suthahar, A., Tauhid, N., Clearihan, L., & Browning, C. (2011). Bridging the gap in ageing: Translating policies into practice in Malaysian Primary Care. *Asia Pac Fam Med, 10*(2).

Andersen, R., & Newman, J. F. (1973). Societal and individual determinants of medical care utilization in the United States. *The Milbank Memorial Fund Quarterly. Health and Society*, 95-124.

Andersen, R. E., Crespo, C. J., Bartlett, S. J., Bathon, J. M., & Fontaine, K. R. (2003). Relationship between body weight gain and significant knee, hip, and back pain in older Americans. *Obesity research*, *11*(10), 1159-1162.

Anderson, K. O., Green, C. R., & Payne, R. (2009). Racial and ethnic disparities in pain: causes and consequences of unequal care. *The Journal of Pain, 10*(12), 1187-1204.

Andersson, H. I. (1994). The epidemiology of chronic pain in a Swedish rural area. *Quality of Life Research, 3*(1), S19-S26.

Andersson, H. I., Ejlertsson, G., Leden, I., & Rosenberg, C. (1993). Chronic pain in a geographically defined general population: studies of differences in age, gender, social class, and pain localization. *The Clinical journal of pain, 9*(3), 174-182.

Arnow, B. A., Hunkeler, E. M., Blasey, C. M., Lee, J., Constantino, M. J., Fireman, B., . . . Hayward, C. (2006). Comorbid depression, chronic pain, and disability in primary care. *Psychosomatic medicine, 68*(2), 262-268.

Aro, S., & Leino, P. (1985). Overweight and musculoskeletal morbidity: a ten-year follow-up. *International journal of obesity, 9*(4), 267.

Artner, J., Cakir, B., Spiekermann, J. A., Kurz, S., Leucht, F., Reichel, H., & Lattig, F. (2013). Prevalence of sleep deprivation in patients with chronic neck and back pain: a retrospective evaluation of 1016 patients. *Journal of pain research, 6*, 1.

Australia. (2010). *National Pain Strategy: Chronic Pain*.

Ayis, S., & Dieppe, P. (2009). The Natural History of Disability and Its Determinants in Adults with Lower Limb Musculoskeletal Pain. *The Journal of rheumatology, 36*(3), 583-591.

Bardsley, M., Georghiou, T., & Dixon, J. (2010). Social care and hospital use at the end of life. *London: The Nuffield Trust*.

Barnabe, C., Elias, B., Bartlett, J., Roos, L., & Peschken, C. (2008). Arthritis in Aboriginal Manitobans: evidence for a high burden of disease. *The Journal of rheumatology, 35*(6), 1145-1150.

Barnes, P. M., Powell-Griner, E., & Adams, P. F. (2005). *Health Characteristics of the American Indian and Alaska Native Adult Population, United States, 1999-2003*: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Barnes, P. M., Powell-Griner, E., McFann, K., & Nahin, R. L. (2004). *Complementary and alternative medicine use among adults: United States, 2002.* Paper presented at the Seminars in Integrative Medicine.

Barros, A., & Hirakata, V. (2003). Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Medical Research Methodology, 3*(1), 21.

Barry, L. C., Allore, H. G., Bruce, M. L., & Gill, T. M. (2009). Longitudinal Association Between Depressive Symptoms and Disability Burden Among Older Persons. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 64A*(12), 1325-1332.

Barsante Santos, A. M., Burti, J. S., Lopes, J. B., Scazufca, M., Pasqual Marques, A., & Pereira, R. M. R. (2010). Prevalence of fibromyalgia and chronic widespread pain in community-dwelling elderly subjects living in São Paulo, Brazil. *Maturitas, 67*(3), 251-255.

Beaufrere, B., & Morio, B. (2000). Fat and protein redistribution with aging: metabolic considerations. *European journal of clinical nutrition, 54*, S48-53.

Bener, A., Alwash, R., Gaber, T., & Lovasz, G. (2003). Obesity and low back pain. *Collegium antropologicum, 27*(1), 95-104.

Bergh, I., Steen, G., Waern, M., Johansson, B., Odén, A., Sjöström, B., & Steen, B. (2003). Pain and its relation to cognitive function and depressive symptoms: A Swedish population study of 70-year-old men and women. *Journal of Pain and Symptom Management, 26*(4), 903-912.

Bergman, S., Herrström, P., Högström, K., Petersson, I. F., Svensson, B., & Jacobsson, L. (2001). Chronic musculoskeletal pain, prevalence rates, and sociodemographic

associations in a Swedish population study. *The Journal of rheumatology, 28*(6), 1369-1377.

Bernabei, R., Gambassi, G., Lapane, K., Landi, F., Gatsonis, C., Dunlop, R., . . . Group, S. S. (1998). Management of pain in elderly patients with cancer. *Jama, 279*(23), 1877-1882.

Bernfort, L., Gerdle, B., Rahmqvist, M., Husberg, M., & Levin, L.-Å. (2015). Severity of chronic pain in an elderly population in Sweden—impact on costs and quality of life. *Pain, 156*(3), 521-527.

Bhandari, A., & Wagner, T. (2006). Self-reported utilization of health care services: improving measurement and accuracy. *Medical Care Research and Review, 63*(2), 217-235.

Bhattarai, B., Pokhrel, P. K., Tripathi, M., Rahman, T. R., Baral, D. D., Pande, R., & Bhattachaya, A. (2007). Chronic pain and cost: an epidemiological study in the communities of Sunsari district of Nepal. *Nepal Med Coll J, 9*(1), 6-11.

Bisschop, M. I., Kriegsman, D. M., Deeg, D. J., Beekman, A. T., & van Tilburg, W. (2004). The longitudinal relation between chronic diseases and depression in older persons in the community: the Longitudinal Aging Study Amsterdam. *Journal of clinical epidemiology, 57*(2), 187-194.

Black, S. A., Goodwin, J. S., & Markides, K. S. (1998). The association between chronic diseases and depressive symptomatology in older Mexican Americans. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 53*(3), M188-M194.

Blyth, F. M., March, L. M., Brnabic, A. J. M., & Cousins, M. J. (2004). Chronic pain and frequent use of health care. *Pain, 111*(1-2), 51-58.

Blyth, F. M., March, L. M., Brnabic, A. J. M., Jorm, L. R., Williamson, M., & Cousins, M. J. (2001). Chronic pain in Australia: a prevalence study. *Pain, 89*(2-3), 127-134.

Blyth, F. M., March, L. M., Nicholas, M. K., & Cousins, M. J. (2003). Chronic pain, work performance and litigation. *Pain, 103*(1-2), 41-47.

Boerlage, A. A., van Dijk, M., Stronks, D. L., de Wit, R., & van der Rijt, C. C. D. (2008). Pain prevalence and characteristics in three Dutch residential homes. *European journal of pain, 12*(7), 910-916.

Brattberg, G., Parker, M. G., & Thorslund, M. (1996). The prevalence of pain among the oldest old in Sweden. *Pain, 67*(1), 29-34.

Breivik, H., Collett, B., Ventafridda, V., Cohen, R., & Gallacher, D. (2006). Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment. *European journal of pain, 10*(4), 287-333.

Brochet, B., Michel, P., Barberger-Gateau, P., & DARTIGUES, J.-F. (1998). Population-based study of pain in elderly people: a descriptive survey. *Age and Ageing, 27*(3), 279-284.

Brown, S. L., Asher, T., & Cialdini, R. B. (2005). Evidence of a positive relationship between age and preference for consistency. *Journal of Research in Personality, 39*(5), 517-533.

Bruhn, H., Bond, C. M., Elliott, A. M., Hannaford, P. C., Lee, A. J., McNamee, P., . . . Wright, D. (2013). Pharmacist-led management of chronic pain in primary care: results from a randomised controlled exploratory trial. *BMJ Open, 3*(4).

Buenaver, L., & Edwards, R. (2007). *Complementary therapies for pain management: An evidence-based approach* (First ed.): Elsevier.

Campbell, C. (2008). (347) Diffuse noxious inhibitory controls (DNIC) in African Americans, Asian Americans and non-Hispanic whites. *The Journal of Pain, 9*(4), 62.

Campbell, C. M., & Edwards, R. R. (2012). Ethnic differences in pain and pain management. *Pain management, 2*(3), 219-230.

Campbell, C. M., Edwards, R. R., & Fillingim, R. B. (2005). Ethnic differences in responses to multiple experimental pain stimuli. *Pain, 113*(1), 20-26.

Cancer Research UK. (January 2014). Cancer Incidence in the UK in 2011 *Cancer Statistics Report*: Cancer Research UK.

Cetin, D. C., & Nasr, G. (2014). Obesity in the elderly: More complicated than you think. *Cleveland Clinic Journal of Medicine, 81*(1), 51-61.

Chan, A., Malhotra, C., Do, Y. K., Malhotra, R., & Østbye, T. (2011). Self reported pain severity among multiethnic older Singaporeans: Does adjusting for reporting heterogeneity matter? *European journal of pain, 15*(10), 1094-1099.

Chen, Q., Hayman, L. L., Shmerling, R. H., Bean, J. F., & Leveille, S. G. (2011). Characteristics of chronic pain associated with sleep difficulty in older adults: the Maintenance of Balance, Independent Living, Intellect, and Zest in the Elderly (MOBILIZE) Boston study. *Journal of the American Geriatrics Society, 59*(8), 1385-1392.

Chen, X., Cheng, H. G., Huang, Y. Q., Liu, Z. R., & Luo, X. M. (2012). Depression symptoms and chronic pain in the community population in Beijing, China. *Psychiatry Research, 200*(2–3), 313-317.

Chi, I., & Chou, K.-L. (2001). Social support and depression among elderly Chinese people in Hong Kong. *International Journal of Aging and Human Development, 52*(3), 231-252.

Chowdhury, P. P., Balluz, L., & Strine, T. W. (2008). Health-related quality of life among minority populations in the United States, BRFSS 2001-2002. *Ethn Dis, 18*(4), 483-487.

Chrubasik, S., Junck, H., Zappe, H., & Stutzke, O. (1998). A survey on pain complaints and health care utilization in a German population sample. *European journal of anaesthesiology, 15*(4), 397-408.

Chung, J. W. Y., & Wong, T. K. S. (2007). Prevalence of Pain in a Community Population. *Pain Medicine, 8*(3), 235-242.

Cleary, P. D., & Jette, A. M. (1984). The validity of self-reported physician utilization measures. *Medical care*, 796-803.

Cleeland, C. S., Gonin, R., Baez, L., Loehrer, P., & Pandya, K. J. (1997). Pain and treatment of pain in minority patients with cancer: the Eastern Cooperative Oncology Group Minority Outpatient Pain Study. *Annals of internal medicine, 127*(9), 813-816.

Cole, L. J., Farrell, M. J., Gibson, S. J., & Egan, G. F. (2010). Age-related differences in pain sensitivity and regional brain activity evoked by noxious pressure. *Neurobiology of aging, 31*(3), 494-503.

Collett, B., O'Mahoney, S., Schofield, P., & Potter, J. (2007). Concise guidance to good clinical practice: The assessment of pain in older people. *National Guidance*.

Cook, A. J., & Thomas, M. R. (1994). Pain and the use of health services among the elderly. *Journal of aging and health, 6*(2), 155-172.

Coutinho, L., Scazufca, M., & Menezes, P. R. (2008). Methods for estimating prevalence ratios in cross-sectional studies. *Revista de Saúde Pública, 42*(6), 992-998.

Covinsky, K. E., Lindquist, K., Dunlop, D. D., & Yelin, E. (2009). Pain, functional limitations, and aging. *Journal of the American Geriatrics Society, 57*(9), 1556-1561.

Craft, R. M., Mogil, J. S., & Aloisi, A. M. (2004). Sex differences in pain and analgesia: the role of gonadal hormones. *European journal of pain, 8*(5), 397-411.

Croft, P. (2010). Disease-related pain: an introduction. In Croft P, Blyth M & Windt, v. d. (Eds.), *Chronic Pain Epidemiology: From Aetiology to Public Health* (pp. 203-208). Oxford, UK/New York: Oxford University Press.

Croft, P., Blyth, F. M., & Windt, D. V. D. (2010a). *Chronic Pain Epidemiology: From Aetiology to Public Health*: Oxford University.

Croft, P., Blyth, F. M., & Windt, D. V. D. (2010b). The global occurrence of chronic pain: an introduction. In Croft, P., Blyth, F. M. & Windt, D. V. D. (Eds.), *Chronic Pain Epidemiology: From Aetiology to Public Health.* (pp. 9-18). Oxford, UK/New York: Oxford University Press.

Crombie, I. K., Irvine, L., Williams, B., McGinnis, A. R., Slane, P. W., Alder, E. M., & McMurdo, M. E. (2004). Why older people do not participate in leisure time physical activity: a survey of activity levels, beliefs and deterrents. *Age and Ageing*, *33*(3), 287-292.

Davies, M., Brophy, S., Williams, R., & Taylor, A. (2006). The prevalence, severity, and impact of painful diabetic peripheral neuropathy in type 2 diabetes. *Diabetes care*, *29*(7), 1518-1522.

Dawson, J., Linsell, L., Zondervan, K., Rose, P., Randall, T., Carr, A., & Fitzpatrick, R. (2004). Epidemiology of hip and knee pain and its impact on overall health status in older adults. *Rheumatology*, *43*(4), 497-504.

Decaria, J., Sharp, C., & Petrella, R. (2012). Scoping review report: obesity in older adults. *International journal of obesity*, *36*(9), 1141-1150.

Deyo, R. A., Mirza, S. K., & Martin, B. I. (2006). Back pain prevalence and visit rates: estimates from US national surveys, 2002. *Spine*, *31*(23), 2724-2727.

Dionne, C. E., Dunn, K. M., & Croft, P. R. (2006). Does back pain prevalence really decrease with increasing age? A systematic review. *Age and Ageing*, *35*(3), 229-234.

Dominick, C. H., Blyth, F. M., & Nicholas, M. K. (2012). Unpacking the burden: understanding the relationships between chronic pain and comorbidity in the general population. *Pain*, *153*(2), 293-304.

Donaldson, L. (2009). 150 years of the Annual Report of the Chief Medical Officer: On the state of public health 2008. *London: Department of Health*, 32-39.

Duncan, R., Peat, G., Thomas, E., Hay, E., McCall, I., & Croft, P. (2007). Symptoms and radiographic osteoarthritis: not as discordant as they are made out to be? *Annals of the rheumatic diseases, 66*(1), 86-91.

Economics Access. (2007). *The high price of pain: the economic impact of persistent pain in Australia*: MBF Foundation.

Edwards, R. R. (2008). The association of perceived discrimination with low back pain. *Journal of behavioral medicine, 31*(5), 379-389.

Edwards, R. R., Giles, J., Bingham III, C. O., Campbell, C., Haythornthwaite, J. A., & Bathon, J. (2010). Moderators of the negative effects of catastrophizing in arthritis. *Pain Medicine, 11*(4), 591-599.

Edwards, R. R., Goble, L., Kwan, A., Kudel, I., McGuire, L., Heinberg, L., . . . Haythornthwaite, J. (2006). Catastrophizing, pain, and social adjustment in scleroderma: relationships with educational level. *The Clinical journal of pain, 22*(7), 639-646.

Edwards, R. R., Moric, M., Husfeldt, B., Buvanendran, A., & Ivankovich, O. (2005). Ethnic similarities and differences in the chronic pain experience: a comparison of African American, Hispanic, and white patients. *Pain Medicine, 6*(1), 88-98.

Ellermeier, W., & Westphal, W. (1995). Gender differences in pain ratings and pupil reactions to painful pressure stimuli. *Pain, 61*(3), 435-439.

Elliott, A. M., Smith, B. H., Penny, K. I., Cairns Smith, W., & Alastair Chambers, W. (1999). The epidemiology of chronic pain in the community. *The lancet, 354*(9186), 1248-1252.

Engel, G. L. (1980). The clinical application of the biopsychosocial model. *Am J Psychiatry, 137*(5), 535-544.

Erikesen, J., Jensen, M., Sjogren, P., Ekholm, O., & Rasmussen, N. (2003). Epidemiology of chronic non-malignant pain in Denmark. *Pain, 106*, 221 - 228.

Eriksen, J., Sjøgren, P., Ekholm, O., & Rasmussen, N. K. (2004). Health care utilisation among individuals reporting long-term pain: an epidemiological study based on Danish National Health Surveys. *European journal of pain, 8*(6), 517-523.

Evans, R. G., & Stoddart, G. L. (1990). Producing health, consuming health care. *Social Science & Medicine, 31*(12), 1347-1363.

Failde, I., Ramos, I., & Fernandez-Palacin, F. (2000). Comparison between the GHQ-28 and SF-36 (MH 1–5) for the assessment of the mental health in patients with ischaemic heart disease. *European journal of epidemiology, 16*(4), 311-316.

Fakhouri, T. H. I., Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (September 2012). Prevalence of Obesity Among Older Adults in the United States, 2007–2010 *NCHS Data Brief* (Vol. 106).

Farrell, M. J. (2012). Age-Related Changes in the Structure and Function of Brain Regions Involved in Pain Processing. *Pain Medicine, 13*(s2), S37-S43.

Fatimah, S., Tahir, A., Siti Sa'adiah, H. N., & Maimunah, A. H. (1999). Nutritional Status of Adults Aged 18 Years and above. National Health and Morbidity Survey 1996 (Vol. Volume 14): Institute of Public Health, Ministry of Health, Malaysia,.

Ferrell, B. A., Ferrell, B. R., & Osterweil, D. (1990). Pain in the nursing home. *Journal of the American Geriatrics Society*.

Ferucci, E. D., Templin, D. W., & Lanier, A. P. (2005). *Rheumatoid arthritis in American Indians and Alaska Natives: a review of the literature.* Paper presented at the Seminars in arthritis and rheumatism.

Fielding, R., & Wong, W. S. (2012). Prevalence of chronic pain, insomnia, and fatigue in Hong Kong. *Hong Kong Med J, 18 Suppl 3*, 9-12.

Fillingim, R. B., King, C. D., Ribeiro-Dasilva, M. C., Rahim-Williams, B., & Riley III, J. L. (2009). Sex, gender, and pain: a review of recent clinical and experimental findings. *The Journal of Pain, 10*(5), 447-485.

Fiori, K. L., Antonucci, T. C., & Akiyama, H. (2008). Profiles of social relations among older adults: A cross-cultural approach. *Ageing and Society, 28*(02), 203-231.

First Asia Pacific Declaration. (2006). For Chronic Pain Relief to Solve its Major Health Crisis. *APBN 2006, 10*(23), 1370-1371.

Fishbain, D. A., Cutler, R., Rosomoff, H. L., & Rosomoff, R. S. (1997). Chronic pain-associated depression:antecedent or consequence of chronic pain? A review. *Clin J Pain, 13*, 116-137.

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Johnson, C. L. (2002). Prevalence and trends in obesity among US adults, 1999-2000. *JAMA: the journal of the American Medical Association, 288*(14), 1723-1727.

Flor, H., Turk, D. C., & Berndt Scholz, O. (1987). Impact of chronic pain on the spouse: Marital, emotional and physical consequences. *Journal of Psychosomatic Research, 31*(1), 63-71.

Fortin, M., Lapointe, L., Hudon, C., & Vanasse, A. (2005). Multimorbidity is common to family practice: is it commonly researched? *Canadian Family Physician, 51*(2), 244-245.

Gagliese, L. (2009). Pain and aging: the emergence of a new subfield of pain research. *The Journal of Pain, 10*(4), 343-353.

Gatchel, R. J. (2004). Comorbidity of chronic pain and mental health disorders: the biopsychosocial perspective. *American Psychologist, 59*(8), 795.

Gatchel, R. J. (2005). *Clinical essentials of pain management*: American Psychological Association.

Gatchel, R. J., & Dersh, J. (2002). Psychological disorders and chronic pain: Are there cause and effect relationships? *Psychological approaches to pain management: A practitioner's handbook*. New York: Guilford Press.

Gerdle, B., Bjork, J., Coster, L., Henriksson, K., Henriksson, C., & Bengtsson, A. (2008). Prevalence of widespread pain and associations with work status: a population study. *BMC Musculoskelet Disord, 9*, 102.

Gibson, S. J., & Farrell, M. (2004). A review of age differences in the neurophysiology of nociception and the perceptual experience of pain. *The Clinical journal of pain, 20*(4), 227-239.

Gibson, S. J., & Helme, R. D. (2001). Age-related differences in pain perception and report. *Clinics in geriatric medicine, 17*(3), 433-456.

Goldberg, D., & McGee, S. (2011). Pain as a global public health priority. *BMC Public Health, 11*(1), 770.

Goldberg, D. P., Gater, R., Sartorius, N., Ustun, T., Piccinelli, M., Gureje, O., & Rutter, C. (1997). The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychological medicine, 27*(01), 191-197.

Goral, A., Lipsitz, J. D., & Gross, R. (2010). The relationship of chronic pain with and without comorbid psychiatric disorder to sleep disturbance and health care utilization: Results from the Israel National Health Survey. *Journal of Psychosomatic Research, 69*(5), 449-457.

Green, C. R., Anderson, K. O., Baker, T. A., Campbell, L. C., Decker, S., Fillingim, R. B., . . . Tait, R. C. (2003). The unequal burden of pain: confronting racial and ethnic disparities in pain. *Pain Medicine, 4*(3), 277-294.

Green, C. R., Baker, T. A., Sato, Y., Washington, T. L., & Smith, E. M. (2003). Race and chronic pain: a comparative study of young black and white Americans presenting for management. *The Journal of Pain, 4*(4), 176-183.

Greenspan, J. D., Craft, R. M., & LeResche, L. (2007). Studying sex and gender differences in pain and analgesia. A consensus report. *Pain, 132*, S26-S45.

Gupta, E. D., Zailinawati, A., Chan, J., Yap, S., & Hla, Y. (2009). Are Indians and females less tolerant to pain? An observational study using a laboratory pain model. *Med J Malaysia, 64*(2), 111.

Hairi, N. N., Cumming, R. G., Blyth, F. M., & Naganathan, V. (2013). Chronic pain, impact of pain and pain severity with physical disability in older people--is there a gender difference? *Maturitas, 74*(1), 68-73.

Hamid, T. A., Krishnaswamy, S., Abdullah, S. S., & Momtaz, Y. A. (2010). Sociodemographic Risk Factors and Correlates of Dementia in Older Malaysians. *Dementia and Geriatric Cognitive Disorders, 30*(6), 533-539.

Han, T., Schouten, J., Lean, M., & Seidell, J. (1997). The prevalence of low back pain and associations with body fatness, fat distribution and height. *International journal of obesity, 21*(7), 600-607.

Han, T., Tajar, A., & Lean, M. (2011). Obesity and weight management in the elderly. *British medical bulletin, 97*(1), 169-196.

Harris, L. (2004). *Review of prevalence of pain in older adults.* MMedSci, Keele University.

Harrison, A., Ahmed Busabir, A., ObeidAl-Kaabi, A., & Khahd Al-Awadi, H. (1996). Does sharing a mother-tongue affect how closely patients and nurses agree when rating the patient's pain, worry and knowledge? *Journal of Advanced Nursing, 24*(2), 229-235.

Hart, D. J., & Spector, T. D. (1993). The relationship of obesity, fat distribution and osteoarthritis in women in the general population: the Chingford Study. *The Journal of rheumatology, 20*(2), 331-335.

Hastie, B. A., Riley, J. L., & Fillingim, R. B. (2005). Ethnic differences and responses to pain in healthy young adults. *Pain Medicine, 6*(1), 61-71.

Hattori, S. (2004). The clinical perspective on chronic pain management in Japan. *Pain Clinic, 25*, 1541-1551.

Heim, N., Snijder, M. B., Deeg, D. J., Seidell, J. C., & Visser, M. (2008). Obesity in older adults is associated with an increased prevalence and incidence of pain. *Obesity, 16*(11), 2510-2517.

Helme, R. D., & Gibson, S. J. (2001). The epidemiology of pain in elderly people. *Clinics in geriatric medicine, 17*(3), 417-431.

Hitt, H. C., McMillen, R. C., Thornton-Neaves, T., Koch, K., & Cosby, A. G. (2007). Comorbidity of obesity and pain in a general population: results from the Southern Pain Prevalence Study. *The Journal of Pain, 8*(5), 430-436.

Ho, K. H., & Ong, B. K. (2001). Headache characteristics and race in Singapore: Results of a randomized national survey. *Headache: The Journal of Head and Face Pain, 41*(3), 279-284.

Hoeffel, E. M., Rastogi, S., Kim, M. O., Hasan, S., & Census, U. S. B. o. t. (2012). *The Asian Population: 2010*: US Department of Commerce, Economics and Statistics Administration, US Census Bureau.

Hooftman, W. E., van der Beek, A. J., Bongers, P. M., & van Mechelen, W. (2005). Gender differences in self-reported physical and psychosocial exposures in jobs with both female and male workers. *Journal of Occupational and Environmental Medicine, 47*(3), 244-252.

Horani, M., & Mooradian, A. (2002). Management of Obesity in the Elderly. *Treatments in Endocrinology, 1*(6), 387-398.

Hübscher, M., Vogt, L., Schmidt, K., Fink, M., & Banzer, W. (2010). Perceived pain, fear of falling and physical function in women with osteoporosis. *Gait & posture, 32*(3), 383-385.

Husum, H., Resell, K., Vorren, G., Heng, Y. V., Murad, M., Gilbert, M., & Wisborg, T. (2002). Chronic pain in land mine accident survivors in Cambodia and Kurdistan. *Social Science & Medicine, 55*(10), 1813-1816.

Huxhold, O., Fiori, K. L., & Windsor, T. D. (2013). The dynamic interplay of social network characteristics, subjective well-being, and health: The costs and benefits of socio-emotional selectivity. *Psychology and aging, 28*(1), 3.

I. Viane, G. C., C. Eccleston, C. Poppe, J. Devulder, B. Van Houdenhove, W. De Corte. (2003). Acceptance of pain is an independent predictor of mental well-being in patients with chronic pain: empirical evidence and reappraisal. *Pain, 106*, 65-72.

IASP. (1986a). Classification of chronic pain. Description of chronic pain syndromes and definitions of pain terms. *Pain*(Suppl 3), S1-S225.

IASP. (1986b). Taxonomy and Classification of Chronic Pain. Description of Chronic pain syndromes and definition of pain terms. *Pain, 3*(Supplement), S1-S226.

IASP. (2010). Desirable Characteristics of National Pain Strategies:Recommendations by the International Association for the Study of Pain

IASP. (2011). International Pain Summit of the International Association for the Study of Pain. Declaration of Montreal: declaration that access to pain management is a fundamental human right. *Journal of Pain and Palliative Care Pharmacotherapy, 25*(1), 29-31.

Institute for Public Health. (2008). The Third National Health and Morbidity Survey (NHMS) 2006. *Ministry of Health, Malaysia, Vols 1&2*.

Institute for Public Health (IPH). (2008). The Third National Health and Morbidity Survey (NHMS) 2006. *Ministry of Health, Malaysia, Vol 1&2*.

Institute of Medicine. (2011). *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*: National Academies Press.

Institute of Public Health. (2011). *The National Health and Morbidity Survey. Healthcare Demand And Out-Of-Pocket Health Expenditure.*: Institute of Public Health.

Jackson, T., Chen, H., Iezzi, T., Yee, M. M. A., & Chen, F. M. A. (2014). Prevalence and Correlates of Chronic Pain in a Random Population Study of Adults in Chongqing, China. [Article].

Jakobsson, U., Klevsgård, R., Westergren, A., & Hallberg, I. R. (2003). Old people in pain: A comparative study. *Journal of Pain and Symptom Management, 26*(1), 625-636.

Janke, E. A., & Kozak, A. T. (2012). The more pain I have, the more I want to eat": obesity in the context of chronic pain. *Obesity (Silver Spring), 20*(10), 2027-2034.

Jensen, M. P., Moore, M. R., Bockow, T. B., Ehde, D. M., & Engel, J. M. (2011). Psychosocial factors and adjustment to chronic pain in persons with physical disabilities: a systematic review. *Archives of physical medicine and rehabilitation, 92*(1), 146-160.

Jimenez, N., Garroutte, E., Kundu, A., Morales, L., & Buchwald, D. (2011). A review of the experience, epidemiology, and management of pain among American Indian, Alaska Native, and Aboriginal Canadian peoples. *The Journal of Pain, 12*(5), 511-522.

Johannes, C. B., Le, T. K., Zhou, X., Johnston, J. A., & Dworkin, R. H. (2010). The Prevalence of Chronic Pain in United States Adults: Results of an Internet-Based Survey. *The Journal of Pain, 11*(11), 1230-1239.

Johnson, R. L., Saha, S., Arbelaez, J. J., Beach, M. C., & Cooper, L. A. (2004). Racial and ethnic differences in patient perceptions of bias and cultural competence in health care. *Journal of general internal medicine, 19*(2), 101-110.

Kalaria, R. N., Maestre, G. E., Arizaga, R., Friedland, R. P., Galasko, D., Hall, K., . . . Potocnik, F. (2008). Alzheimer's disease and vascular dementia in developing countries: prevalence, management, and risk factors. *The Lancet Neurology, 7*(9), 812-826.

Kananatu, K. (2002). Healthcare financing in Malaysia. *Asia-Pacific Journal of Public Health, 14*(1), 23-28.

Keehan, S., Sisko, A., Truffer, C., Smith, S., Cowan, C., Poisal, J., & Clemens, M. K. (2008). Health spending projections through 2017: the baby-boom generation is coming to Medicare. *Health Affairs, 27*(2), w145-w155.

Kemler, M. A., & Furnée, C. A. (2002). The Impact of Chronic Pain on Life in the Household. *Journal of Pain and Symptom Management, 23*(5), 433-441.

Kerns, R. D., & Haythornthwaite, J. A. (1988). Depression among chronic pain patients: cognitive-behavioral analysis and effect on rehabilitation outcome. *Journal of Consulting and Clinical Psychology, 56*(6), 870.

Kikuchi, N., Ohmori-Matsuda, K., Shimazu, T., Sone, T., Kakizaki, M., Nakaya, N., . . . Tsuji, I. (2009). Pain and risk of completed suicide in Japanese men: a population-based cohort study in Japan (Ohsaki Cohort Study). *J Pain Symptom Manage, 37*(3), 316-324.

Klonoff, E. A. (2009). Disparities in the provision of medical care: an outcome in search of an explanation. *Journal of behavioral medicine, 32*(1), 48-63.

Korten, A., Jacomb, P., Jiao, Z., Christensen, H., Jorm, A., Henderson, A., & Rodgers, B. (1998). Predictors of GP service use: a community survey of an elderly Australian sample. *Australian and New Zealand journal of public health, 22*(5), 609-615.

Kraschnewski, J. L., Sciamanna, C. N., Ciccolo, J. T., Rovniak, L. S., Lehman, E. B., Candotti, C., & Ballentine, N. H. (2014). Is exercise used as medicine? Association of meeting strength training guidelines and functional limitations among older US adults. *Prev Med, 66*, 1-5.

Kuch, K. (2001). Psychological factors and the development of chronic pain. *The Clinical journal of pain, 17*(4), S33-S38.

Kumar, A., & Allcock, N. (2008). *Pain in Older People. Reflections and Experiences from an Older Person's Perspective.* London.

Lalonde, L., Choinière, M., Martin, É., Berbiche, D., Perreault, S., & Lussier, D. (2014). Costs of moderate to severe chronic pain in primary care patients–a study of the ACCORD program. *Journal of pain research, 7*, 389.

Landi, F., Onder, G., Cesari, M., Russo, A., Barillaro, C., & Bernabei, R. (2005). Pain and Its Relation to Depressive Symptoms in Frail Older People Living in the Community: An Observational Study. *Journal of Pain and Symptom Management, 29*(3), 255-262.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33*(1), 159-174.

Launer, L. J., & Harris, T. (1996). Weight, height and body mass index distributions in geographically and ethnically diverse samples of older persons. *Age and Ageing, 25*(4), 300-306.

Lautenbacher, S., Kunz, M., Strate, P., Nielsen, J., & Arendt-Nielsen, L. (2005). Age effects on pain thresholds, temporal summation and spatial summation of heat and pressure pain. *Pain, 115*(3), 410-418.

Leboeuf-Yde, C., & Lauritsen, J. M. (1995). The prevalence of low back pain in the literature. A structured review of 26 Nordic studies from 1954 to 1993. *Spine, 20*, 2112-2118.

Leboeuf–Yde, C., Kyvik, K. O., & Bruun, N. H. (1999). Low Back Pain and Lifestyle. Part II—Obesity: Information From a Population-based Sample of 29,424 Twin Subjects. *Spine, 24*(8), 779-784.

Lee, J. (1994). Odds ratio or relative risk for cross-sectional data? [letter]. *International Journal of Epidemiology, 23*, 201 - 203.

Lee, M. S., Crittenden, K. S., & Yu, E. (1996). Social support and depression among elderly Korean immigrants in the United States. *The International Journal of Aging and Human Development*, *42*(4), 313-327.

Lee, S., Tsang, A., Huang, Y. Q., Zhang, M. Y., Liu, Z. R., He, Y. L., . . . Kessler, R. C. (2007). Arthritis and physical–mental comorbidity in metropolitan China. *Journal of Psychosomatic Research*, *63*(1), 1-7.

LeResche, L. (1999). Gender considerations in the epidemiology of chronic pain. *Epidemiology of pain*, *17*, 43-52.

Leveille, S. G., Wee, C. C., & Iezzoni, L. I. (2005). Trends in obesity and arthritis among baby boomers and their predecessors, 1971–2002. *American Journal of Public Health*, *95*(9), 1607.

Lin, C. W. C., McAuley, J. H., Macedo, L., Barnett, D. C., Smeets, R. J., & Verbunt, J. A. (2011). Relationship between physical activity and disability in low back pain: a systematic review and meta-analysis. *PAIN®*, *152*(3), 607-613.

Lin, E. H., Katon, W., Von Korff, M., Tang, L., Williams Jr, J. W., Kroenke, K., . . . Arean, P. (2003). Effect of improving depression care on pain and functional outcomes among older adults with arthritis: a randomized controlled trial. *Jama*, *290*(18), 2428-2429.

Little, R. J., & Rubin, D. B. (1989). The analysis of social science data with missing values. *Sociological Methods & Research*, *18*(2-3), 292-326.

Little, R. J., & Rubin, D. B. (2002). *Statistical analysis with missing data* (2nd ed.). New York: John Wiley & Sons.

Loevinger, B. L., Muller, D., Alonso, C., & Coe, C. L. (2007). Metabolic syndrome in women with chronic pain. *Metabolism*, *56*(1), 87-93.

Lu, H., & Javier, F. (2011). Prevalence and treatment of chronic pain in the Philippines. *Philipp J Intern Med*, *49*, 61-69.

MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On the practice of dichotomization of quantitative variables. *Psychological methods, 7*(1), 19.

Macfarlane, G. J., Morris, S., Hunt, I. M., Benjamin, S., McBeth, J., Papageorgiou, A. C., & Silman, A. J. (1999). Chronic widespread pain in the community: the influence of psychological symptoms and mental disorder on healthcare seeking behavior. *J Rheumatol, 26*(2), 413-419.

Malaysia. Department of Statistics. (2010).

Mallen, C., Peat, G., Thomas, E., & Croft, P. (2005). Severely disabling chronic pain in young adults: prevalence from a population-based postal survey in North Staffordshire. *BMC Musculoskeletal Disorders, 6*(1), 42.

Maniam, T. (1996). Validation of the General Health Questionnaire (GHQ-30) for a Malaysian population. *Mal J Psych, 4*(2), 25-31.

Mäntyselkä, P. T., Turunen, J. H., Ahonen, R. S., & Kumpusalo, E. A. (2003). Chronic pain and poor self-rated health. *Jama, 290*(18), 2435-2442.

Martin, K. R., Schoster, B., Woodard, J., & Callahan, L. F. (2012). What community resources do older community-dwelling adults use to manage their osteoarthritis? A formative examination. *Journal of Applied Gerontology, 31*(5), 661-684.

Mathus Vliegen, E. M. (2012). Obesity Management Task Force of the European Association for the Study of Obesity: Prevalence, pathophysiology, health consequences and treatment options of obesity in the elderly: a guideline. *Obes Facts, 5*(3), 460-483.

McAlindon, T., Cooper, C., Kirwan, J., & Dieppe, P. (1992). Knee pain and disability in the community. *Rheumatology, 31*(3), 189-192.

McCallum, J., Simons, L., Simons, J., Wilson, J., Sadler, P., & Owen, A. (1996). Patterns and costs of post-acute care: a longitudinal study of people aged 60 and over in Dubbo. *Australian and New Zealand journal of public health, 20*(1), 19-26.

McCarthy, L. H., Bigal, M. E., Katz, M., Derby, C., & Lipton, R. B. (2009). Chronic pain and obesity in elderly people: results from the Einstein aging study. *Journal of the American Geriatrics Society, 57*(1), 115-119.

McCracken. (1998). Learning to live with the pain: Acceptance of pain predicts adjustment in persons with chronic pain *Pain, 74*(1), 21-27.

McCracken, C. E. (2003). Coping or acceptance: What to do about chronic pain? . *Pain, 105*(1-2), 197-204.

McVinnie, D. S. (2013). Obesity and pain. *British Journal of Pain, 7*(4), 163-170.

Mechlin, B., Heymen, S., Edwards, C. L., & Girdler, S. S. (2011). Ethnic differences in cardiovascular-somatosensory interactions and in the central processing of noxious stimuli. *Psychophysiology, 48*(6), 762-773.

Mechlin, B., Morrow, A. L., Maixner, W., & Girdler, S. S. (2007). The relationship of allopregnanolone immunoreactivity and HPA-axis measures to experimental pain sensitivity: Evidence for ethnic differences. *Pain, 131*(1), 142-152.

Mechlin, M. B., Maixner, W., Light, K. C., Fisher, J. M., & Girdler, S. S. (2005). African Americans show alterations in endogenous pain regulatory mechanisms and reduced pain tolerance to experimental pain procedures. *Psychosomatic medicine, 67*(6), 948-956.

Melding, P. (1996). Is there such a thing as geriatric pain? *Pain, 46*, 119-121.

Melhorn, J. M. (2000). Workers' Compensation: Avoiding Work-Related Disability*. *The Journal of Bone & Joint Surgery, 82*(10), 1490-1490.

Mendoza-Sassi, R., Beria, J., & Barros, A. (2003). Outpatient health service utilization and associated factors: a population-based study. *Revista de Saude Publica, 37*, 372 - 378.

Messing, K., Dumais, L., Courville, J., Seifert, A. M., & Boucher, M. (1994). Evaluation of exposure data from men and women with the same job title. *Journal of Occupational and Environmental Medicine, 36*(8), 913-917.

Miaskowski, C. (2000). The impact of age on a patient's perception of pain and ways it can be managed. *Pain Management Nursing, 1*(3), 2-7.

Miettinen, T., Lindgren, K.-A., Airaksinen, O., & Leino, E. (2002). Whiplash injuries in Finland: a prospective 1-year follow-up study. *Clinical and experimental rheumatology, 20*(3), 399-402.

Ministry of Health Malaysia. (2012). Census Report 2012. Anaesthesiology: Ministry of Health, Malaysia.

Miró, J., Paredes, S., Rull, M., Queral, R., Miralles, R., Nieto, R., . . . Baos, J. (2007). Pain in older adults: A prevalence study in the Mediterranean region of Catalonia. *European journal of pain, 11*(1), 83-92.

Mohamed Zaki, L. R., & Hairi, N. N. (2014). A Systematic Review of the Prevalence and Measurement of Chronic Pain in Asian Adults. *Pain Management Nursing, 16*(3), 440-452.

Molton, I., Jensen, M. P., Ehde, D. M., Carter, G. T., Kraft, G., & Cardenas, D. D. (2008). Coping With Chronic Pain Among Younger, Middle-Aged, and Older Adults Living With Neurological Injury and Disease. *Journal of aging and health*.

Molton, I. R., & Terrill, A. L. (2014). Overview of persistent pain in older adults. *American Psychologist, 69*(2), 197.

Nakamura, M., Nishiwaki, Y., Ushida, T., & Toyama, Y. (2011). Prevalence and characteristics of chronic musculoskeletal pain in Japan. *J Orthop Sci, 16*(4), 424-432.

Neville, A., Peleg, R., Singer, Y., Sherf, M., & Shvartzman, P. (2008). Chronic pain: a population-based study. *The Israel Medical Association Journal, 10*(10), 676.

Ng, K. F. J., Tsui, S. L., & Chan, W. S. (2002). Prevalence of Common Chronic Pain in Hong Kong Adults. *SO - Clinical Journal of Pain September/October 2002;18(5):275-281*.

O'Reilly, S., Muir, K., & Doherty, M. (1998). Knee pain and disability in the Nottingham community: association with poor health status and psychological distress. *Rheumatology, 37*(8), 870-873.

Okura, Y., Urban, L. H., Mahoney, D. W., Jacobsen, S. J., & Rodeheffer, R. J. (2004). Agreement between self-report questionnaires and medical record data was substantial for diabetes, hypertension, myocardial infarction and stroke but not for heart failure. *Journal of clinical epidemiology, 57*(10), 1096-1103.

Oliveria, S. A., Felson, D. T., Cirillo, P. A., Reed, J. I., & Walker, A. M. (1999). Body Weight, Body Mass Index, and Incident Symptomatic Osteoarthritis of the Hand, Hip, and Knee. *Epidemiology, 10*(2), 161-166.

Ong, F. S., Phillips, D. R., & Hamid, T. A. (2009). Ageing in Malaysia: progress and prospects. In Hughes, T.-h. F. R. (Ed.), *Ageing in East Asia: Challenges and policies for the twenty-first century*. (pp. 138-160). London.

Oriol, W. E. (1982). Aging in all nations: a special report on the United Nations World Assembly on Aging including the text of the International Action Program on Aging Vienna Austria July 26-August 6 1982.

Ospina, M., & Harstall, C. (2002). *Prevalence of chronic pain: an overview*. Canada: Alberta Heritage Foundation for Medical Research.

Palmer, B., Macfarlane, G., Afzal, C., Esmail, A., Silman, A., & Lunt, M. (2007). Acculturation and the prevalence of pain amongst South Asian minority ethnic groups in the UK. *Rheumatology, 46*(6), 1009-1014.

Penninx, B. W. J. H., Beekman, A. T. F., Ormel, J., Kriegsman, D. M. W., Boeke, A. J. P., Van Eijk, J. T. M., & Deeg, D. J. H. (1996). Psychological status among elderly people with chronic diseases: Does type of disease play a part? *Journal of Psychosomatic Research, 40*(5), 521-534.

Petrou, S., Murray, L., Cooper, P., & Davidson, L. L. (2002). The accuracy of self-reported healthcare resource utilization in health economic studies. *International journal of technology assessment in health care, 18*(3), 705-710.

Picavet, H. S. J. (2010). Musculoskeletal pain complaints from a sex and gender perspective. *Chronic Pain Epidemiology: From Aetiology to Public Health, 118*, 119.

Poole, H., White, S., Blake, C., Murphy, P., & Bramwell, R. (2009). Depression in chronic pain patients: prevalence and measurement. *Pain Pract, 9*(3), 173-180.

Portenoy, R. K., Ugarte, C., Fuller, I., & Haas, G. (2004). Population-based survey of pain in the United States: differences among white, African American, and Hispanic subjects. *The Journal of Pain, 5*(6), 317-328.

Potts, M. K. (1997). Social support and depression among older adults living alone: The importance of friends within and outside of a retirement community. *Social work, 42*(4), 348-362.

Przekop, P., Haviland, M. G., Oda, K., & Morton, K. R. (2014). Prevalence and correlates of pain interference in older adults: Why treating the whole body and mind is necessary. *Journal of Bodywork and Movement Therapies*.

Quiton, R. L., Roys, S. R., Zhuo, J., Keaser, M. L., Gullapalli, R. P., & Greenspan, J. D. (2007). Age-Related Changes in Nociceptive Processing in the Human Brain. *Annals of the New York Academy of Sciences, 1097*(1), 175-178.

Raftery, M. N., Sarma, K., Murphy, A. W., De la Harpe, D., Normand, C., & McGuire, B. E. (2011). Chronic pain in the Republic of Ireland--Community prevalence, psychosocial profile and predictors of pain-related disability: Results from the Prevalence, Impact and Cost of Chronic Pain (PRIME) study, Part 1. *Pain, 152*(5), 1096-1103.

Rahim-Williams, F. B., Riley, J. L., Herrera, D., Campbell, C. M., Hastie, B. A., & Fillingim, R. B. (2007). Ethnic identity predicts experimental pain sensitivity in African Americans and Hispanics. *Pain, 129*(1), 177-184.

Raina, P., Torrance-Rynard, V., Wong, M., & Woodward, C. (2002). Agreement between Self-reported and routinely collected Health-care utilization data among seniors. *Health services research, 37*(3), 751-774.

Ray, L., Lipton, R. B., Zimmerman, M. E., Katz, M. J., & Derby, C. A. (2011). Mechanisms of association between obesity and chronic pain in the elderly. *PAIN®, 152*(1), 53-59.

Rhee, H. (2000). Prevalence and predictors of headaches in US adolescents. *Headache: The Journal of Head and Face Pain, 40*(7), 528-538.

Rickards, L. (2004). *Living in Britain: Results from the 2002 General Household Survey* (Vol. 31): The Stationery Office.

Riley III, J. L., Wade, J. B., Myers, C. D., Sheffield, D., Papas, R. K., & Price, D. D. (2002). Racial/ethnic differences in the experience of chronic pain. *Pain, 100*(3), 291-298.

Ritter, P. L., Stewart, A. L., Kaymaz, H., Sobel, D. S., Block, D. A., & Lorig, K. R. (2001). Self-reports of health care utilization compared to provider records. *Journal of clinical epidemiology, 54*(2), 136-141.

Roberts, R. O., Bergstralh, E. J., Schmidt, L., & Jacobsen, S. J. (1996). Comparison of self-reported and medical record health care utilization measures. *Journal of clinical epidemiology, 49*(9), 989-995.

Robinson, M. E., Gagnon, C. M., Riley III, J. L., & Price, D. D. (2003). Altering gender role expectations: effects on pain tolerance, pain threshold, and pain ratings. *The Journal of Pain, 4*(5), 284-288.

Rostam, K. (2012). Warga tua Melayu pinggir Wilayah Metropolitan, Selangor: pengalaman dan persepsi tentang diri. *Geografia: Malaysian Journal of Society and Space, 8*(6), 1-14.

Rubin, D. B. (1996). Multiple imputation after 18+ years. *Journal of the American Statistical Association, 91*(434), 473-489.

Rudy, T. E., Kerns, R. D., & Turk, D. C. (1988). Chronic pain and depression: toward a cognitive-behavioral mediation model. *Pain, 35*(2), 129-140.

Rustoen, T., Wahl, A. K., Hanestad, B. R., Lerdal, A., Paul, S., & Miaskowski, C. (2004). Prevalence and characteristics of chronic pain in the general Norwegian population. *Eur J Pain, 8*(6), 555-565.

Rustoen, T., Wahl, A. K., Hanestad, B. R., Lerdal, A., Paul, S., & Miaskowski, C. (2005). Age and the experience of chronic pain: differences in health and quality of life among younger, middle-aged, and older adults. *Clin J Pain, 21*(6), 513-523.

Sarkisian, C. A., Hays, R. D., & Mangione, C. M. (2002). Do older adults expect to age successfully? The association between expectations regarding aging and beliefs regarding healthcare seeking among older adults. *Journal of the American Geriatrics Society, 50*(11), 1837-1843.

Schneider, E. L., & Guralnik, J. M. (1990). The aging of America: impact on health care costs. *Jama, 263*(17), 2335-2340.

Schofield. (2012). *Quantifying the Productivity impacts of poor health and health interventions*. Health Economics. University of Sydney Oct 2012.

Scudds, R. J., & Østbye, T. (2001). Pain and pain-related interference with function in older Canadians: the Canadian Study of Health and Aging. *Disability & Rehabilitation, 23*(15), 654-664.

Shavers, V. L., Bakos, A., & Sheppard, V. B. (2010). Race, ethnicity, and pain among the US adult population. *Journal of health care for the poor and underserved, 21*(1), 177-220.

Shi, Y., Hooten, W. M., Roberts, R. O., & Warner, D. O. (2010). Modifiable risk factors for incidence of pain in older adults. *PAIN®, 151*(2), 366-371.

Short, M. E., Goetzel, R. Z., Pei, X., Tabrizi, M. J., Ozminkowski, R. J., Gibson, T. B., . . . Wilson, M. G. (2009). How Accurate are Self-Reports? An Analysis of Self-Reported Healthcare Utilization and Absence When Compared to Administrative Data. *Journal of occupational and environmental medicine / American College of Occupational and Environmental Medicine, 51*(7), 786-796.

Siddall, P. J., & Cousins, M. J. (2004). Persistent Pain as a Disease Entity: Implications for Clinical Management. *Anesthesia & Analgesia, 99*(2), 510-520.

Sjøgren, P., Ekholm, O., Peuckmann, V., & Grønbæk, M. (2009). Epidemiology of chronic pain in Denmark: an update. *European journal of pain, 13*(3), 287-292.

Sjölander, P. (2011). What is known about the health and living conditions of the indigenous people of northern Scandinavia, the Sami? *Global health action, 4*.

Smith, Y. R., Stohler, C. S., Nichols, T. E., Bueller, J. A., Koeppe, R. A., & Zubieta, J.-K. (2006). Pronociceptive and antinociceptive effects of estradiol through endogenous opioid neurotransmission in women. *The Journal of neuroscience, 26*(21), 5777-5785.

Srikanthan, P., Seeman, T. E., & Karlamangla, A. S. Waist-Hip-Ratio as a Predictor of All-Cause Mortality in High-Functioning Older Adults. *Annals of Epidemiology, 19*(10), 724-731.

Stanaway, F. F., Blyth, F. M., Cumming, R. G., Naganathan, V., Handelsman, D. J., Waite, L. M., . . . Couteur, D. G. (2011). Back pain in older male Italian-born immigrants in Australia: The importance of socioeconomic factors. *European journal of pain, 15*(1), 70-76.

Sternbach, R. A. (1986). Survey of pain in the United States: the Nuprin pain report. *The Clinical journal of pain, 2*(1), 49-53.

Strine, T. W., Hootman, J. M., Chapman, D. P., Okoro, C. A., & Balluz, L. (2005). Health-related quality of life, health risk behaviors, and disability among adults with pain-related activity difficulty. *American Journal of Public Health, 95*(11), 2042.

Suzana S, Zuriati I, Afaf Ruhi AF, Suriah AR, Noor Aini MY, &, F. A., & Y., Z. (2007). A multidimensional assessment of nutritional and health status of rurals elderly Malays. *Asia Pac J Clin Nutr, 16*, 346-353.

Suzana, S., Kee, C. C., Jamaludin, A., Safiza, M. N., Khor, G. L., Jamaiyah, H., . . . Ruzita, A. (2012). The third national health and morbidity survey prevalence of obesity, and abdominal obesity among the Malaysian elderly population. *Asia-Pacific Journal of Public Health, 24*(2), 318-329.

Szpalski, M., Nordin, M., Skovron, M., Melot, C., & Cukier, D. (1995). Health care utilization for low back pain in Belgium: influence of sociocultural factors and health beliefs. *Spine, 20*(4), 431-442.

Tabachnick, B., & Fidell, L. (2001). Cleaning up your act: screening data prior to analysis. *Using multivariate statistics, 5*, 61-116.

Thomas, E., Mottram, S., Peat, G., Wilkie, R., & Croft, P. (2007). The effect of age on the onset of pain interference in a general population of older adults: prospective findings from the North Staffordshire Osteoarthritis Project (NorStOP). *Pain, 129*(1-2), 21-27.

Thomas, E., Peat, G., Harris, L., Wilkie, R., & Croft, P. R. (2004). The prevalence of pain and pain interference in a general population of older adults: cross-sectional findings from the North Staffordshire Osteoarthritis Project (NorStOP). *Pain, 110*(1-2), 361-368.

Tracey, I., & Bushnell, M. C. (2009). How Neuroimaging Studies Have Challenged Us to Rethink: Is Chronic Pain a Disease? *The Journal of Pain, 10*(11), 1113-1120.

Tsang, A., Von Korff, M., Lee, S., Alonso, J., Karam, E., Angermeyer, M. C., . . . Watanabe, M. (2008). Common Chronic Pain Conditions in Developed and Developing Countries: Gender and Age Differences and Comorbidity With Depression-Anxiety Disorders. *The Journal of Pain, 9*(10), 883-891.

Tse, M., Wan, V. T., & Wong, A. M. (2013). Pain and pain-related situations surrounding community-dwelling older persons. *J Clin Nurs, 22*(13-14), 1870-1879.

Turk, D. C., Flor, H., & Rudy, T. E. (1987). Pain and families. I. Etiology, maintenance, and psychosocial impact. *Pain, 30*(1), 3-27.

Turk, D. C., & Monarch, E. S. (1996). Biopsychosocial perspective on chronic pain. *Psychological approaches to pain management: A practitioner's handbook*, 3-32.

Turk, D. C., & Theodore, B. R. (2011). Epidemiology and economics of chronic and recurrent pain. *Clinical pain management: A practical guide*, 6-13.

United Nations. (2013). *World Population Ageing 2013.*

Unruh, A. M. (1996). Gender variations in clinical pain experience. *Pain, 65*(2), 123-167.

Valentine, R. J., Woods, J. A., McAuley, E., Dantzer, R., & Evans, E. M. (2011). The associations of adiposity, physical activity and inflammation with fatigue in older adults. *Brain, behavior, and immunity, 25*(7), 1482-1490.

Van der Beek, A., Kluver, B., Frings-Dresen, M., & Hoozemans, M. (2000). Gender differences in exerted forces and physiological load during pushing and pulling of wheeled cages by postal workers. *Ergonomics, 43*(2), 269-281.

van Groenou, M. B., Hoogendijk, E. O., & van Tilburg, T. G. (2013). Continued and New Personal Relationships in Later Life Differential Effects of Health. *Journal of aging and health, 25*(2), 274-295.

van Leeuwen, M. T., Blyth, F. M., March, L. M., Nicholas, M. K., & Cousins, M. J. (2006). Chronic pain and reduced work effectiveness: The hidden cost to Australian employers. *European journal of pain, 10*(2), 161-166.

Verdú, E., Ceballos, D., Vilches, J. J., & Navarro, X. (2000). Influence of aging on peripheral nerve function and regeneration. *Journal of the Peripheral Nervous System, 5*(4), 191-208.

Verhaak, P. F., Kerssens, J. J., Dekker, J., Sorbi, M. J., & Bensing, J. M. (1998). Prevalence of chronic benign pain disorder among adults: a review of the literature. *Pain, 77*(3), 231-239.

Von Korff, M., Wagner, E. H., Dworkin, S. F., & Saunders, K. W. (1991). Chronic pain and use of ambulatory health care. *Psychosomatic medicine, 53*(1), 61-79.

Vuong, Q. H. (1989). Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica: Journal of the Econometric Society*, 307-333.

Wallihan, D. B., Stump, T. E., & Callahan, C. M. (1999). Accuracy of self-reported health services use and patterns of care among urban older adults. *Medical care, 37*(7), 662-670.

Wang, X., Wang, Y., Zhou, S., Wang, J., & Lofstedt, P. (2009). Women's postpartum practices and chronic pain in rural China. *Matern Child Health J, 13*(2), 206-212.

Webb R, Brammah T, Lunt M, Urwin M, Allison T, & D., S. (2003). Prevalence and predictors of intense, chronic, and disabling neck and back pain in the UK general population. *Spine (Phila Pa 1976). 28*(11), 1195-1202.

Weiner, D. K., Rudy, T. E., Kim, Y. S., & Golla, S. (2004). Do medical factors predict disability in older adults with persistent low back pain? *Pain, 112*(1), 214-220.

Wellen, K. E., & Hotamisligil, G. S. (2003). Obesity-induced inflammatory changes in adipose tissue. *Journal of Clinical Investigation, 112*(12), 1785-1788.

WHO. (1995). Physical Status: the use and interpretation of anthropometry.(Technical Report Series No.854). World Health Organization, Geneva.

WHO. (2000). Regional Office for the Western Pacific, International Association for the Study of Obesity. International Obesity Task Force. The Asia-Pacific perspective: redefining obesity and its treatment. Melbourne. *Health Communications Australia*.

WHO, E. C. (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet, 363*(9403), 157.

Wijnhoven, H. A., de Vet, H. C., Smit, H. A., & Picavet, H. S. J. (2006). Hormonal and reproductive factors are associated with chronic low back pain and chronic upper extremity pain in women–the MORGEN study. *Spine, 31*(13), 1496-1502.

Williams, D. R., Neighbors, H. W., & Jackson, J. S. (2003). Racial/ethnic discrimination and health: findings from community studies. *American Journal of Public Health, 93*(2), 200-208.

Williamson, G. M. (2000). Extending the activity restriction model of depressed affect: evidence from a sample of breast cancer patients. *Health Psychology, 19*(4), 339.

Williamson, G. M., & Schulz, R. (1992). Pain, activity restriction, and symptoms of depression among community-residing elderly adults. *Journal of Gerontology, 47*(6), P367-P372.

Williamson, G. M., & Schulz, R. (1995). Activity restriction mediates the association between pain and depressed affect: A study of younger and older adult cancer patients. *Psychology and aging, 10*(3), 369.

Windt, D. V. D. (2012). The role of co-morbidity in accumulating risk of chronic pain. *Pain, 153*(2), 259-260.

Wong, W. S., & Fielding, R. (2011). Prevalence and Characteristics of Chronic Pain in the General Population of Hong Kong. *The Journal of Pain, 12*(2), 236-245.

Wong, Y., & Mohamad Amin, J. (2005). Malaysian Society and Health: Issues and challenges in the 21st century. *JUMMEC, 8*, 2-8.

Wright, L. J., Schur, E., Noonan, C., Ahumada, S., Buchwald, D., & Afari, N. (2010). Chronic pain, overweight, and obesity: findings from a community-based twin registry. *The Journal of Pain, 11*(7), 628-635.

Wu, E., Borton, J., Said, G., Le, T., Monz, B., Rosilio, M., & Avoinet, S. (2007). Estimated prevalence of peripheral neuropathy and associated pain in adults with diabetes in France*. *Current Medical Research and Opinion®, 23*(9), 2035-2042.

Yeo, S. N., & Tay, K. H. (2009). Pain prevalence in Singapore. *Ann Acad Med Singapore, 38*(11), 937-942.

Yosipovitch, G., Meredith, G., Chan, Y. H., & Goh, C. L. (2004). Do ethnicity and gender have an impact on pain thresholds in minor dermatologic procedures? *Skin Research and Technology, 10*(1), 38-42.

Yu, H. Y., Tang, F. I., Kuo, B. I. T., & Yu, S. (2006). Prevalence, Interference, and Risk Factors for Chronic Pain Among Taiwanese Community Older People. *Pain Management Nursing, 7*(1), 2-11.

Yu, H. Y., Tang, F. I., Yeh, M. C., Kuo, B. I. T., & Yu, S. (2011). Use, Perceived Effectiveness, and Gender Differences of Pain Relief Strategies Among the Community-Dwelling Elderly in Taiwan. *Pain Management Nursing, 12*(1), 41-49.

Zainal Ariffin Omar, Zainuddin Mohd. Ali, & Nor Saleha Ibrahim Tamin. (2006). Malaysian Cancer Statistics- Peninsular Malaysia.: Cancer Registry Centre, Ministry of Health, Malaysia.

Zanocchi, M., Maero, B., Nicola, E., Martinelli, E., Luppino, A., Gonella, M., . . . Molaschi, M. (2008). Chronic pain in a sample of nursing home residents: Prevalence, characteristics, influence on quality of life (QoL). *Archives of Gerontology and Geriatrics, 47*(1), 121-128.

Zatzick, D. F., & Dimsdale, J. E. (1990). Cultural variations in response to painful stimuli. *Psychosomatic medicine*, *52*(5), 544-557.

Zawawi, R. (2013). *Active Ageing in Malaysia.* Paper presented at the The Second Meeting Of The Committee on "International Cooperation on Active Ageing". Tokyo, Japan.

Zhang, Y., Wang, C., Wang, L., Parks, Gregory S., Zhang, X., Guo, Z., . . . Civelli, O. (2014). A Novel Analgesic Isolated from a Traditional Chinese Medicine. *Current Biology*, *24*(2), 117-123.

Zhu, X., Wong, F., Bensoussan, A., Lo, S. K., Zhou, C., & Yu, J. (2010). Are there any cross-ethnic differences in menstrual profiles? A pilot comparative study on Australian and Chinese women with primary dysmenorrhea. *Journal of Obstetrics and Gynaecology Research*, *36*(5), 1093-1101.

Zivin, K., Llewellyn, D. J., Lang, I. A., Vijan, S., Kabeto, M. U., Miller, E. M., & Langa, K. M. (2010). Depression among older adults in the United States and England. *The American Journal of Geriatric Psychiatry*, *18*(11), 1036-1044.

LIST OF PUBLICATIONS

1. Lily R. Mohamed Zaki, Noran N. Hairi. Chronic Pain and pattern of health care utilization among Malaysian elderly population: National Health and Morbidity Survey III (NHMS III, 2006). *Maturitas* 2014; 79: 435-441.
2. Lily R. Mohamed Zaki, Noran N. Hairi. A Systematic Review of Prevalence and Measurement of Chronic Pain in Asian Adults. *Pain Management Nursing* 2014; 16 (3): 440-452.
3. Lily R. Mohamed Zaki, Noran N. Hairi, GH Tee, Tahir Aris. Gender differences in the relationship between overweight/obesity and chronic pain among older people – Evidence from Malaysia's National Health Morbidity Survey III (NHMS III). *Manuscript submitted to Pain Management Nursing on 30th April 2015.*

LIST OF PAPERS PRESENTED

1. Chronic Pain in Asian Adults: Definition, Measurement Strategy and Prevalence. Paper presented at the 1st Asia Pacific Clinical Epidemiology and Evidence-Based Medicine (APCEEBM), Kuala Lumpur, Malaysia, 6-8th July 2012).
2. Pattern of Health Services Utilization in Malaysian Elderly with Chronic Pain. Paper presented at the Faculty of Medicine Research Week, University of Malaya, Kuala Lumpur, Malaysia, 21-23rd January, 2013.
3. Chronic Pain and Pattern of Health Care Utilization Among Malaysian Elderly Population (Revised). Paper presented at the 3rd International Public Health (IPH) and 20th National Public Health Colloqium, Kuching, Malaysia, 27-29 August, 2013.
4. Gender differences in the relationship between overweight/obesity and chronic pain among older people – Evidence from Malaysia's National Health Morbidity Survey III (NHMS III). Abstract submitted for poster presentation at 7th Sarawak State Research Day, Kuching, Malaysia, 29-30th September 2015.