SMOKING CESSATION IN DENTAL SETTING: EFFECTIVENESS OF BEHAVIORAL THERAPY AS WELL AS PATIENT'S AND PROVIDER'S PERCEPTION

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ABSTRACT

Objective: The objectives of this study were, 1) to assess the effectiveness of the 5A's smoking cessation intervention (5A's) to that of brief advice (BA) which dentists delivered in a dental setting; 2) To assess and compare the dental patients' knowledge of the effects of smoking and perceptions on the role of dentists in smoking cessation intervention (SCI) by smoking status; 3) To assess smokers' attitude towards smoking cessation counselling; 4) To investigate and compare the motivation for, capabilities in, and opportunities for SCI between private and public dentists; 5) To identify the barriers to implementing SCI in dental practice. **Methods:** Part 1 was a single-blinded randomized controlled trial was designed to compare the effectiveness of the 5A's to that of BA. Six Dental Public Health specialists were recruited, randomized and trained to participate in this trial. Patients who fulfilled the inclusion criteria were enrolled into the assigned intervention programs. The main outcome measures were biochemically validated self-reported abstinence and behaviour change at 6-months follow-up. Part 2 comprised of 2 cross-sectional surveys using self-administered questionnaires conducted separately on dental patients and dentists' population in Malaysia. **Results:** In the clinical trial, the odd of quitters in 5A's intervention was 3.81 (95%CI: 1.871-7.76; p= 0.00) times higher compared to BA. After controlling other factors, the odds ratio for the 5A's was 1.90 (95%CI: 0.652-5.547; p=0.24) higher compared to BA. In the dental patient survey, there was a significant difference in the knowledge on effects of smoking among smokers and non-smokers ($p<0.05$). Commonly known effects of smoking were on stained teeth (n=335, 89.3%), bad breath (n=320, 85.3%), lung cancer (n=290, 77.3%) and oral cancer (n=279, 74.4%). Among smokers, majority (n=72, 81.8%) agreed on dentists giving advice on effects of smoking. Meanwhile, in the dentists' survey, 285 dentists (public, n=158, 53.6%; private, n= 127, 43.1%) replied to the questionnaire survey. Statistically significant differences were found between the

types of the dentist with their perceptions of their professional role and identity ($p<0.05$). A majority of public dentists (n=103, 65.1%) believed that promoting tobacco abstinence is an important part of their professional identity compared to private dentists (n=65, 51.2%). More public dentists (n=95, 60.1%) were significantly aware of the 5A's guidelines compared to private dentists (n=34, 26.8%). Statistically significant differences were found between the types of dentists on their abilities to prevent patients from using tobacco products ($p= 0.004$). More of public dentists (n=77, 48.7%) were unsure they have the confidence compared to private dentists (n= 41, 32.3%). **Conclusion:** The 5A's was found to be more effective in initiating positive behaviour change compared to BA. However, after controlling other factors, there was no difference in the effectiveness although the odds ratio was slightly higher in 5A's. Dental patients have good knowledge of the effects of smoking on oral and general health and have positive perception about dentist giving smoking cessation counselling. Dentists whether in public or private practice have the motivation to conduct SCI; however, their capabilities are compromised and lack of support from their organisation.

ABSTRAK

Objektif kajian ini adalah, 1) untuk menilai keberkesanan intervensi berhenti merokok 5A's (5A's) berbanding nasihat ringkas (BA) yang disampaikan oleh doktor pergigian dalam klinik pergigian; 2) Menilai dan membandingkan pengetahuan pesakit pergigian mengenai kesan merokok dan persepsi terhadap peranan doktor pergigian dalam intervensi berhenti merokok (SCI) dengan status merokok pesakit; 3) Menilai sikap perokok terhadap kaunseling berhenti merokok; 4) Menyiasat dan membandingkan motivasi untuk, keupayaan dan peluang untuk SCI antara doktor pergigian awam dan swasta; 5) Untuk mengenal pasti halangan-halangan untuk melaksanakan SCI dalam amalan pergigian. **Kaedah:** Bahagian 1 adalah satu percubaan klinikal terkawal rawak untuk membandingkan keberkesanan 5A's berbanding BA. Enam pakar Kesihatan Awam Pergigian telah dikenalpasti secara rawak dan dilatih untuk mengambil bahagian dalam kajian ini. Pesakit yang memenuhi kriteria kajian dijemput untuk menyertai program intervensi yang diberikan. Hasil utama kajian adalah berhenti merokok yang disahkan secara biokimia dan perubahan tingkah laku pada rawatan susulan selepas 6 bulan. Bahagian 2 pula terdiri daripada 2 kaji selidik keratan rentas dengan menggunakan soal selidik yang dijalankan secara berasingan pada pesakit pergigian dan doktor pergigian di Malaysia. **Keputusan:** Dalam ujian klinikal, nisbah kemungkinan pesakit yang berhenti merokok dalam 5A's adalah 3.81 (95% CI: 1,871-7, 76; p = 0.00) kali lebih tinggi berbanding BA. Selepas mengawal faktor-faktor yang lain, nisbah kemungkinan bagi yang 5A's adalah 1.90 (95% CI: 0,652-5,547; p = 0.24) lebih tinggi berbanding BA. Dalam kaji selidik pesakit pergigian, terdapat perbezaan yang signifikan dalam pengetahuan mengenai kesan merokok di kalangan perokok dan bukan perokok ($p < 0.05$). Kesan merokok yang paling diketahui oleh pesakit adalah gigi berubah warna (n = 335, 89.3%), nafas berbau (n = 320, 85.3%), kanser paru-paru (n = 290, 77.3%) dan kanser mulut (n = 279, 74.4%). Di kalangan perokok, majoriti (n = 72,

81.8%) bersetuju doktor pergigian memberi nasihat mengenai kesan merokok. Sementara itu, dalam kajian di kalangan doktor pergigian, 285 orang (awam, n = 158, 53.6%; persendirian, n = 127, 43.1%) menjawab kajian soal selidik yang diberikan. Perbezaan statistik yang signifikan didapati antara jenis doktor pergigian dengan persepsi terhadap peranan profesional dan identiti mereka ($p < 0.05$). Majoriti doktor pergigian awam (n = 103, 65.1%) berpendapat bahawa penggalakkan perhentian penggunaan tembakau adalah satu bahagian penting dalam identiti profesional mereka berbanding dengan doktor pergigian swasta (n = 65, 51.2%). Doktor pergigian awam (n = 95, 60.1%) di dapati lebih mengetahui tentang garis panduan 5A's berbanding doktor pergigian swasta (n = 34, 26.8%). Statistik perbezaan yang signifikan didapati diantara jenis doktor pergigian pada keupayaan mereka untuk menghalang pesakit dari menggunakan produk tembakau ($p = 0.004$). Lebih ramai doktor pergigian awam (n = 77, 48.7%) tidak pasti mereka mempunyai keyakinan berbanding doktor pergigian swasta (n = 41, 32.3%). **Kesimpulan:** 5A's telah didapati lebih berkesan dalam memulakan perubahan tingkah laku positif berbanding BA. Walau bagaimanapun, selepas mengawal faktor-faktor lain, tidak ada perbezaan dalam keberkesanan walaupun nisbah kemungkinan yang lebih tinggi sedikit pada 5A. Pesakit pergigian mempunyai pengetahuan yang baik mengenai kesan merokok kepada kesihatan gigi dan badan serta mempunyai persepsi positif mengenai doktor pergigian memberi berhenti merokok kaunseling. Doktor pergigian sama ada dalam amalan awam atau swasta mempunyai motivasi untuk menjalankan SCI; walau bagaimanapun, keupayaan mereka dikompromi dan kekurangan sokongan dari organisasi mereka.

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LIST OF SYMBOLS AND ABBREVIATIONS

3A's	:	Ask, assess, and arrange
5R's	:	Risk, relevant, reward, repetition, and roadblocks
5A's	:	Ask, Advice, Assess, Assist, and Arrange
95% CI	:	95% Confidence Interval
ABC	:	Ask, Brief Advice, Cessation Support
ATTUD	:	Association for Treatment of Tobacco Use and Dependence
BA	:	Brief advice
CO	:	Carbon monoxide
COHb	:	Carboxyhaemoglobin
CONSORT	:	Consolidated Standards of Reporting Trials
CPG	:	Clinical Practice Guideline
CRFA	:	Common risk factor approach
DENTUPAC	:	Dental Education Regarding Tobacco Use Prevention and Cessation
DPH	:	Dental Public Health
DPMIS	:	Dental Practitioner Management Information System
DSA	:	Dental surgery assistant
FCTC	:	Framework Convention on Tobacco Control
FDI	:	Fédération Dentaire Internationale
FTND	:	Fagerström Test for Nicotine Dependence
GATS	:	Global Adult Tobacco Survey
HCP	:	Health care provider
HIT	:	High-intensity intervention
ICTRP	:	International Clinical Trials Registry Platform
ISRCTN	:	International Standard Randomised Controlled Trial Number

ITC	:	International Tobacco Control
ITT	:	Intention-to-treat
KAP	:	Knowledge, Attitude, and Perception/Practice
LED	:	Light-emitting diode
LIT	:	Low-intensity intervention
MOH	:	Ministry of Health
MPOWER	:	M-monitor tobacco use and prevention policies; P-protect people from tobacco smoke; O-offer help to quit tobacco use; W-warn about the dangers of tobacco; E-enforce bans on tobacco advertising, promotion, and sponsorship; R-raise taxes on tobacco
MREC	:	Medical Research Ethics Committee
MYR	:	Malaysian Ringgit
N	:	the population size
NCDs	:	Non-communicable diseases
NHMS	:	National Health and Morbidity Survey
NHS	:	National Health Services
NMRR	:	National Medical Research Register
NRT	:	Nicotine replacement therapy
OR	:	Odds ratio
ppm	:	Parts per million
r	:	the fraction of responses
RCT	:	Randomised controlled trial
RR	:	Relative risk
SCIDD	:	Smoking Cessation Intervention Delivered by Dentists
SD	:	Standard deviation
SE	:	Standard error of mean

SPSS	:	Statistical Package for the Social Science
STROBE	:	Strengthening the Reporting of Observational studies in Epidemiology
TDF	:	Theoretical Domain Framework
TDQ	:	Theoretical Domain Questionnaire
TTM	:	Transtheoretical Model
U.K.	:	United Kingdom
U.S.	:	United States
UKM	:	Universiti Kebangsaan Malaysia
UM	:	University of Malaya
WHO	:	World Health Organization
Z(c/100)	:	the critical value of the confidence level c
$\chi 2$ test	:	Chi-square test

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CHAPTER 1: INTRODUCTION

1.1 Preface

Encouraging healthy behaviour in relation to smoking has the potential to improve people's health and quality of life. Dentist plays a key role, through everyday contact with service users, in helping people to adopt and sustain healthier lifestyles through the use of behaviour change interventions. At this point, the goal is to motivate dental patients who smoke, to at least start thinking about quitting. This research explores the feasibility, acceptability and capability amongst dentists to deliver behaviour change interventions to reduce the impact of tobacco use on oral health.

1.2 Background of study

Tobacco is the major cause of preventable mortality and morbidity all over the world (World Health Organization, 2010). The World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) came into force on 27 February 2005 (World Health Organization, 2003). WHO-FCTC is a set of basic framework, for national and intergovernmental efforts to fight the tobacco epidemic. Currently, 180 countries in the world have ratified the WHO-FCTC (World Health Organization, 2015). Malaysia became a signatory to the WHO-FCTC on 23 September 2003, signed by Honourable Dato' Seri Chua Jui Meng, Minister of Health of Malaysia (South East Asia Tobacco Control Alliance, 2008). The ratification of FCTC was on 16th September 2005, signed by Right Honourable Datuk Seri (Haji) Abdullah Ahmad Badawi, Prime Minister of Malaysia (International Tobacco Control (ITC) Project, March 2012). On 15 November 2005, Malaysia became a Party of the Conference of Parties. Later, the Tobacco Control & Framework Convention on Tobacco Control (FCTC) Unit was established in Malaysia in 2006 within the Non-communicable

Disease Section of the Disease Control Division, Ministry of Health Malaysia. In addition to that, the Fédération Dentaire Internationale (FDI) (FDI World Dental Federation, 2004) policy statements on non-communicable diseases (NCDs) strengthen the role of dental professionals in interventions against tobacco use by using the common risk factor approach for oral diseases and NCDs.

Recently, a National Strategic Plan for Tobacco Control (2015-2019) has been formulated and endorsed by the honorary Health Minister in 2014 (Institute of Public Health, 2015). Its policy is to develop a tobacco and smoke-free Malaysia. The missions are to inculcate smoke-free lifestyle among youths, to empower the society in battling the smoking habit and to provide complete protection from cigarette smoke in public places. This strategic plan is based on the MPOWER strategy. The MPOWER (Monitor tobacco used and prevention policies, Protect people from tobacco smoke, Offer help to quit tobacco, Warn about the danger of tobacco, Enforce ban on tobacco advertising, promotion, and sponsorship, Raise taxes on tobacco) activities are the main elements and activities to achieve the stipulated objectives on tobacco control launched by WHO to fight and curb the pandemic of smoking around the world (World Health Organization, 2016).

1.3 An Overview of the Dental Settings and Dental Practitioners involved in the Study

This research which comprised of two parts was conducted in both public and private dental sectors in Malaysia. Oral healthcare in Malaysia is provided by both the public and private sectors. In the public sector, oral healthcare is delivered to the population through a comprehensive network of decentralised dental facilities. The Oral Health Division in the Ministry of Health is the lead agency in the provision of oral healthcare services and the development of legislation concerning oral healthcare in Malaysia

(Oral Health Division, 2005a). The target groups to be rendered oral healthcare by the Ministry of Health in the public sector are pre-school children, primary and secondary school children, ante-natal mothers, and the socially, physically and economically disadvantaged groups, the adults and the elderly (Oral Health Division, 2005a). The private sector provides oral healthcare on a fee-for-service basis (Oral Health Division, 2005a). There are only a few third party payment schemes. Private dental clinics are mainly located in well-populated urban areas throughout Malaysia (Oral Health Division, 2005a).

The RCT was conducted in the state of Selangor. Selangor is located in the middle of the west coast of Peninsular Malaysia and around the Federal Territory of Kuala Lumpur and Putrajaya. Selangor is the state with the largest population in Malaysia. There are 45 dental clinics in Selangor. However, only 6 dental clinics were involved in the RCT. They are located in the Petaling District (3 dental clinics), Sepang District (1 dental clinic), Hulu Selangor District (1 dental clinic) and Hulu Langat District (1 dental clinic).

The dental practitioners involved in the randomised control trial were Dental Public Health Specialists (DPHS). They are individuals with basic qualification in dentistry and post-graduate education and training in the field of Dental Public Health or Community Dentistry (Oral Health Division, 2017). Dental Public Health is a speciality based on exclusivity of core competencies, referral or consultancy, and training to ensure the enhancement of the oral health of the community (Oral Health Division, 2017). The dental public health specialist is responsible for providing oral healthcare to the community through population-based strategies and community programmes (Oral Health Division, 2017). The dental public health specialist is also responsible for oral health policy development, programme management, oral health promotion and oral

disease prevention as well as the safety and health aspects of the clinical environment (Oral Health Division, 2017).

1.4 Problem Statement

As of December 2010, Malaysia has 326 quit-smoking clinics and 32 hospitals within the Ministry of Health facilities throughout the country that provides smoking cessation services, which include the counselling and pharmacotherapy for quitting smoking (Institute for Public Health, 2012). Medical doctors, nurses, and medical assistants ran these clinics. Unfortunately, public dentists are not included to run tobacco dependence treatment (Amer Nordin *et al.*, 2014). Dentists and dental specialists refer their dental patients who want to quit smoking to these clinics. However, there was no clear record of these patients who went to these clinics and was seen by these health providers and successfully quit.

In Malaysia, the standard of practice policy on smoking cessation intervention in the dental practice is unavailable. Currently, in the Ministry of Health Malaysia, dentists practiced the 5A's approach using the Malaysian Clinical Practice Guideline for Treatment of Tobacco Dependence 2003. However, most dentists refer their dental patients who want to quit smoking to the existing Quit Smoking Clinic located in most Health Centres in the Ministry of Health. Consequently, in Malaysia, the recent National Oral Health Plan for 2011-2020, has for the first time include dental professionals to participate in and contribute to the success of the Ministry of Health's efforts in providing some form of care and advice to their patients against smoking (Oral Health Division, 2011). The 5A's model of behavioural therapy (Ask, Advice, Assess, Assist, and Arrange) which utilises the stage of change model is the most commonly recognised framework for the provision of smoking cessation and is

advocated widely. However, the lack of time and expertise are commonly cited by dentists as barriers to undertaking this intervention (Dawson, Noller, & Skinner, 2013).

A simpler brief advice intervention (Coleman, 2004; Lando *et al.*, 2007) could offer important insights for it to be explored as a suitable method for chairside smoking cessation intervention in the dental setting. Although in Malaysia, there were dentists trained either from their undergraduate institution (Yahya, Rani, Abang Abdullah, & Kadir, 2012) or on the job training (Amer Nordin *et al.*, 2014), to relate patients tobacco-use with their oral health and to advise them to quit, there is still limited data on the acceptability, feasibility and effectiveness of the smoking cessation intervention given.

1.5 Rationale of Study

1.5.1 The Role of Dentists and the Impact of Tobacco Use on Oral Health

One of the globally accepted roles of dentists in prevention and health promotion is helping tobacco users to quit and tobacco cessation should be part of the practice of dentistry (Gallagher *et al.,* 2010). A large number of oral diseases and conditions such as staining of teeth and restorations, halitosis, impaired wound healing, periodontal diseases, failure of implants and surgical treatments, acute necrotizing ulcerative gingivitis and life-threatening precancerous and cancerous lesions are attributed to smoking (Warnakulasuriya *et al.,* 2010). The Surgeon General's Report (2004) on The Health Consequences of Smoking concluded that the evidence is sufficient to infer a causal relationship between smoking and cancers of the oral cavity and pharynx (U.S. Department of Health and Human Services, 2004). The report also stated that the evidence is sufficient to infer a causal relationship between smoking and periodontitis. Smokers with periodontitis show poorer levels of improvement in probing depths and clinical attachment levels (Johnson & Hill, 2004). Smoking increases the risk of

periodontal disease, reduces benefits of treatment and increases the chance of losing teeth (Chambrone, Chambrone, Lima, & Chambrone, 2010; Krall, Dietrich, Nunn, & Garcia, 2006; Labriola, Needleman, & Moles, 2005). Quitting smoking has an additional beneficial effect in reducing probing depths following non-surgical treatment over a 12-month period (Preshaw *et al.*, 2005). In regards to caries, there was inadequate evidence to infer the presence or absence of a causal relationship between smoking and coronal dental caries (U.S. Department of Health and Human Services, 2004). However, the evidence was suggestive but not sufficient to infer a causal relationship between smoking and root-surface caries. Smokers were reported to respond poorly to periodontal therapy and dental implants treatment (Bain, 1996). Again, smokers have a higher incidence of failure and complications following dental implantation and implant-related surgical procedures (Baig & Rajan, 2007). However, the latest Surgeon General's Report 2014 concluded that the evidence is suggestive but not sufficient to infer a causal relationship between cigarette smoking and failure of dental implants. This was due to the fact that risk factor research in implant dentistry was mostly of case series studies (Rocchietta & Nisand, 2012).

1.5.2 Smoking Cessation

Hujeol *et al.* (2003) stated that conducting smoking cessation would be a simpler and effective therapeutic approach for periodontitis rather than the costly intervention of scaling and root planning. In England and Wales, Unal *et al*. (2004) reported that between 1981 and 2000, more than half of the decrease in coronary heart disease mortality was due to the reduction in smoking. This finding discussed that smoking as a common risk factor (Sheiham, 1992) for coronary heart disease and periodontitis (or any tobacco related oral conditions) and that offering smoking cessation in the dental practice will impact upon patients both oral and systemic disease risk. Success rates in quitting following smoking cessation advice given as part of a periodontal treatment

compared very favourably to national quit rates achieved in specialist smoking cessation clinic (Nasry *et al.,* 2006). Therefore, the involvement of primary dental care in smoking cessation will help contribute to a wider nationally coordinated tobacco control strategy (Croucher, 2005).

Numerous guidelines have been developed globally to encourage health professionals including dentists, to deliver effective cessation advice and support (West *et al.* 2000; Beaglehole & Watt, 2004; Cunningham, *et al.*, 2005; FDI World Dental Federation, 2005; Fiore *et al.* 2008; WHO, 2010). Dental care settings represent a clinical opportunity where patients may be receptive to cessation advice & assistance particularly if their oral health concerns can be related to tobacco use (Gordon *et al.,* 2006). However, adoption of the 5A's in the routine dental care has been slow (Warnakulasuriya, 2002; Needleman *et al.,* 2010; Hu *et al.,* 2006). Again as discussed earlier, the practice of the 5A's has limitations. Dentists have accepted the responsibility of the first two A's- Ask & Advice, but reluctant to assess interest, assist and follow up due to it being time-consuming and limited knowledge (Gordon *et al.,* 2006). Literature has indicated that smoking cessation interventions in health care are different, but tend to follow either a three- or five-step model (Dawson *et al.*, 2013). However, there is no definitive conclusion about what a best practice model should be like or practically effective particularly for its implementation in the dental setting (Dawson *et al.*, 2013). As time constraint is the commonly cited reason for not conducting smoking cessation intervention, comparing the 5A's model with the brief advice could provide understandings into the tensions and realities of providing chairside smoking cessation intervention.

1.6 Objectives of the Study

This study comprised of two parts. Part 1 was a randomized control trial, while part 2 comprised of 2 cross-sectional surveys conducted separately on dental patients and dentists' population in Malaysia. Below are the objective(s) of the study:

Part 1: Randomised Control Trial

1. To assess the effectiveness of the 5A's smoking cessation intervention (5A's) to that of brief advice (BA) which dentists delivered in a dental setting.

Part 2 (a): Survey on dental patients

1. To assess and compare the dental patients' knowledge of the effects of smoking and perceptions on the role of dentists in smoking cessation intervention by smoking status.
2. To assess smokers' attitude towards smoking cessation counselling.

Part 2 (b): Survey on dentists

1. To investigate and compare the motivation for, capabilities in, and opportunities for smoking cessation intervention between private and public dentists.
2. To identify the barriers to implementing smoking cessation interventions in dental practice.

1.7 Null Hypothesis

1. There is no difference between the effectiveness of the 5A's model of smoking cessation intervention (5A's) and that of brief advice (BA) which dentists delivered in a dental setting.
2. There is no difference on dental patients' knowledge of the effects of smoking and perceptions on the role of dentists in smoking cessation intervention between smoking statuses.

3. There is no difference between on the motivation for, capabilities in, and opportunities for smoking cessation intervention between private and public dentists.

1.8 Research Questions

The present study attempts to pose important research questions. The questions are:

1. How effective is the 5A's smoking cessation intervention compared to that of brief advice (BA) which dentists deliver in a dental setting?
2. What is the dental patients' knowledge of the effects of smoking and their perceptions on the role of dentists in smoking cessation intervention?
3. What is the smokers' attitude towards smoking cessation counselling?
4. What are the dentists' motivation for, capabilities in, and opportunities for smoking cessation intervention?
5. What are the barriers to implementing smoking cessation interventions in dental practice?

The following Chapter 2: Literature Review reviews the literature pertaining to the research area.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

There are myriad of literature covering a wide area on smoking cessation. There is also rapidly increasing evidence on the unique involvement of dentists to provide assistance to dental patients to help them quit smoking. Although there are various models of smoking cessation intervention, little evidence of which model would be effective and suitable to be implemented in the dental practice. This chapter reviews on the trend of smoking globally and in Malaysia and on tobacco control. The review includes different models of smoking cessation interventions using the stage-based transtheoretical model, effectiveness of smoking cessation clinical trials conducted in dental settings and training of dentists on the topic. Next, this chapter reviews the theoretical domain framework to assess difficulties in implementation of smoking cessation guidelines, and finally on dental patients' knowledge and perception regarding smoking cessation intervention.

The following databases were searched from September 2012 onwards for relevant studies: The Cochrane Central Register for Controlled Trials (CENTRAL), MEDLINE, PsycINFO, PUBMED and Web of Science through University of Malaya and Universiti Kebangsaan Malaysia e-journal portals. The literature search used the following terms: smokers; smoking; cigarettes; dentists; dental; randomized; behaviour modification; therapy; behaviour; counselling; behavioural intervention; tobacco-use cessation; smoking cessation; smoking abstinence; tobacco abstinence; oral health. Further studies were identified by examining the reference lists of all included articles, and searching relevant websites. This literature review was kept updated by continuing literature search throughout the thesis writing.

2.2 Trends in Smoking: Global and Malaysia

Until today, the tobacco epidemic presents a global public health challenge. Smoking still remains as a public health problem. It was estimated that deaths due to tobacco are likely to be more than double between 1998 and 2030, when there could be more than 8 million deaths annually (World Health Organization, 2010). According to the Report on the Global Tobacco Epidemic (World Health Organization, 2015), adult smokers were 950 million men and 177 million were women. The report also stated that global smoking has decreased slightly from 23% (2007) to 21% (2013). Interestingly, smoking prevalence was revealed highest in high-income countries with 25% adults, mid-income (21%) and low-income (16%) being current smokers (World Health Organization, 2015).

In Malaysia, it was evident from the results of Global Adult Tobacco Survey (GATS) 2011, that tobacco consumption is still a major public health problem (Institute of Public Health, 2012). As reported in the GATS, nearly half of men in Malaysia were current cigarette smokers and the average of cigarette smoked was 14 sticks per day (Institute of Public Health, 2012). In a comparison of two different surveys done in Malaysia, The National Health and Morbidity Survey (NHMS) III (Institute of Public Health, 2006) and The GATS (Institute of Public Health, 2012), overall smoking prevalence has increased from 21.5% to 23.4%. However, the recent NHMS reported that approximately 22.8% (4,991,458) of Malaysian population aged 15 years and above were smokers, with 43.0 % (4.85 million) of men and 1.4% (143,566) of women smoked manufactured cigarettes, hand-rolled and smokeless cigarettes (Table 2.1) (Institute of Public Health, 2015).

In comparison with the GATS (Institute of Public Health, 2012) and NHMS (Institute of Public Health, 2015), the overall prevalence of current smokers aged 15

years old and above has reduced slightly from 23.1% in 2011 (GATS) to 22.8% in 2015 (NHMS). It was also observed that the prevalence of male smokers reduced only about 0.9% from 43.9% in 2011 to 43.0% in the current survey. Surprisingly, however, the prevalence among female has increased from 1.0% in 2011 to 1.4% in 2015. The prevalence of smokeless tobacco product usage has increased abruptly from 0.7% in 2011 to 10.9% in 2015. This might be due to increasing popularity in the use of electronic cigarettes (Institute of Public Health, 2015).

In Malaysia, the percentage of adults who smoked tobacco products was higher in rural areas (27.7%, 95 CI 26.09-29.35) compared to their counterparts in urban areas at 20.9% (17.99-20.21) (Institute of Public Health, 2015). The used of manufactured cigarettes was 23.1% in rural areas and 19.1% in urban areas, in addition, the proportion of smokers who smoked hand-rolled cigarettes in rural areas was almost three times compared to those in urban areas, (4.6% vs 1.6%) (Institute of Public Health, 2015). The prevalence of smoking any tobacco product increased from 15.2% among those with tertiary education to 27.8 % among those with secondary education. However, the proportion of current smokers who smoked manufactured cigarettes was almost similar among those with no formal education and tertiary education, (14.6% vs 14.3) (Institute of Public Health, 2015).

The Disease Control Division in 2003, has estimated that 10,000 deaths due to these tobacco use related illnesses are reported in Malaysia every year making it the primary cause of death in this country since the 1980s (Ministry of Health Malaysia, 2003). In 2006, diseases related to smoking account for at least 15% of hospitalized cases and approximately 35% of hospital deaths (Information and Documentation System (IDS), 2006).

Of all cases, heart diseases and diseases of pulmonary circulation ranked first, accounting for 15.7% of these deaths, followed by malignant neoplasms, 10.6%, and cerebrovascular diseases, 8.5%. By race/ethnicity, the highest number for any types of smoked tobacco product was smoked by 2.971 million for Malays, followed by 0.586 million for Chinese, and 0.376 million for Indians.

Table 2.1: Smoking status of Malaysian population by gender

Smoking status	Overall	Male	Female
		Percentage (95% CI)	
Current tobacco smoker	22.8 (21.86,23.81)	43.0 (41.38,44.6)	1.4 (1.05,1.75)
Daily smoker	20.5 (19.63,21.46)	38.8 (37.25,40.35)	1.1 (0.82,1.44)

Data source: Institute of Public Health (2015)

2.3 Tobacco Control Framework

Tobacco control is the public health science, policy and practice to address morbidity and mortality caused by tobacco use. The strategies in tobacco control were aimed to improve the population's health by eliminating, or reducing the consumption of tobacco products and exposure to tobacco smoke (World Health Organization, 2003). In 2008, WHO Report on the Global Tobacco Epidemic recommends a comprehensive and effective approach to implementing and manages tobacco control by introducing the MPOWER package. The MPOWER stands for M-monitor tobacco use and prevention policies; P-protect people from tobacco smoke; O-offer help to quit tobacco use; W-warn about the dangers of tobacco; E-enforce bans on tobacco advertising, promotion, and sponsorship; R-raise taxes on tobacco. Two of the MPOWER package lies with the health sector, which is O - offer help to quit tobacco use and W- warn about the dangers of tobacco. The core responsibilities of health professionals including dentist are to reduce the use of tobacco in the community by providing clear and definite advice on

the dangers of tobacco to patients and the public generally (World Health Organization, 2010).

2.3.1 The Role of Dentists in Tobacco Control

Helping tobacco users to quit is part of the role of oral health professionals is well recognised and accepted globally which includes tobacco cessation as part of the practice of dentistry (FDI World dental Federation, 2004; Ramseier, *et al.,* 2010). The role of dentists and its supported rationale was that every member of the dental team should be ethically responsible as a public health advocate in promoting health and preventing disease (Gallagher *et al.,* 2010). Furthermore, working with other health professionals in multi-disciplinary and multi-agency system was also suggested (Gallagher *et al.,* 2010).

Smoking has many negative effects on the mouth, including staining of teeth and dental restorations, reduction of the ability to smell and taste, and the development of oral diseases such as smoker's palate, smoker's melanosis, coated tongue, and, possibly, oral candidiasis and dental caries, periodontal disease, implant failure, oral pre-cancer and cancer (Reibel, 2003).

Since prevention and cessation of tobacco use contributes to better general and oral health, dentists should use the 'common risk factor approach' to focus on tobacco as well as other risks (diet, hygiene, alcohol) in promoting health (Gallagher *et al.,* 2010). Thus, dentists' activities in tobacco control will twofold benefit their patients' to improve oral health plus the prevention of all smoking related diseases.

The common risk factor approach (CRFA) (see Figure 2.1) has been highly significant in integrating oral health into health improvement strategies (Watt & Sheiham, 2012). The CRFA recognizes that chronic non-communicable diseases such as

obesity, heart disease, stroke, cancers, diabetes, mental illness and oral diseases share a set of common risk conditions and factors (Watt, 2005). Smoking is one of the risk factors common to diabetes, cardiovascular disease, stroke, cancer, and periodontal disease (Genco & Genco, 2014).

Therefore, treating tobacco use or dependence will have a major impact on periodontal disease, and will be important in preventing heart disease and some cancers. Genco & Genco (2014) also reported that The U.S. Department of Health and Human Service Guidelines stated: "that tobacco dependence treatment delivered by a variety of clinical type's increases abstinence." Thus, there is a role for dentistry in the inter-professional management of chronic diseases by addressing these common risk factors (Genco & Genco, 2014).

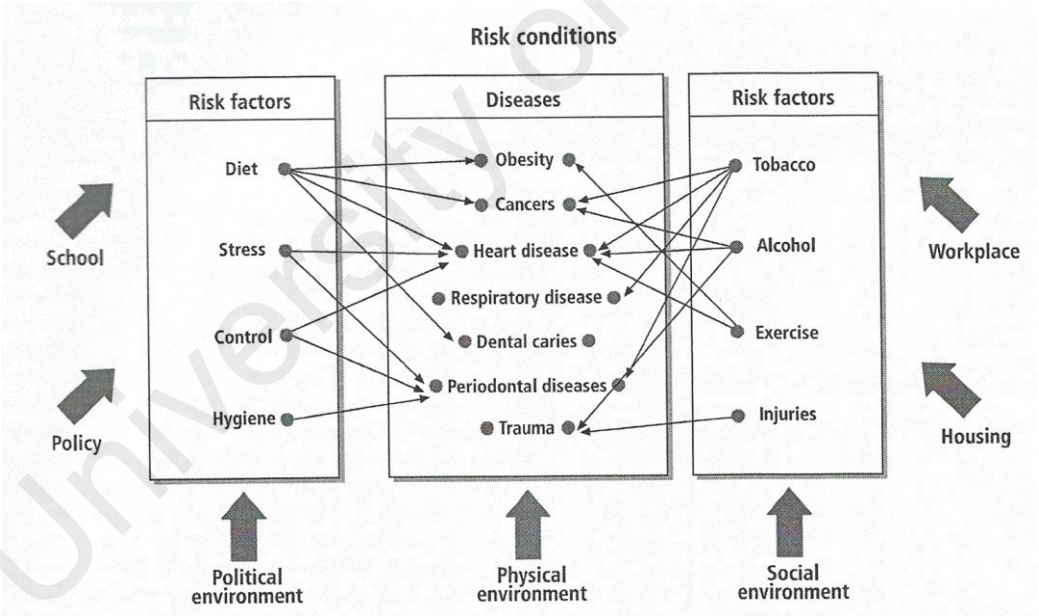


Figure 2.1: Common risk factor approach
Data source: Watt (2005)

2.3.2 Smoking Cessation Services and Support

Smoking cessation is a process of discontinuing tobacco smoking. The provision of evidence-based smoking cessation services and support are the key elements in tobacco

control relevant to the health service settings (Watt, 2005). Smoking cessation services are most effective when they are part of a coordinated tobacco control programme (World Health Organization, 2009).

Smoking cessation services can be either clinical intervention (behavioural therapy) and/or pharmacological intervention using nicotine replacement therapy (NRT) or non-nicotine based such as varenicline, sustained release (SR) bupropion and nortriptyline (Ministry of Health Malaysia, 2003). Only 17 countries provide access to comprehensive help to quit smoking with a national quit line and coverage for costs of both NRT and some cessation services, covering 8.2% of the world's population (World Health Organization, 2009).

Table 2.2 describes briefly on the support for tobacco dependence treatment for countries in the Western Pacific Region which includes Malaysia (World Health Organization, 2009). Malaysia seems to provide smoking cessation support in some hospitals, primary health care but not in the health professionals' clinic (World Health Organization, 2009; World Health Organization 2013). The recent National Health Survey in Malaysia (Institute of Public Health, 2015) reported that overall, 52.3% (95%CI: 49.85-54.81) of the current smokers made an attempt to quit smoking in the past 12 months with 52.1% (95%CI: 47.28-55.12) and 59.2% (95%CI: 48.32- 69.25) among male and female current smokers respectively.

However, the report stated that the proportion of current smokers who made an attempt to quit smoking in the past 12 months decreased with increasing age groups. In addition, the quit attempts increased with increasing level of education (Institute of Public Health, 2015).

In terms of health care utilisation, about less than 10% (9.7%, 95%CI: 8.42-11.07) of the current Malaysian smokers visited a healthcare provider (HCP) in the past 12 months, with 9.5 % of them were men and 15.8% were women (Institute of Public Health, 2015). Moreover, the prevalence of current smokers who visited a HCP was significantly lower among the 15 - 24 years age group (5.2%, 95%CI: 3.57-7.47). This similar report by Institute of Public Health (2015), stated that almost three quarter (75.4%, 95%CI: 68.60-81.11) of the current smokers who visited healthcare services in the past 12 months had been advised to quit smoking by HCPs (76.1% of men and 60.3% of women). Current smokers in the older age-groups were more likely to be advised to quit smoking by a HCP; 85.8% and 82.1% in the 45-59 and ≥65 years' age groups respectively (Institute of Public Health, 2015). By education level, more than 70% of the current smokers were advised to quit smoking by HCPs; with the highest prevalence among those with primary education (80.8%) and lowest among those with no formal education (71.3%) (Institute of Public Health, 2015). However, specific data on smoking cessation activities by dentists and dental patients were not mentioned in the National Health and Morbidity Survey 2015. The inclusion of dentists in the tobacco control efforts might increase its success to reduce the morbidity and mortality related to smoking behaviour.

2.4 Behavioural Therapies in Smoking Cessation

Behavioural therapy is an action-based therapy to foster positive behaviour change (Counselling Directory, 2016). It is also called behavioural modification or cognitive behavioural therapy (Healthline, 2016). It focuses on an individual's learnt, or conditioned, behaviour and how this can be changed. The approach assumes that if behaviour can be learnt, then it can be unlearnt (or reconditioned) so is useful for dealing with issues such as phobias or addictions. In behavioural therapy, the past is still

important as it often reveals where and when the unwanted behaviour was learned, however it looks more so at present behaviour and ways in which it can be rectified (Counselling Directory, 2016). In smoking addiction, there are many approaches in behavioural therapy to assist patients to quit. Some of these approaches are brief intervention, brief advice, stage of change and motivational interviewing. Brief intervention and brief advices adopting the stage of change were the two methods used in this clinical trial and are discussed in detail in this chapter. Motivational interviewing will be discussed briefly in this section.

Table 2.2: Support for treatment of tobacco dependence in the Western Pacific

Country	Population with access to a toll-free quit line	NRT available	NRT, place available *	Smoking cessation support is available in primary care facilities +	Smoking cessation support is available in hospitals +	Smoking cessation support is available in offices of health professionals +	Smoking cessation support is available in the community +	Smoking cessation support is available in other +
Australia	Yes	Yes	Pharmacy	Yes in most	Yes in most	Yes in most	Yes in some	. . .
Brunei Darussalam	No	Yes	Pharmacy	Yes in some	No	. . .	Yes in some	. . .
Cambodia	No	No	—	Yes in some	No	No	Yes in some	Yes in some
China	No	Yes	Pharmacy	Yes in some	Yes in some	Yes in some	Yes in some	. . .
Cook islands	No	Yes	Pharmacy	Yes in most	Yes in most	Yes in most	Yes in most	No
Fiji	No	No	—	No	No	No	No	. . .
Japan	No	Yes	Pharmacy	Yes in some	Yes in some	Yes in some	Yes in some	. . .
Lao people's democratic republic	Yes	No	—	No	Yes in some	No	No	No
Malaysia	**No**	**Yes**	**Pharmacy**	**Yes in some**	**Yes in some**	**No**	**Yes in some**	**Yes in some**
Marshall islands	No	Yes	Pharmacy with Rx	No	No	No	No	. . .
Mongolia	No	Yes	Pharmacy	Yes in some	Yes in some	Yes in some	No	. . .

* "Pharmacy with Rx" means that a prescription is required.
\+ "Most" means that availability of service is generally not an obstacle to treatment; "Some" means that low availability of service is often an obstacle to treatment.

Data source: World Health Organisation (2009)

Table 2.2: Support for treatment of tobacco dependence in the Western Pacific *(continued)*

Country	Population with access to a toll-free quit line	NRT available	NRT, place available *	Smoking cessation support is available in primary care facilities +	Smoking cessation support is available in hospitals +	Smoking cessation support is available in offices of health professionals +	Smoking cessation support is available in the community +	Smoking cessation support is available in other +
New Zealand	Yes	Yes	General store	Yes in most	Yes in most	Yes in most	Yes in most	. . .
Papua new guinea	No	Yes	Pharmacy with Rx	Yes in some	Yes in some	Yes in some	Yes in some	Yes in some
Philippines	No	Yes	Pharmacy with Rx	No	Yes in some	Yes in some	No	. . .
Republic of Korea	Yes	Yes	Pharmacy	Yes in some	Yes in some	No	No	No
Samoa	No	Yes	Pharmacy	No	No	No	No	. . .
Singapore	Yes	Yes	Pharmacy	Yes in most	Yes in most	Yes in some	Yes in some	. . .
Vietnam	No	No	—	No	Yes in some	No	No	. . .

* "Pharmacy with Rx" means that a prescription is required.

\+ "Most" means that availability of service is generally not an obstacle to treatment; "Some" means that low availability of service is often an obstacle to treatment.

Data source: World Health Organisation (2009)

2.4.1 Brief Intervention (5A's)

Definitions of brief interventions vary. They have been referred to as "simple advice," "minimal interventions," "brief counselling" or "short-term counselling" (Center for Substance Abuse Treatment, 2012). Brief interventions are low in cost and are effective across all levels of hazardous and harmful substance use and so are ideally suited for use as a method of health promotion and disease prevention with primary care patients (Henry-Edwards, Humeniuk, Ali, Monteiro, & Poznyak, 2003). Brief interventions were proven effective in helping patients to change behaviour and would only take up 5-15 minutes of their dental appointment (Ramseier & Suvan, 2010). The aim of the intervention is to help the patient understand that their tobacco use is putting them at risk and to encourage them to reduce or give up tobacco use (Henry-Edwards *et al.,* 2003). Brief interventions should be personalized and offered in a supportive, non-judgmental manner (Henry-Edwards *et al.,* 2003). It should target three main issues of health behaviour change which are: assessing motives, raising awareness and supporting change (Ramseier & Suvan, 2010). The basic goal brief intervention in this clinical trial is to reduce the risk of harm that could result from continued use of tobacco.

The 5A's approach in smoking cessation is a brief intervention, which can be carried out by any clinician and are most relevant to clinicians who treat a wide variety of patients and can be used in all populations (Fiore *et al.,* 2008). Figure 2.2 presents the 5A's approach for treating tobacco use and dependence (Fiore *et al.,* 2008). It emphasizes the chronic and often relapsing nature of tobacco dependence highlighting the message that clinicians need to persist in efforts to provide evidence-based treatment.

The 5A's approach which utilises stages of change model is the framework for smoking cessation brief interventions and is considered as the gold standard (Fiore *et al.,* 2000; West *et al.,* 2000: Fiore *et al.,* 2008). This approach is based on the principle that smokers should be given brief intervention to quit smoking at every consultation. The five major steps in the 5A's approach are: 1) ask the patient if he or she uses tobacco, 2) advise him or her to quit smoking, 3) assess willingness to make a quit attempt, 4) assist those who are willing to make a quit attempt, and 5) arrange for follow-up contact to prevent relapse (Fiore *et al.,* 2000; West *et al.,* 2000: Fiore *et al.,* 2008).

The first step in smoking cessation intervention is to identify tobacco users (Step 1: Ask). Dentists should ask all their patients whether they smoke and their smoking status should be recorded. Identification of smoking status can classify the appropriate interventions based on patient's tobacco use status and their willingness to quit (Fiore *et al.,* 2008). Documentation of tobacco use practically doubles the rate at which clinicians intervene with smokers and results in higher rates of smoking cessation (Fiore *et al.,* 2008).

Next, in a clear, strong and personalised manner, urge every tobacco user to quit (Step 2: Advice). Brief smoking cessation advice from health professionals delivered opportunistically during routine consultations has a modest effect size but substantial potential public health benefit (Fiore *et al.,* 2008). For patients who are willing to quit, the next step is to assist the patient in quitting by providing counselling and medication. However, counselling and medication are effective alone, and should be provided even if the smoker is not interested in combined therapy (Fiore *et al.,* 2008).

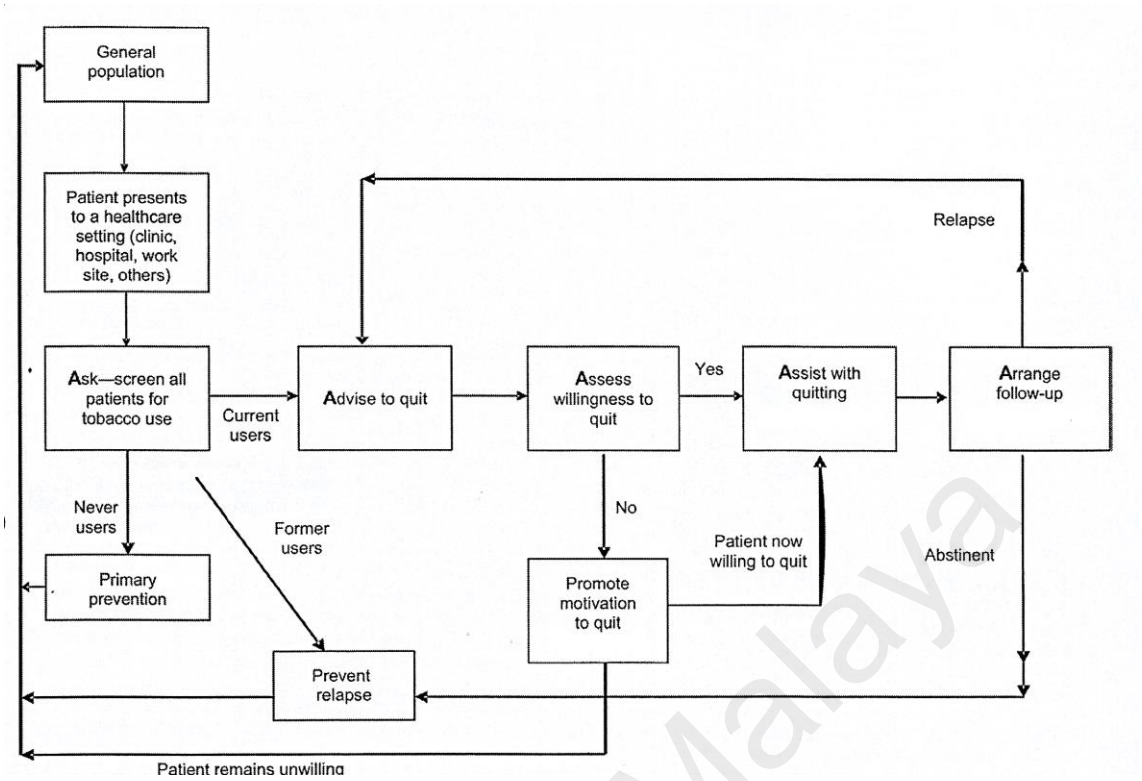


Figure 2.2: 5A's approach

Adapted from Fiore *et al.* (2008)

The next step is assessment of readiness to quit (Step 3: Assess). Smoker's readiness to change is assessed using the stage of change model (Cahill, Lancaster, & Green, 2010) and advice is tailored on the basis of the patient's readiness to quit (Zwar *et al.,* 2005). For patients who are not ready to make a quit attempt at this time, a brief intervention designed to promote motivation to quit should be given (Fiore *et al.,* 2000; West *et al.,* 2000: Fiore *et al.,* 2008). Using the 5R's: R-relevance, R-risks, R-rewards, R-roadblock and R-repetition via motivational interviewing technique would increase motivation in smokers (Fiore *et al.,* 2000; West *et al.,* 2000: Fiore *et al.,* 2008). It is a guiding style for enhancing intrinsic motivation to change. Motivational interviewing is a clinical or a communication method, a complex skill that is learned with considerable practice over time and is not easy (Miller & Rollnick, 2009).

Zwar *et al.* (2005) reported that factors consistently associated with higher

abstinence rates are high motivation, readiness to quit, moderate to high self-efficacy and supportive social networks. Additionally, an assessment of nicotine dependence can help predict whether a smoker is likely to experience nicotine withdrawal upon stopping smoking and the intensity and type of support that may be required to assist quitting (Zwar *et al.,* 2005; Fiore *et al.,* 2008). Characteristics of smokers with nicotine dependence include smoking soon after waking, smoking when ill, difficulty stopping smoking, finding the first cigarette of the day the most difficult to give up, and smoking more in the morning than in the afternoon (Heatherton *et al.,* 1991).

The next step is to assist (Step 4). The decision on whether and what assistance to provide to smokers are influenced by their needs, preferences and suitability of available support, and the capacity of the health professional and their service (Zwar *et al.,* 2005). Finally, follow-up contacts, either in person or via telephone should be arranged to all smokers (Step 5). Follow-up visits to discuss progress and to provide support have been revealed to increase the possibility of successful long-term abstinence (Zwar *et al.,* 2005; Fiore *et al.,* 2008).

There are research evidences that 5A's intervention from dentists increases the rate of smoking cessation (Warnakulasuriya, 2002; Carr & Ebbert, 2006, Carr & Ebbert, 2012). Fourteen clinical trials of dental interventions compared to usual care, no contact, or less treatment intensive controls were pooled (including all tobacco users) and it was found that a statistically significant increase in the odds of tobacco abstinence at 6 to 24 months was observed (OR: 1.71, 95% CI: 1.44-2.03) (Carr & Ebbert, 2012). However, heterogeneity between the studies were $I^2 = 61\%$ (Carr & Ebbert, 2012). A clinical trial by Gordon *et al.* (2007) reported that in comparison with the 3A's plus proactive referral to a quit line, the 5A's intervention was found to be more effective.

2.4.2 Brief Advice Intervention

Brief advice (BA) is less in-depth and more informal than a brief intervention and usually involves giving information about the importance of behaviour change and simple advice to support behaviour change (Powell & Thurston, 2016). BA describes a short intervention (usually around 3 minutes) delivered opportunistically in relation to patient's reason for seeking help (Powell & Thurston, 2016).

BA is verbal instructions to stop smoking with or without added information about the harmful effects of smoking (Coleman, 2004; Stead *et al.,* 2013). BA means pro-actively raising awareness of, and assessing a person's willingness to engage in further discussion about, healthy lifestyle issues and given opportunistically (Powell & Thurston, 2016). The goal is to provide information and initiate thinking about change (raising awareness). It is a short intervention which normally take up to 3 minutes, less in depth and more informal than The 5A's approach. It usually involves giving information about the importance of behaviour change and simple advice to support behaviour change (Powell & Thurston, 2016).

Despite the consensus that the 5A's is the best practice approach for smoking cessation interventions, it was argued that in practice, it can seem technical and can be too time-consuming (Yahya & Croucher, 2005; Asmaon & Razak, 2007; Ibrahim & Norkhafizah, 2008; Vaithilingam *et al.,* 2012; Hanioka *et al.,* 2013; Amer Nordin, *et al.,* 2014). Trotter & Worcester (2003) argued that dentists were likely to be opportunistic rather than systematic in their approach to smoking cessation. Although dentists were trained and have a proper guideline, they did not follow the recommended steps (Hu *et al.,* 2006). Therefore, a different approach is required to increase dentists' familiarity and adherence to the guidelines (Hu *et al.,* 2006). A new protocol or guidelines for the

best practice of smoking cessation interventions for dentists might be needed to address these issues. Using the BA would be an alternate choice compared to the 5A's approach. However, a recent review on the models of smoking cessation concluded that the interventions in health care varied, thus difficult to draw a conclusion of what the best practice model is, theoretically and practically (Dawson, Noller, & Skinner, 2013).

Table 2.3: Comparison of brief advice according to countries

Author/ Centre	National Centre for Smoking Cessation and Training (2012)	NSW Department of Health (2009)	Gordon *et al.* (2010)	New Zealand Ministry of Health (2013)
Country	England	Australia	USA	New Zealand
Brief advice	Ask Advise Act	Ask Approach Advise	Ask Advise Refer	Ask Brief Advice Cessation support

There are different approaches in the BA as shown in Table 2.3. England has adapted 'Ask, Advise and Act' by giving very brief advice (30 seconds) to dental patients to stop smoking (National Centre for Smoking Cessation and Training, 2012). The step 'ask' is to assess current and past smoking behaviour, while 'advise' is to provide information on consequences of smoking and smoking cessation. The step 'Act' here is to provide options for later/additional support and advice on stop smoking medications (National Centre for Smoking Cessation and Training, 2012).

New South Wales (NSW) introduced a mandatory policy for public dental services in NSW to conduct smoking cessation at the chair side based on a three-step approach (Ask, Approach, Advise), which is currently being evaluated (Dawson, Noller, & Skinner, 2013). It requires their staff to ask patients about their smoking status; approach smokers about their interest in quitting and advice of the NSW Quitline and to refer as appropriate (NSW Ministry of Health, 2013).

New Zealand adopted a three-step approach in the form of ABC (Ask, Brief Advice, Cessation Support), which states that all smokers should be advice to stop and supported to stop regardless of whether or not they are interested in quitting (Ministry of Health New Zealand, 2007). The first step 'ask' is to ask all people about their smoking status and document this. The next step is to provide Brief advice to stop smoking to all people who smoke, regardless of their desire or motivation to quit. Finally, 'cessation support' is to make an offer of, and refer to or provide, evidence-based cessation treatment.

A three-step approach of Ask, Advise, Refer was advocated in the United States by the Dental Hygienists, theorising that a referral to a tobacco Quitline could replace the need for oral health professionals to assist and follow-up patients who smoke (Gordon *et al.,* 2010a).

Opportunistic brief advice increases long-term abstinence by 47% (RR 1.47, 95% CI: 1.24-1.75) (Aveyard *et al.,* 2012). A recent systematic review of 17 trials of brief advice versus no advice (or usual care) demonstrated a statistically significant increase in quit rates (RR 1.66, 95% CI: 1.42 to 1.9) (Stead *et al.,* 2013). These findings indicate the potential benefits from brief advice given by physicians to their smoking patients. However, these trials were not conducted by dentists in the dental settings but by medical practitioners (Stead *et al.,* 2013).

From the Cochrane Review by Carr and Ebbert (2012), Lando *et al.* (2007) could not conclude about the effectiveness of brief advice compared to brief advice plus motivational interview and follow-up contact due to poor subject recruitment (OR 0.56, 95% CI:0.16 to 2.02). Similarly, Ebbert et al. (2007) study on smokeless tobacco users, favours control which was brief counselling plus patient education brochure over treatment, with the OR of 0.89 (95% CI: 0.29 to 2.69).

2.4.3 The Transtheoretical Model (TTM) - The Stages of Change

The Transtheoretical Model (TTM) sees behaviour change as an intentional process that unfolds over time and involves progress through a series of six stages of change (Prochaska & Velicer, 1997). The name Transtheoretical in TTM refers to the integrated processes and principles of change from across leading theories (Prochaska & Velicer, 1997). One of the popular methods of smoking cessation is built upon the transtheoretical model (TTM) (Young & Skorga, 2011). The work of Prochaska and DiClemente and their "stages-of-change" model help clinicians adapt brief interventions to patients' needs (Henry-Edwards *et al.,* 2003). The TTM is one of the frequently cited frameworks for understanding the stages of behaviour change in addiction treatment particularly smoking addiction (Ramseier & Suvan, 2010). The stage of change is one of the 4 key constructs of the Transtheoretical Model of Change (TTM). The other three constructs are 1) Processes of Change, 2) Critical markers of Change, and 3) Context of Change (Winnipeg Regional Health Authority, 2007). The use of the "stages of change," "5 A's," and"5 R's" is advocated in smoking cessation counselling (Chandler & Rennard, 2010). The TTM is well-suited for brief intervention (The 5A's model) because it advocates starting from the stage of change that the individual is in and working from there. It proposes that individuals go through various motivational stages of change to stop smoking and smoking cessation interventions are tailored to these stages rather than to the individual patient (Young & Skorga, 2011). The stage of change model acknowledges that the smoker's readiness to change is an important issue in cessation and advice can be tailored on the basis of the patient/client's readiness to quit (Zwar *et al.,* 2005). Patients need motivational support appropriate to their stage of change to avoid treatment resistance or non-compliance could result.

In this model, there are 5 stages of change i.e. precontemplation, contemplation, preparation, action and maintenance (Ramseier & Suvan, 2010) (See Figure 2.3).

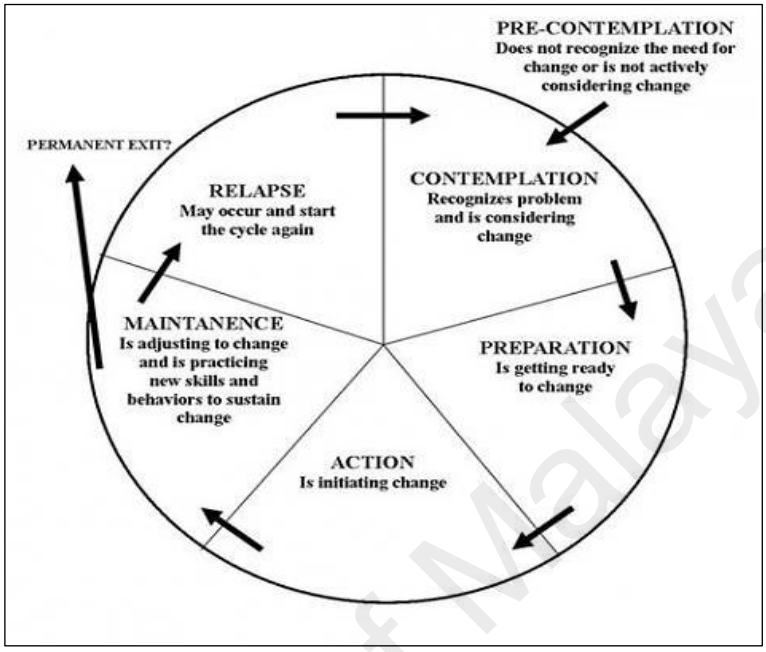


Figure 2.3: The transtheoretical model of behaviour change
Source: Prochaska & DiClemente (1983)

Stage one is the precontemplation, in which the individual does not view smoking as a problem and do not expect to make any change in behaviour within the next 6 months (Young & Skorga, 2011). The individual is resistant to hearing or learning about health behaviour change. They do not see any reason why they should consider changing their behaviour despite any objective evidence that may be shown to contradict this (Ramseier & Suvan, 2010). Stage two is the contemplation stage, where the individual begins to see smoking is a problem and plans to make a behaviour change within the next 6 months (Young & Skorga, 2011). This stage is characterised by ambivalence about smoking and may weigh up the pros and cons of change (Ramseier & Suvan, 2010). Once the individual anticipates making a behaviour change, they move to stage three, the stage of preparation. Individuals in this phase have made plans for taking

action and intend to make a change within the next month (Young & Skorga, 2011). Stage four is the action stage, where the individual are actively engaged in the changed behaviour; in the case of smoking cessation, the individual has quit completely for a period of time (a day to 6 months) (Young & Skorga, 2011). At the maintenance stage, the individual who is a non-smoker, plans methods to maintain non-smoking, prevent relapse, and consolidate non-smoking as a permanent change in lifestyle for more than 6 months (Young & Skorga, 2011).

The TTM has its limitations. Increasingly evidence suggests that stage-based interventions in smoking cessation may not be the best approach (Dawson, Noller, & Skinner, 2013). West (2005) has criticized the stage of change for its flawed concept where he claimed that the model focuses on conscious decision making and planning processes and draws attention away from what are known important underpinnings of human motivation. However, a comprehensive source for smoking cessation treatments using the stage of change was clearly evident through the Clinical Guidelines for Treatment of Tobacco by Fiore *et al.* (2000) which was updated later in 2008. The Guidelines identified 300 best studies and found a broad range of evidence-based treatments for motivated smokers, namely in the preparation stage, and found no evidence-based treatments for unmotivated smokers in the precontemplation and contemplation stage (Prochaska, 2006). A systematic review of stage-based intervention for influencing smoking behaviour found that despite its popular use in promoting smoking cessation, there is limited evidence on its effectiveness (Cahill, Lancaster, & Green, 2010). Therefore, the evidence advocates offering practical support through all of the stages for expert system, self-help and counselling interventions (Cahill, Lancaster, & Green, 2010; Young & Skorga, 2011).

2.4.4 Motivational Interviewing (MI)

Motivational interviewing is a specific clinical method to enhance personal motivation for change (Miller & Rollnick, 2009) and thus may help people to make a successful attempt to quit smoking (Lindson-Hawley, Thompson, & Begh, 2015). Miller and Rollnick (2002) defined MI as a directive client-centred style of counselling for enhancing intrinsic motivation to change behaviour by exploring and resolving ambivalence. MI involves the application of four basic principles: 1) Expressing empathy; 2) Developing discrepancy; 3) Rolling with resistance; 4) Supporting self-efficacy. In dentistry, only one study by Lando et al. (2007) conducted brief advice plus motivational interviewing in their clinical trial and was included in the recent Cochrane review (Carr & Ebbert, 2012). However, conclusions were not drawn about the effectiveness of the treatment due to the problems of enrolling subjects and limited implementation of the motivational intervention (Lando et al., 2007). A recent Cochrane review on MI for smoking cessation concluded that although MI may assist people to quit, however there were variations in the study characteristics, how the treatment was delivered, and lack of reporting of study details (Lindson-Hawley, Thompson, & Begh, 2015). This could be due to MI is not easy to practice. MI is not easily learned and mastered through self-study or by attending workshop but requires practice with feedback and coaching over time (Miller & Rollnick, 2009). Consequently, MI is not described further in this chapter as this study focuses only 5A's intervention, BA and stage of change.

2.5 Evidence-Based Smoking Cessation Guidelines

The FDI policy statement recommended that oral health organisations to routinely ask patients and clients about tobacco consumption and exposure to tobacco smoke using evidence-based approaches and best practices, giving on how to quit smoking and

ensure proper follow-ups (FDI World Dental Federation, 2004). Various evidence-based guidelines for treating tobacco users and dependence have been published all over the world. Fiore *et al.* (2008) updated the U.S. Public Health Service guideline which recommends brief and intensive tobacco-cessation interventions to promote the assessment and treatment of tobacco use. In the United Kingdom (UK), smoking cessation manual for primary care dental teams (Department of Health, 2007) was published and later, an evidence summary for the National Health Service dentistry by the British Dental Association (British Dental Association, February 2015). An advocacy guide for oral health professionals including smoking cessation practice was also developed globally (FDI World Dental Federation, 2004; FDI World Dental Federation, 2005; World Health Organization, 2010).

In Malaysia, all health professionals adhere to a clinical practice guideline with the latest and updated treatment protocols in managing smokers' tobacco use and dependence (Ministry of Health Malaysia, 2003). All of these guidelines basically advocate the use of the 5A's model of tobacco cessation intervention to be delivered by health-care practitioners. However, the use of the 3A's approach (British Dental Association, February 2015) or the Ask, Brief Advice, Cessation Support (ABC) (Ministry of Health New Zealand, 2007) which involves identifying and advising tobacco-using patients to quit, but refers proactive patients interested in quitting to either a smoking cessation specialist or telephone tobacco quit line for counselling, were also adapted.

2.6 Effectiveness of Smoking Cessation in Dental Settings

Table 2.4 listed 8 smoking cessation trials for cigarette smokers conducted in dental settings extracted from a systematic review by Carr & Ebbert (2012). Out of 14 studies selected for the review, we have selected eight trials which targeted cigarette smokers to

be discussed in this section of the literature review. The remaining trials targeted smokeless tobacco users.

Brief advice to quit given by an oral health professional was included in all 14 studies. Interventions in the dental setting involved were either: 1) brief advice plus quitline referral (Ebbert *et al.,* 2007), brief advice plus motivational interviewing (Lando *et al.,* 2007), brief advice plus video-based cessation program with phone follow-up, or 2) counselling using the 5A's plus nicotine replacement therapy (NRT) (Binnie *et al.,* 2007), 5A's plus NRT and population specific printed material (Gordon *et al.,* 2010b), 3A's plus pharmacotherapy and referral as needed (Gordon *et al.,* 2010b), or 3) high intensity intervention where the intensity was assessed as frequency of personal contact, and occurred five times or more (Hanioka *et al.,* 2010; Nohlert *et al.,* 2009).

The review found that the dental offices involved in these trials vary. Five studies involving adults were conducted in private practices (Ebbert *et al.,* 2007; Gordon *et al.,* 2010; Hanioka *et al.,* 2010; Nohlert *et al.,* 2009). Other studies were conducted in public health dental clinics (Gordon *et al.,* 2010b), a hospital based-periodontal clinic (Binnie *et al.,* 2007) and managed care clinics (Lando *et al.,* 2007).

Lando *et al.,* (2007) conducted his trial on adolescents aged 14-17 years old. Severson et al. (1998), enrolled participants in their trial from 15 years of age or older, while other studies targeted adults.

A brief behavioural counselling was provided as part of the intervention for adults smokers (Binnie *et al.,* 2007; Ebbert *et al.,* 2007; Gordon *et al.,* 2010b; Hanioka *et al.,* 2010). However, two studies by Nohlert *et al.,* (2009) and Hanioka *et al.,* (2010) provided intervention based on intensity of time and counselling sessions.

Four studies (Ebbert *et al.,* 2007; Gordon *et al.,* 2010b; Sevenson *et al.,* 1998) had the dental office as the unit of randomization. Another four studies (Binnie *et al.,* 2007; Hanioka *et al.,* 2010; Lando *et al.,* 2007; Nohlert *et al.,* 2009), the patient was the unit of randomization.

In terms of follow-ups, patients were followed for 6 months (Ebbert *et al.,* 2007), seven and a half months (Gordon *et al.,* 2010b) and 12 months (Binnie *et al.,* 2007; Lando *et al.,* 2007; Gordon *et al.,* 2010a; Hanioka *et al.,* 2010; Nohlert *et al.,* 2009).

Primary outcomes for tobacco abstinence vary in definitions. Ebbert *et al.,* 2007 reported abstinence as 7-days point prevalence, while Lando *et al.,* (2007) reported 30-day point prevalence abstinence. Others used continuous abstinence at 3 months (Severson *et al.,* 1998), 12 months (Severson *et al.,* 1998; Hanioka *et al.,* 2010) and 6 months (Nohlert *et al.,* 2009). Prolonged abstinence was used by Gordon et al. (2010a; 2010b) in both of his studies. Validation of self-reported abstinence was confirmed biochemically in only two studies (Binnie *et al.,* 2007; Hanioka *et al.,* 2010).

Through meta-analysis of the review by Carr & Ebbert (2012) on trials on cigarette smokers (8 studies), there was a statistically significant increase in the odds of abstinence at 6 to 24 months (odds ratio [OR] 1.74, 95% confidence interval [CI] 1.33 to2.27), but with heterogeneity of 51%. It was discussed in the review, that the heterogeneity might be due to the different types of practices and type of patients, where some targeted adolescent while others adults (Carr & Ebbert, 2012).

However, the length of follow-up or definition of abstinence did not explain heterogeneity between studies (Carr & Ebbert, 2012). The authors also argued that factors such as the inability to blind; unclear allocation of treatment methods, lack of biochemical validation of self-report abstinence and inconsistent content and delivery of

specific interventions should be observed carefully. Thus, there was insufficient evidence to conclude about the effectiveness of specific intervention components for dentists in the dental settings. (Carr & Ebbert, 2012).

2.7 Training Dentists in Smoking Cessation

2.7.1 Smoking cessation training programs

Smoking cessation interventions by more than one type of health professional (including dentists) have the potential to increase the cessation rate and promote the readiness to quit in the population (An *et al.,* 2008). A U.S. Public Health guideline reported that training in smoking cessation should provide the essential treatment skills to the health professionals and convinced them that the treatment is a standard good clinical practice (Fiore *et al.,* 2008).

A systematic review concluded that smoking cessation training programs for health professionals increased offers of advice and help patients quit (Carson *et al.,* 2012). Therefore, dentists likewise have a strong potential to contribute significantly to provide smoking cessation treatment if adequately trained (Amer Nordin *et al.,* 2014). However, levels of intervention from dentists on smoking cessation reported by their patients were fairly low compared to those from physicians (Hanioka *et al.,* 2015).

Training programs for treating tobacco dependence had started since 1984 in high- and middle-income countries; however since 2000 all including those in low-income countries had begun (Rigotti *et al.,* 2009). In Malaysia, training for dental professionals and the dental team has started as early as 2003 (Oral Health Division, Ministry of Health Malaysia, 2005b) and continues on until today (Amer Nordin *et al.,* 2014; Amer Nordin, 2013).

Most of the training programs globally (Rigotti *et al.,* 2009) and also in Malaysia (Ministry of Health Malaysia, 2003) were based on evidence-based treatment guidelines mainly adapting the US clinical guideline (Fiore *et al.,* 2008) and the UK guideline (West, 2000).

Table 2.4: Smoking cessation trials and studies on smokers by dentists and its effectiveness

Authors	Year	Country	Setting	n	Intervention	Control	Outcome	Quit rate OR (95%CI)
Binnie	2007	UK	Hospital perio (n=1)	118 (T)	1. Intervention group-5A's, NRT prn (gum,patches)	2. Usual care-info on role of tobacco in perio disease, very brief advice to quit	3,6,12m point prevalence	1.47 (0.24,9.16)
Ebbert	2007	USA	General dental practices (n=8)	60(I) 22(C)	1. Quitline referral- brief counselling + quitline referral	2.Usual care-brief counselling + patient education brochure	6m, 7-day point prevalence	0.89 (0.29,2.69)
Gordon	2010a	USA	Private dental practices (n=68)	2160 (T)	1. 3A's: ask,advise, arrange quitline referral 2. 5A's: ask, advise, assist, arrange counselling with Quitline referral as an option at provider's discretion	3.Usual care: practitioners provided usual tobacco-use cessation services	12m prolonged abstinence	2.11 (0.88,5.11)
Gordon	2010b	USA	Public dental clinics	2549 (T)	1. Intervention- brief 'tailored' tobacco advice, assistance, & NRT	2. Usual care- Tobacco cessation methods as standard practice	7.5m prolonged abstinence	2.89 (1.76,4.74)

T-Total number of patients; I- intervention; C- control
Data source: Carr & Ebbert (2012)

Table 2.4: Smoking cessation trials and studies on smokers by dentists and its effectiveness *(continue)*

Authors	Year	Country	Setting	n	Intervention	Control	Outcome	Quit rate OR (95%CI)
Hanioka	2010	Japan	Dental clinics	33(I) 23(C)	1. Intervention- behavioural and pharmacological (NRT patch & gum) relapse strategies; counsel at initial 2 visits and at 2, 4, 8 and 12 w.	2. Non-intervention (not described)	3,6,12m continuous abstinence	3.81 (0.93,15.53)
Lando	2007	USA	Dental offices (14-17 yrs old)	344 (T)	1. Intervention – provider advice + motivational interviewing/follow-up phone calls	2. Usual care – provider advice	12 m abstinence within past 30 days	0.56 (0.16,2.02)
Nohlert	2009	Sweden	General dental clinics	300 (T)	1. High intensity	2. Low intensity	12 m point prevalence & continuous abstinence	2.31 (1.14,4.68)
Severson	1998	USA	Private practices (n=75)	4029 (T)	1. Minimal intervention 2. Extended intervention	3. Usual care	12 m sustained abstinence	1.08 (0.66,1.75)

T-Total number of patients; I- intervention; C- control
Data source: Carr & Ebbert (2012)

Table 2.5 displays the core competencies for evidence-based treatment of tobacco dependence by The Association for Treatment of Tobacco Use and Dependence (ATTUD). ATTUD (2005) task force and committee members identified a set of 11 competencies with associated skill sets to describe the broad sets of knowledge, skills, and abilities needed by a professional to competently provide highly Intensive Tobacco Treatment in a variety of treatment settings.

Table 2.5: Core competencies for evidence-based treatment of tobacco dependence

ATTUD category	Core competencies
Tobacco Dependence Knowledge and Education	Provide clear and accurate information about tobacco use, strategies for quitting, the scope of the health impact on the population, the causes and consequences of tobacco use
Counselling Skills	Demonstrate effective application of counselling theories and strategies to establish a collaborative relationship, and to facilitate client involvement in treatment and commitment to change
Assessment Interview	Conduct an assessment interview to obtain comprehensive and accurate data needed for treatment planning
Treatment Planning	Demonstrate the ability to develop an individualized treatment plan using evidence-based treatment strategies
Pharmacotherapy	Provide clear and accurate information about pharmacotherapy options available and their therapeutic use.
Relapse Prevention	Offer methods to reduce relapse and provide ongoing support for tobacco-dependent persons
Diversity and Specific Health Issues	Demonstrate competence in working with population subgroups and those who have specific health issues
Documentation and Evaluation	Describe and use methods for tracking individual progress, record keeping, program documentation, outcome measurement and reporting
Professional Resources	Utilize resources available for client support and for professional education or consultation
Law and Ethics	Consistently use a code of ethics and adhere to government regulations specific to the health care or work site setting
Professional Development	Assume responsibility for continued professional development and contributing to the development of others

Source: ATTUD (2005)

The National Health Services (NHS) UK had an almost similar training standard for smoking cessation to improve the effectiveness of its service by raising the quality of the training provided to smoking cessation advisers (Health Development Agency NHS, 2003). The NHS standard covers three levels of smoking cessation advice which are: (1) brief interventions; (2) intensive one-to-one support and advice; (3) group interventions (Table 2.6). Both ATTUD and NHS standard requires smoking cessation providers to be knowledgeable and skilled in smoking cessation treatment upon completion of its training.

Table 2.6: Standards for training in smoking cessation treatments

Levels	Brief Interventions	Intensive one to one support and advice	Group interventions
Core content areas	1. Assessment and recording of smoking status. 2. Assessment of readiness to quit. 3. The health risks of smoking and the benefits of quitting. 4. Reasons why stopping smoking can be difficult. 5. Treatments to help with stopping smoking. 6. Referral to local services. 7. Wider context.	1. Smoking demographics. 2. The effects of smoking and of stopping smoking. 3. Smoking cessation treatments and their outcome. 4. Assessment 5. Pharmacotherapy 6. Behavioural support. 7. Treatment programme 8. Monitoring and continuing education.	1. Recruitment and assessment. 2. Treatment programme for groups. 3. Group processes 4. Monitoring and follow-up.

Data source: Health Development Agency NHS (2003)

Rigotti *et al.* (2009) reported 23% of training programs globally adhered to all competencies of ATTUD. The authors also found that 90% of the training programs taught about tobacco use, health risks, counselling skills, pharmacotherapy, relapse prevention and assessing a smoker. In terms of teaching methods, most training

programs used primary lectures (98%), small group sessions (94%) and role plays (70%) (Rigotti *et al.,* 2009). The trainers were mostly physicians (77%), psychologists (53%), tobacco treatment counsellors (53%), nurses (32%), pharmacists (18%) and dentists (10%) (Rigotti *et al.,* 2009). The median duration of a training program was 16 hours and a median of 30 individuals per program were trained (Rigotti *et al.,* 2009).

2.7.2 Undergraduate dental education regarding smoking cessation

The most cited barriers for dentists who wish to provide smoking cessation support was the lack of training (Filoche *et al.,* 2010). Davis *et al.* (2010) stated that the limited training of dental students reflected the continuing report of dentists offering incomplete tobacco interventions and proposed a paradigm shift in how the intervention be incorporated into existing curricula. The author suggested a careful consideration of the level of competency training; establishing rapport through good communication skills; the core knowledge level; suggested instructional and assessment strategies for tobacco use prevention and cessation. A tobacco use cessation program in Manitoba dental school proved that it was able to significantly increase the proportion of tobacco users receiving quit smoking counselling (Gelskey, 2002). In the United Kingdom, dental undergraduates were introduced to the skills of smoking cessation as part of health promotion and disease prevention and patient communication as part of their initial training (General Dental Council, 2008). Ramseier *et al.* (2013) found from an 8-year review of the implementation of a tobacco dependence education curriculum in a Swiss dental school was successful. The similar author also concluded that improvements on identifying smokers, increasing initial and follow-up interventions may lead to higher quit rates. In Japan, the implementation of a tobacco curriculum was found effective in preventing smoking initiation (Haresaku *et al.,* 2010).

In Malaysia, the Faculty of Dentistry, Universiti Kebangsaan Malaysia (UKM) was the pioneer to include tobacco dependence treatment as a full module in their undergraduate curriculum (since 2006) (Yahya *et al.,* 2012) and on-the-job training for dentists in smoking cessation was only available lately (Amer Nordin, 2013). Hanioka *et al.* (2015) reviewed that dental education regarding tobacco use prevention and cessation (DENTUPAC) should be emphasised and evaluated to help increase the involvement of dentists in cessation counselling upon graduation.

2.8 Theoretical Domain Framework (TDF)

The theoretical domains framework (TDF) is an integrative framework developed from a synthesis of psychological theories as a vehicle to help apply theoretical approaches to interventions aimed at behaviour change (Phillips *et al.,* 2015). It is basically a method to bring together the models and theories of behavioural change. TDF is used to identify which model and theory to use when designing an intervention and how to implement the intervention effectively. TDF was originally developed by Michie *et al.* (2005) through a consensus of experts which have identified 12 theoretical domains derived from the constructs of many behaviour change theories.

TDF has been developed for the adoption of tobacco use prevention and cessation counselling among dental providers by several researchers (Amemori *et al.,* 2011b; Cane & O'Connor, 2012). Amemori *et al.* (2011a) developed a theoretical domain questionnaire (TDQ) covering 10 domains based on TDF by Michie *et al.* (2005) to understand dentists' behaviour and challenges to implementation of the clinical guideline on tobacco cessation (see Figure 2.4) This similar questionnaire was adapted in the survey on Malaysian dentists later in the study.

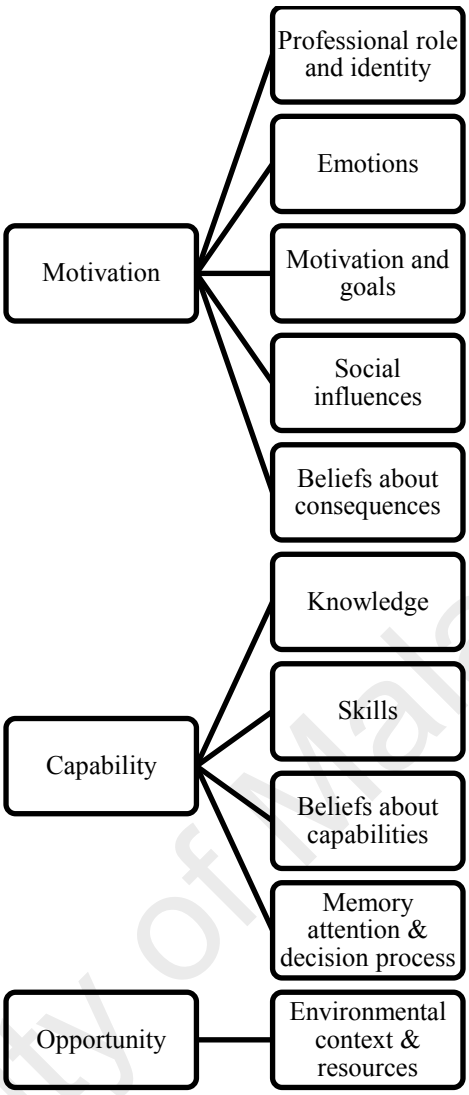


Figure 2.4: The Conceptual Framework: 10 theoretical domains in the TDQ
Data source: Amemori *et al*. (2011a)

Amemori *et al.* (2011a) extracted 3 factors (motivation, capability, and opportunity) from the 10 theoretical domains upon analysis of its internal consistencies through factor analysis (Figure 2.4). The 10 domains and its description are outlined in Table 2.7. The first factor is motivation, which its component domains are all serve to energise and direct behaviour. The component domains are emotion, motivation and goals, social influences, beliefs about consequences, and professional role and identity. Motivation can be either extrinsic or intrinsic.

Extrinsic motivation explains the drive for an individual to participate within a specific activity or role given the potential to achieve a reward or punishment (Pam, 2016). This type of motivation arises from outside the individual, as opposed to intrinsic motivation, which originates inside of the individual. External rewards such as money, praise, and fame would be examples of extrinsic motivation. Intrinsic motivation would be the internal rewards such as feeling emotionally good, enthusiasm, and beliefs. Amemori *et al.* (2011a) found in his study among dentists, that motivational and goals were most highly ($r > 0.50$) associated with professional role and identity, social influences and emotion.

Component domains for the second factor, capability, are all aspects of physical or psychological capability, which are knowledge, skills, beliefs about capabilities, and memory attention and decision process. Knowledge by definition is an awareness of the existence of something while skills are acquired through practice. Psychological capabilities would be dentists' beliefs about their capabilities in delivering smoking cessation intervention. Another psychological capability is dentists' ability, which is to retain information and to decide based on that information in delivering smoking cessation intervention (memory attention and decision process) (Table 2.7)

The third factor is the opportunity (environmental context & resources domain) which is describe as any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour (see Table 2.7). In this study, the resources would be in terms of facilities pertaining to promoting tobacco abstinence in the dental setting.

Table 2.7: The domains of the Theoretical Domains Framework (TDF)

TDF Domain	Description
Knowledge	An awareness of the existence of something
Skills	An ability or proficiency acquired through practice
Professional role and identity	A coherent set of behaviour and displayed personal qualities of an individual in a social or work setting
Beliefs about capabilities	Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use
Beliefs about consequences	Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation
Goals	Mental representation of outcomes or end states that an individual wants to achieve
Memory attention & decision process	The ability to retain information, focus selectively on aspects of the environment, and choose between two or more alternatives
Environmental context & resources	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour
Emotion	A complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event

Data source: Amemori *et al.* (2011a)

2.9 Barriers to Delivering Smoking Cessation Intervention

A consistently reported barrier in studies from the United States, United Kingdom, Australia, Canada, Pakistan, Japan, India, New Zealand, Norway, Saudi Arabia, the Netherlands, and Sweden was the lack of training (Hanioka *et al.,* 2013). Lack of educational materials, lack of knowledge of available resources, constituted barriers (Hanioka *et al.,* 2013). Wickholm *et al.* (2006) mentioned the lack of time, lack of

reimbursement mechanisms, lack of confidence and skills, concerns over the effectiveness of support were common barriers to involvement in tobacco use cessation activities reported by dentists. Davis *et al.* (2010) further mentioned the reasons for dentists not providing smoking cessation intervention was that they feel uncomfortable and unprepared talking with patients about their smoking. A study in Sweden stated that, despite all these barriers, dentists have a potentially active role in tobacco cessation counselling (Helgason *et al.,* 2003). Similarly, Malaysian studies revealed the similar issues as barriers to conducting smoking cessation treatment (Yahya & Croucher, 2005; Asmaon & Razak, 2007; Ibrahim & Norkhafizah, 2008; Vaithilingam *et al.,* 2012; Amer Nordin *et al.,* 2014). Thus, training of dentists increased the implementation frequency of tobacco cessation interventions (Rankin *et al.,* 2010) and barriers to be addressed during training in order to keep dentists motivated (Wickholm *et al.,* 2006). Interactive workshops with a minimum of 4-hours training for basic intervention was suggested rather than didactic sessions, but the challenges would be high costs, intensive resources and potentially small participation per session (Davis *et al.,* 2010).

2.10 Knowledge, Attitude, and Perception/Practice (KAP) of Patients towards Smoking Cessation Intervention

A KAP survey is a representative study of a specific population to collect information on what is known, believed and done in relation to a particular topic - in this case, smoking cessation intervention (World Health Organisation, 2008). This study gathers information about what respondents know about general and oral health effects of smoking, what they think about dentists providing such intervention, and what they actually do with regard to seeking care or taking other action related to tobacco use. KAP surveys can identify knowledge gaps, cultural beliefs, or behavioural patterns that may facilitate understanding and action, as well as pose problems or create barriers for

smoking cessation efforts. It can identify information that is commonly known and attitudes that are commonly held.

This study uses a conceptual framework that was adapted from the knowledge, attitude, and practice (KAP) model based on the cognitive-affective-behaviour theory (Schwartz, 1976) (see figure 2.5). The definitions of this model are discussed in the following text (Badran, 1995). Knowledge is define as the capacity to acquire, retain and use the information; a mixture of comprehension, experience, discernment and skill. Education is the prerequisite of knowledge. However, Watt (2005) argued that health knowledge gain alone is of little value when resources and opportunities to change do not exist. Attitude refers to preferences to react in a certain way to certain situations; to see and interpret events according to certain predispositions; or to organize opinions into a coherent and interrelated structure (Badran, 1995). Practice means the application of rules and knowledge that leads to action (Badran, 1995). Similarly, the definition of perception is an individual's view making it a powerful driving force for action (McDonald, 2011).

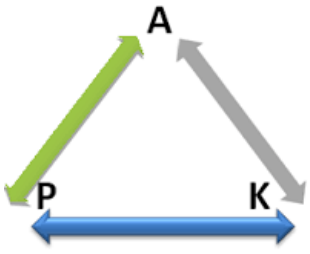


Figure 2.5: Knowledge, attitude, and practice (KAP) model based on the cognitive-affective-behaviour theory
Source: Schwartz (1976)

2.10.1 Dental Patients' Knowledge on Smoking Related Conditions

Surveys on patients' knowledge of smoking-related health conditions indicated that patients mostly knew smoking was a risk factor for the development of lung cancer and heart disease (Rikard-Bell, Donelly & Ward, 2003; Terrades *et al.,* 2009; Sood *et al.,* 2014). However, significantly fewer patients knew that smoking was a cause for oral cancer and other oral diseases, or condition such as gum disease, periodontal disease and impaired wound healing after a minor oral surgery (Rikard-Bell *et al.,* 2003; Lung *et al.,* 2005; Terrades *et al.,* 2009; Sood *et al.,* 2014). Nevertheless, many patients recognized that smoking can also cause tooth staining (Terrades *et al.,* 2009; Sood *et al.,* 2014) and bad mouth odour (Sood *et al.,* 2014), although an earlier study by Lung *et al.* (2005) proves it otherwise.

2.10.2 Dental Patients' Attitudes and Perceptions on Smoking Cessation Intervention

Campbell *et al.* (1999) reported there is evidence that patients believed dentists should routinely offer smoking cessation services, and those interested in quitting felt more comfortable receiving advice about quitting. Dental patients have positive and high expectations towards dentists' involvement in smoking cessation activities (Terrades *et al.,* 2009; Rikard-Bell *et al.,* 2003; Sood *et al.,* 2014). They expect dentists to be interested in all relevant health issues and smoking cessation advice provided by dentists will not estrange patients who smoke (Rikard-Bell *et al.,* 2003). Furthermore, current smokers were more likely to have perceived dental needs compared with non-smokers (Dye *et al.,* 2006). Therefore, dentists should not hesitate to provide smoking cessation advice to their patients and to show them the oral health effects of smoking.

2.11 Summary

Tobacco smoking still remains a public health problem worldwide and in Malaysia. The WHO has recognized the support of smoking cessation treatment and has extended the inclusion of dentists in its tobacco control efforts. However, the acceptance of smoking cessation interventions in the dental setting has been lacking in Malaysia. Additionally, limitations in the health care resources particularly in dental settings may have reduced further efforts. Consequently, an insight on the knowledge of dental patients particularly smokers on the general and oral disease related to tobacco use and their perception on dentists providing smoking cessation should be explored as well. Issues in relation to smoking cessation activity perceived by dentists should be looked into to understand their behaviour and challenges in implementing such intervention.

Thus, additional research should be carried out to determine the effectiveness, feasibility, and acceptability of the models of smoking cessation intervention by both dental practitioners and patients before it can be implemented in a dental setting.

The following chapter, Chapter 3- Methodology, explains in detail on the materials and methods used for Part1 and Part 2 of the study.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter details out the ethical approvals and research methodologies for Part 1 and Part 2 of the research study. Part 1 is the randomised controlled trial (RCT). Part 2 consists of the two surveys: a) the survey of dental patients; b) the survey of dentists. In Part 1, the objective of the study was to compare the effectiveness of the 5A's smoking cessation intervention (5A's) to that of brief advice (BA) which dentists delivered in a dental setting. It was an extensive study of the demographic characteristic of participants and details of the trial conducted by dental public health specialists. This study was carried out by randomization and training of the specialists on the two different methods of smoking cessation interventions by developing standard training modules and clinical protocols. Detail instrumentations used for data collection and data analysis were also discussed.

This chapter also describes the study designs for Part 2(a) and (b); participants of the studies, instrumentations done, data collection, and data analysis procedures of the both entire studies. Alternative research instruments to self-administered questionnaire are internet-based surveys and telephone surveys of dentists and dental patients (Braithwaite *et al.,* 2003). Nonetheless, they raise important technical and methodological issues which should be carefully considered before widespread implementation (Braithwaite *et al.,* 2003). The administration technique chosen for this study was depended on the amount and type of information desired, the target sample size, investigator time, financial constraints and whether test properties were established.

3.2 Ethical Approvals

Ethical clearance for both surveys and the RCT were obtained from the Research Ethics Committee of the University of Malaya's Faculty of Dentistry (Reference number: DFCO1301/003[P]) and the Ministry of Health Malaysia's Medical Research Ethics Committee (MREC) (Reference number: KKM/NIHSEC/P13-551). The surveys and RCT were also registered with the National Medical Research Register (NMRR) (Registration number: NMRR-13-406-15721) (Appendix A) and the International Standard Randomised Controlled Trial Number (ISRCTN) registry (Registration number: ISRCTN 16325841) a primary clinical trial registry recognised by the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) and the International Committee of Medical Journal Editors (ICMJE).

3.3 PART 1: Randomised Control Trial: The 5 A's Model in Behavioural Therapy vs. Brief Advice on Smoking Cessation Delivered by Dentists in a Dental Setting

The randomised control trial report conformed to the Consolidated Standards of Reporting Trials (CONSORT) guidelines (Schulz, Altman & Moher, 2010). CONSORT is an evidence-based, minimum set of recommendations for reporting randomized trials, offering a standard way of reporting trial findings, facilitate to complete and provide transparent reporting.

3.3.1 Objective

The objective of the present study was to compare the effectiveness of the 5A's smoking cessation intervention (5A's) to that of brief advice (BA) which dentists delivered in a dental setting.

3.3.2 Null Hypothesis

There is no difference between the effectiveness of the 5A's model of smoking cessation intervention (5A's) and that of brief advice (BA) which dentists delivered in a dental setting.

3.3.3 Study Design

This study was a single-blinded randomized controlled trial (parallel design) designed to compare the effectiveness of the 5A's smoking cessation intervention (5A's) to that of brief advice (BA) which dentists delivered in a dental setting. Figure 3.1 shows the overall conduct of the study.

The effectiveness of the smoking cessation intervention was the outcome variables in this part of the study, which were measured as follows:

1. Primary outcome: a prolonged abstinence of 30 days (Velicer & Prochaska, 2004) as a self-reported outcome measure and a piCO+ carbon monoxide (CO) monitor to validate abstinence at the six-month follow-up.
2. Secondary outcomes:
    a. Seven-day point prevalence abstinence at the one-month follow-up and the three-month follow-up.
    b. Behaviour change of smokers at any stage of change based on the Contemplation Ladder questionnaire at the one-month follow-up and the three-month follow-up.

3.3.4 Time Frame

This clinical trial started in March 2014 and ended in August 2015.

3.3.5 Samples

There were two samples involved in this trial. First was the healthcare provider which conducted the clinical trial. Secondly were the patients who attended dental clinics for dental treatment, enrolled to participate in this trial.

3.3.5.1 The Healthcare Provider

Dental Public Health (DPH) specialists in Selangor state were recruited as healthcare providers to deliver smoking cessation interventions in this study. These DPH specialists conducted the trial at their primary dental clinics in the Ministry of Health, Malaysia. The decision was based on the probability that the turnover rates would be high if general dentists were be recruited for the longitudinal study. Therefore, out of 14 DPH specialists in Selangor, only 6 met the inclusion criteria. The inclusion criteria were DPH specialists with five or more years of working experience who were posted at the main district clinic, were interested in this research project, and were not involved in other research projects with other organizations. DPH specialists who served as the main administrators (deputy directors) or whose main clinics were located remotely from the city centre of Kuala Lumpur and those who planned to retire within the two-year period were excluded from the study.

3.3.5.2 Randomization Procedure

The six DPH specialists who participated in this study were randomized equally into two intervention groups by the drawing of lots. One group was devoted to the 5A's (3 DPH specialists) and the other was devoted to brief advice intervention (3 DPH specialists). All the dental clinics enrolled patients into this study for a minimum of six months. Randomising dental patients was not feasible due to logistic and time constraints.

3.3.5.3 Dental Patients

Each DPH specialist enrolled patients who fulfilled the inclusion criteria into the assigned smoking cessation intervention program. The inclusion criteria follow:

1. Smokers who attended Ministry of Health Dental Clinics in Selangor;
2. Malaysian citizens;
3. Adults aged between 15 and 70 years (this age range was adapted from the Malaysian Global Adult Tobacco Survey (GATS) 2011, a nationally representative household survey of noninstitutionalized men and women aged 15 years or older);
4. Smokers who have smoked at least one cigarette in 30 days;
5. Those who are contactable via a mobile phone or a landline; and
6. Those who are not currently undergoing smoking cessation treatment with other health clinics.

A receptionist at the registration counter of each dental clinic invited patients who fit the inclusion criteria to participate in the trial during their dental visits. Once the patients agreed, a dental surgery assistant (DSA) then explained about the study using the patient information sheet (Appendix C) and presented them with a consent form (Appendix C) to sign in the presence of a witness. The respective DPH specialist would then see the patients. The duration of the intervention was six months. Patients were followed-up at four weeks, three months, and six months after their initial visit to quit smoking. Each patient received a token of appreciation after each visit.

Patients were followed up by a telephone call at one month and three months to assess their stages of change and quitting methods and to provide any support in case of the development of withdrawal symptoms. All calls were made a maximum of three

times to reduce the number of dropouts. If there were no responses during these telephone follow-ups, patients were considered to be smokers at the same stages of change as those they had been at when previously contacted. The six-month follow-ups were done at the dental clinic. Again, if there were no responses during these follow-ups, patients were considered to be smokers at the same stages of change as those they had been at when previously contacted.

3.3.6 Blinding

This study was a single-blind trial. Patients enrolled did not know which interventions they received. This was meant to eliminate potential sources of bias. The DPH specialists, however, were trained and briefed solely on the smoking cessation intervention that they were to deliver. Thus, they were well aware of the protocols they were required to adhere to. Adherence to these protocols by the DPH specialists was ensured by the strict use of the step-by-step assessment forms, which were different for the two interventions (Appendix D & E).

3.3.7 Estimated Sample Size Calculation

Adequate sample size is necessary to ensure that it has enough statistical power to prove a hypothesis (Freiman *et al.*, 1978). The statistical power (or 1-β) is the probability of not making Type II errors (β). In hypothesis testing, a Type II error entails accepting a result when it is wrong or failing to reject the null hypothesis when it is false.

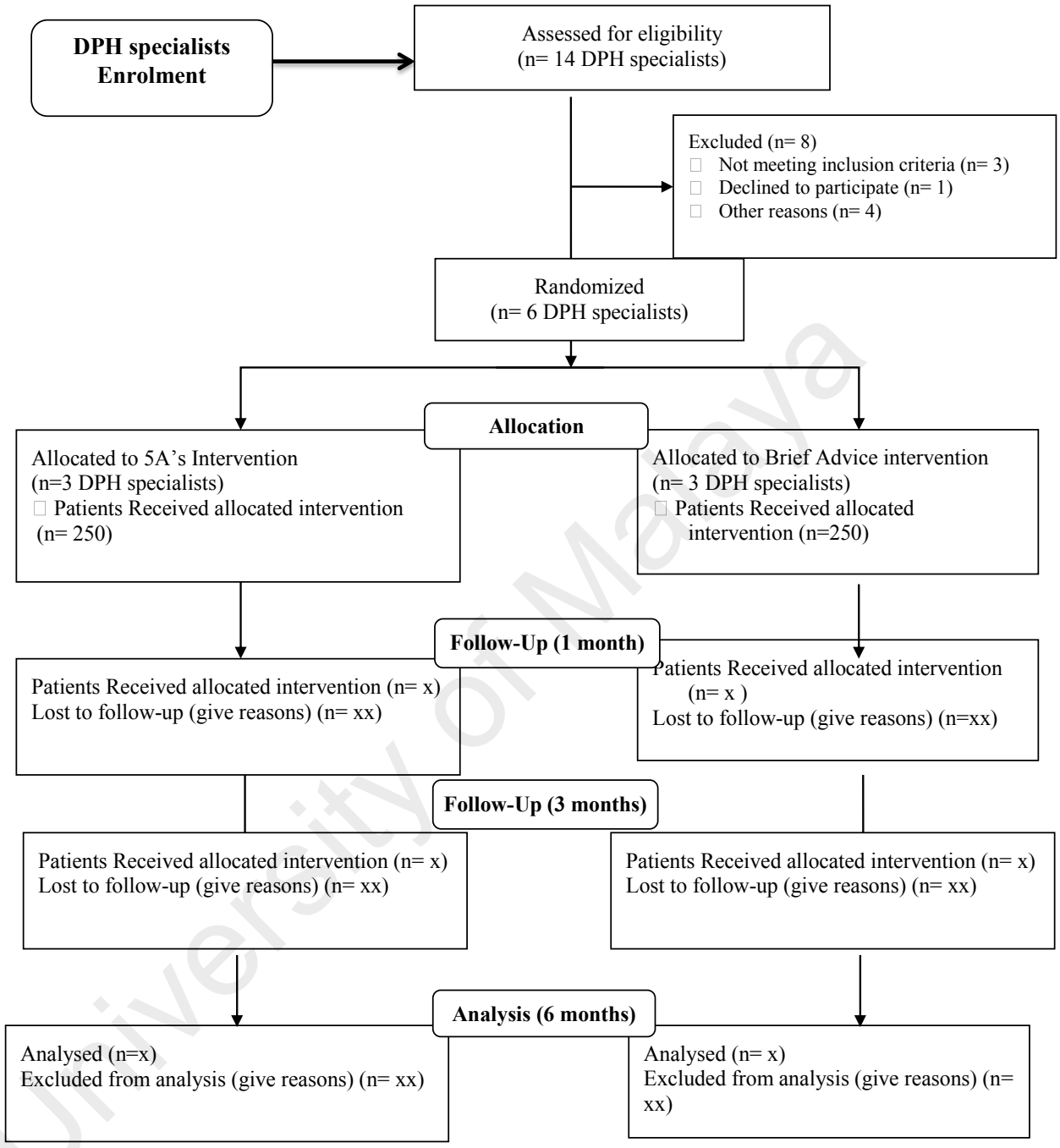


Figure 3.1: Flow diagram of the study design

Source: CONSORT (2010)

The estimated sample size for this study was dependent on the following:

- The effect size: the clinically meaningful and important magnitude of the difference between the 5A's and BA;
- The P-value/alpha level: the level of significance considered appropriate [P<α=reject null hypothesis; P>α= not reject null hypothesis]; and
- The 'power' of the test: the chance of detecting the difference anticipated (the ability of a test to reject the null hypothesis when it should be rejected).

Using the formula for sample size to compare two binomial proportions from independent samples,

- $n_1 = [z_{1-\alpha/2} \sqrt{pq(1+1/k)} + z_{1-\beta} \sqrt{p_1q_1 + p_2q_2/k}]^2$

  Δ^2

$n_2 = k\, n_1$

The proportions of populations 1 and 2 were based on a study by Nohlert *et al.* (2009), which indicated that individuals in the high-intensity intervention (HIT-arm) were twice as likely to report continuous abstinence as those in the low-intensity intervention (LIT-arm) (18% vs. 9%, p = 0.02).

With α value = 0.05 and desired power = 0.80 (effect size= 80%), the estimated sample size for this study was 226 ($n_1 = n_2$) patients on both arms. The final sample size estimated was 250 patients on both arms after taking 10% dropouts into consideration.

3.3.8 Training and Standardization

The DPH specialists attended separate one-day courses of training and standardization according to the intervention groups using the Smoking Cessation Intervention Delivered by Dentists (SCIDD) module.

3.3.8.1 The Development of the SCIDD Module

A standard training module called the Smoking Cessation Intervention Delivered by Dentists (SCIDD) module was developed to train dentists to deliver smoking cessation interventions.

(a) Synopsis of the SCIDD Module

The purpose of the module was to train dentists to deliver smoking cessation interventions. It contained two smoking cessation intervention approaches, that is, brief advice (BA) and the 5A's intervention. The BA approach entailed verbal instructions to stop smoking with or without added information about the harmful effects of smoking (Coleman, 2004). The 5A's approach was a structured method based on Prochaska's and DiClementi's theory of change, which had been used for smoking cessation in healthcare settings. This approach had five steps: ask, advice, assess, assist, and arrange (Fiore *et al.*, 2000). The details of the approach are described in the literature review chapter (see Chapter 2, page 17).

(b) Designing the SCIDD program

The SCIDD module design was adapted from Nichter (2006), Muramoto and Lando (2009) and World Health Organization (2005), for the application to tobacco cessation. Figure 3.2 shows the process of developing and implementing the SCIDD module. The next section discusses the steps of the process.

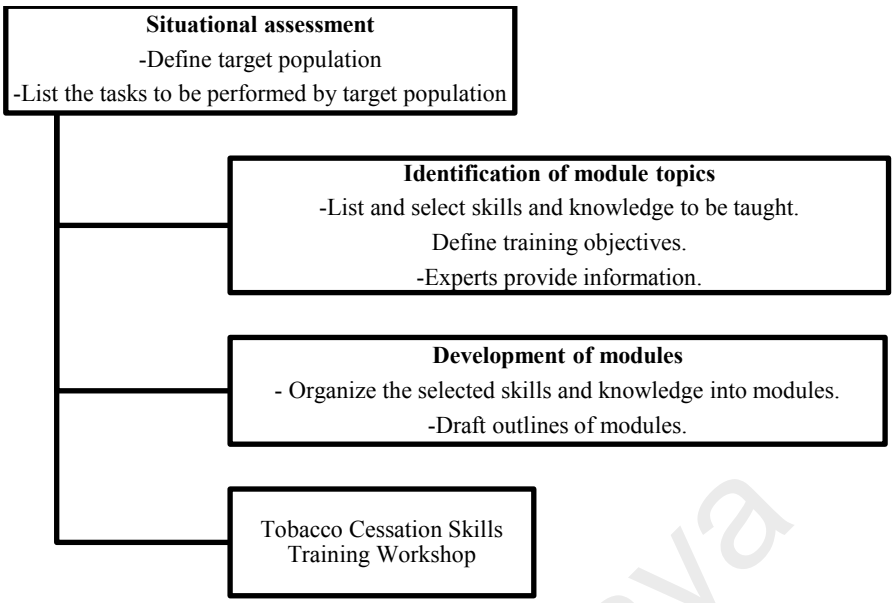


Figure 3.2: Steps in the development and implementation of the SCIDD module

Adapted from WHO (2005), Nichter (2006), and Muramoto & Lando (2009)

Table 3.1: Summary of studies on tobacco-related knowledge, attitudes, and practices among Malaysian dentists

Authors	Sample Size (n)	Main Findings
Yahya and Croucher (2005)	72 dentists	Time consuming (n=29, 40.3%). Lack of knowledge (n=39, 54.2%).
Asmaon and Razak (2007)	558 dentists	Lack of information in smoking cessation (86.1%). Constrained because of lack of training in smoking cessation (66.0%). Lack of time in practice prevents involvement in smoking cessation (56.5%).
Vaithilingam *et al.* (2012)	236 dentists	Insufficient time (n=195, 82.6%). Lack of skills in counselling (n=165, 69.9%). Lack of knowledge in smoking cessation (n=112, 47.5%).
Amer Nordin *et al.* (2014)	223 dentists	Discussing patients' smoking habit is time-consuming (n=130, 60.5%).

d) Identification of SCIDD module topics

The content of this module was identified based on the findings of the situational analysis. The module focused on basic and in-depth knowledge and skills regarding tobacco cessation and exposure to a range of clinical scenarios so as to practice cessation skills on dental patients. The objectives of the training module as follow:

1. To provide knowledge on tobacco use and its effects,
2. To explain the steps involved in the BA or 5A's approach to smoking cessation, and
3. To develop skills in conducting the BA or 5A's method of counselling on smoking cessation.

Therefore, at the end of the training, the dentists should have benefitted from the following learning outcomes:

1. They should have been able to explain the health and oral consequences of tobacco use,
2. They should have been able to describe the current approaches to smoking cessation intervention in the dental clinic,
3. They should have been able to demonstrate skills in assessing tobacco use in dental patients, and
4. They should have been able to demonstrate skills in assisting dental patients to quit tobacco use.

Based on the objectives, module content was developed for BA and the 5A's separately. The content was adapted from a training standard by the National Health Service, U.K. (Health Development Agency NHS, 2003), using evidence-based guidelines (Ministry of Health Malaysia, 2003; Fiore *et al.,* 2008; Lando *et al.,* 2007;

Coleman, 2004). To ensure the suitability of the adapted content for Malaysian use, expert opinions were sought. The experts involved were a smoking cessation specialist/consultant psychiatrist (Addiction) from the University of Malaya, Centre of Addiction Sciences, an instructional technologist, and expert in the development of training modules from the University of Malaya, and a dental public health specialist from the Ministry of Health, Malaysia. The first draft of the SCIDD module was emailed to these experts and they were asked to provide feedback.

Comments from the experts follow:

1. Since the target group will be dentists who are experienced, the module should include more discussions, small group activities (role playing), and pre-planned readings; fewer lectures should be given.
2. The content appears appropriate.
3. Time constraints are an issue if the module is based mainly on lectures; and if too much information is given in one day, it will be difficult or the participants to absorb.
4. The trainer for the SCIDD module should ideally be one individual for consistency.

The modules were revised according to this expert feedback.

(e) The content of the SCIDD training module

The SCIDD training module has two modules (Figure 3.3). Two major outcomes for both modules are knowledge and skills. Multiple teaching methods are used. They include lectures, planned reading (self-reading), small group discussions, case studies, and role play. Module 1 covers the BA intervention; the total training time is 4 hours and 30 minutes. Module 2 covers the 5A's intervention; the length of training time is 6 hours. Tables 3.2 and 3.3 show the detailed lesson plan, core content, key learning

outcomes, objectives, and types of delivery methods for Module 1 and Module 2, respectively.

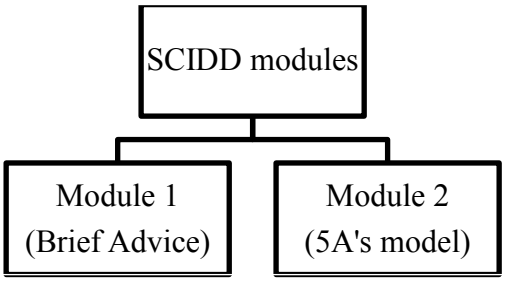


Figure 3.3: The Smoking Cessation Intervention Delivered by Dentists (SCIDD) modules

(f) Training and standardization of DPH specialists

A training workshop was held to train and standardize the DPH specialists in each intervention group at the Faculty of Dentistry, Universiti Kebangsaan Malaysia, on two separate dates. The training was conducted according to the SCIDD training module.

After the SCIDD training, all DPH specialists involved were briefed on the clinical trial protocols. They were also informed regarding how to use the CO monitor and the forms. The study protocol was tested using simulated patients to pilot test the assessment forms and the CO monitor. This took place in the Quit Smoking Clinic in the Department of Dental Public Health in the Universiti Kebangsaan Malaysia's Faculty of Dentistry.

The specialists received kits containing tobacco use assessment sheets, pamphlets, and CO monitors after the training in order to conduct the intervention in their respective dental clinics. All the DPH specialists trained received six continuing professional development (CPD) points upon their completion of the training.

Table 3.2: Core content areas and key learning outcomes for Module 1: Brief Advice (BA) intervention (4 hours 30 minute)

NO.	LESSON	CORE CONTENT	KEY LEARNING OUTCOMES	OBJECTIVE(S)	DELIVERY METHODS
1.	Smoking, health, and oral health (1 hour, 30 minutes)	Health and oral health effects of smoking. Behavioural and pharmacological determinants of smoking behaviour. The health benefits of quitting.	1. Able to list the major life-threatening and non-life-threatening diseases related to oral and general health caused by smoking and potential years of life lost. 2. Able to describe the effects of passive smoking on adults and children. 3. Able to explain the benefits of quitting smoking. 4. Able to describe compensatory smoking in relation to reducing the frequency of smoking or switching to lower tar cigarettes.	Knowledge Knowledge Knowledge Knowledge	• Planned reading • Group discussion • Case studies
2.	The Brief Advice Guideline for Smoking Cessation in a Dental Setting (Gordon *et al.*, 2007; Coleman, 2004) (1 hour, 30 minutes)	Ask and record smoking status. Assessing a person's readiness to change. Assessing tobacco use and nicotine dependence. Advice all smokers to quit.	1. Able to ask about smoking in an appropriate way, to elicit an accurate response. 2. Able to record status and action taken in an appropriate computer or paper-based system. 3. Able to ask appropriate questions to assess readiness to attempt to quit. 4. Able to assess willingness to use appropriate treatments. 5. Assess a client's nicotine dependence using an appropriate method. 6. Assess a client's commitment to the present quit attempt and to attending treatment. 7. Able to describe the relevance to treatment of past quitting history and smoking characteristics. 8. Able to demonstrate the use of the CO monitor as a motivational tool and as a means of assessing and validating smoking status.	Skills Skills Knowledge/Skills Skills Skills Skills Knowledge Skills	• Lecture • Group discussion • Case studies • Role play • Clinical demonstration
3.	The Effects of Quitting Smoking. *(Standard for Training in Smoking Cessation Training 2003. Health Development Agency, National Health Service, UK)* (1 hour, 30 minutes)	Barriers to quitting smoking. Withdrawal syndrome in smoking cessation.	1. Able to describe the main features of the tobacco withdrawal syndrome. 2. Able to describe the common and less common tobacco withdrawal symptoms and their duration. 3. Able to address problems with patient's motivation, strong withdrawal reactions, and adherence to treatment.	Knowledge Knowledge Skill	• Lecture • Group discussion • Case studies • Role play

Table 3.3: Core content areas and key learning outcomes for Module 2: 5A's intervention (6 hours)

NO.	LESSON	CORE CONTENT	KEY LEARNING OUTCOMES	OBJECTIVE (S)	DELIVERY METHODS
1.	Smoking, health, and oral health (1 hour, 30 minutes)	Health and oral health effects of smoking. Behavioural and pharmacological determinants of smoking behaviour. The health benefits of quitting.	1. Able to list the major life-threatening and non-life-threatening diseases related to oral and general health caused by smoking and potential years of life lost. 2. Able to describe the effects of passive smoking on adults and children. 3. Able to describe behavioural and pharmacological determinants of smoking behaviour. 4. Able to explain the benefits of quitting smoking. 5. Able to describe compensatory smoking in relation to reducing frequency of smoking or switching to lower tar cigarettes.	Knowledge Knowledge Knowledge Knowledge Knowledge	• Planned reading • Group discussion • Case studies
2.	The 5A's Guideline for Smoking Cessation in a Dental Setting *(Gordon et al., 2007; Coleman, 2004)*. (2 hours)	Ask and record smoking status. Assessing a person's readiness to change. Assessing tobacco use and nicotine dependence. Advising smokers to quit. Assisting smokers to quit.	1. Able to ask about smoking in an appropriate way, to elicit an accurate response. 2. Able to record status and action taken in an appropriate computer or paper-based system. 3. Able to ask appropriate questions to assess readiness to make a quit attempt. 4. Able to assess willingness to use appropriate treatments. 5. Able to assess a client's nicotine dependence using an appropriate method. 6. Able to assess a client's commitment to the present quit attempt and to attending treatment 7. Able to describe the relevance to treatment of past quitting history and smoking characteristics. 8. Able to demonstrate the use of the CO monitor as a motivational tool and as a means of assessing and validating smoking status.	Skill Skill Skill/ Knowledge Skill Skill Skill Knowledge Skill	• Lecture • Group discussion • Case studies • Role play • Clinical demonstration

Table 3.3: Core content areas and key learning outcomes for Module 2: 5A's intervention (6 hours) *(continued)*

NO.	LESSON	CORE CONTENT	1. KEY LEARNING OUTCOMES	OBJECTIVE (S)	DELIVERY METHODS •
3.	The Effects of Quitting Smoking *(Standard for Training in Smoking Cessation Training 2003. Health Development Agency, National Health Service, UK)* (1 hour, 30 minutes)	Barriers to quitting smoking. Withdrawal syndrome in smoking cessation.	2. Able to describe common barriers to quitting. 3. Able to describe the main features of the tobacco withdrawal syndrome. 4. Able to describe the common and less common tobacco withdrawal symptoms and their duration. 5. Able to address problems with patient's motivation, strong withdrawal reactions, and adherence to treatment.	Knowledge Knowledge Knowledge Skill	• Lecture • Group discussion • Case studies • Role play
4.	Behavioural Support in Smoking Cessation (1 hour)	Relapse prevention. Cognitive and behavioural strategies to assist cessation.	1. Maximize commitment to the target quit date. 2. Able to discuss relapse situations and known predictors of relapse. 3. Able to deal appropriately with lapses and with full relapse during treatment. 4. Respond to common questions and issues raised by smokers.	Skill Knowledge Skill Skill	• Lecture • Group discussion • Case studies • Role play

3.3.9 Instruments

This trial employed several instruments as described below.

- Nicotine dependency was measured using the Fagerström Test for Nicotine Dependence (FTND) questionnaire (Heatherton et al, 1991), which was available in two languages: English (Appendix F) and Bahasa Malaysia (Malay). Yee, Ng & Rusdi (2011) translated the Bahasa Malaysia version (Appendix G).
- The level of carbon monoxide was measured using a piCO+ CO monitor at baseline and during the six-month follow-up in the dental clinic. A breath sampling D-piece and new steribreath^{TM} mouthpiece were attached to the monitor. Each patient was asked to inhale and to hold his breath for 15 seconds to start the breath test. During the last three seconds of the countdown, a beep sounded and the patient was asked to blow slowly into the mouthpiece. The aim was to empty his lungs completely. The coloured light-emitting diodes (LED) lit up in such a manner as to place patients into different categories based on the interpretation of the readings (as Table 3.4 shows). The rise in the parts per million (ppm) and equivalent percentage of carboxyhaemoglobin (COHb) levels were eminent and recorded.
- The stage of change was assessed using the Contemplation Ladder questionnaire (Biener & Abrams, 1991). This questionnaire had 11 statements describing the stages of change with a number score assigned to each statement. Each patient was allowed to choose only one appropriate statement to describe the stage of change at that moment. Patients who chose any score from 0–3, were in the pre-contemplation stage; those who chose scores from 4–5 were in the contemplation stage; those who chose scores from 6–8 were in the preparation stage; and those who chose scores of 9–10 were in the action stage. This

information was recorded in the assessment form. The Contemplation Ladder questionnaire was available in English (Appendix H) and translated Malay (Bahasa Malaysia) versions (Appendix I). The forward-backward translation technique was used to translate the questionnaire. A dental specialist, a secondary school English teacher, and a dental matron translated it from English to Bahasa Malaysia, and two retired lecturers from a teacher's training college and a dental specialist did a backward translation from Bahasa Malaysia to English.

- Tobacco abstinence was self-reported and measured using a piCO+ CO monitor to validate abstinence.

Table 3.4: Levels of CO in lungs and blood haemoglobin according to breath CO monitor.

Adult		**Category**
CO ppm	**%CO Hb**	
01–06	0.79–1.59	Non-smoker
07–10	1.75–2.23	Light smoker
11 and above	2.39 and above	Smoker

Source: Bedfont Scientific Ltd. (2012)

3.3.10 Trial Interventions

This trial compared the effectiveness of two behavioural therapies for smoking cessation. They were the 5A's model of smoking cessation intervention (Fiore *et al.,* 2000; Ministry of Health, 2003) and BA (Coleman, 2004; Lando *et al.,* 2007).

3.3.10.1 Trial for the 5A's smoking cessation intervention group

First visit (Baseline)

Figure 3.4 shows the schematic diagram of the 5A's model clinical protocol. DPH specialists in this intervention group conducted the trial using the five major steps in the 5A's intervention (Fiore *et al.,* 2000; Fiore et *al.,* 2008) (Table 3.5). At baseline, all patients were asked about their tobacco use and nicotine dependence and assessed and the information was recorded in Smoking Cessation Assessment Form A (Appendix D). All patients were asked how old they were when they started smoking, how long they had smoked the number of cigarettes they smoked in a day, and the amount of money they spent on cigarettes in a month. They were also questioned about their previous quit attempts, asked to identify what their single major reason for quitting smoking would be, and asked to name one major barrier to their efforts to quit smoking. Any oral health conditions associated with the patient were also recorded in the assessment form. These oral health conditions were subsequently used to personalise the advice that the DPH specialists gave patients to help them quit smoking.

All patients were asked about their nicotine dependence using the Fagerström Test for Nicotine Dependence (FTND) questionnaire. The levels of CO in patients' lungs were recorded using the piCO+ CO monitor. The patients' stages of change were then assessed using the Contemplation Ladder questionnaire. Each patient was asked to select one statement that best fit his or her readiness to quit smoking. Based on the answer, the patient's stage of change was determined. The patient subsequently received assistance appropriate to his or her stage of change.

For patients who were at the pre-contemplation and contemplation stages of change, 5R's (Fiore *et al.,* 2008) were applied to increase their motivation to quit smoking.

Moreover, the patients were reassessed at the next follow-up. The 5R's constitute a motivational counselling intervention that emphasizes the following: relevance to the patient, risks of smoking, rewards of quitting, roadblocks to quitting, and repetition. The intervention involved talking about smoking and quitting and then reinforcing the points most likely to motivate patients to quit. Patients in the preparation were advised on behavioural strategies that would help them cope with withdrawal symptoms and prevent relapses. They were given self-help pamphlets and encouraged to set a quit date within two weeks of this first visit. However, patients in this study did not receive any nicotine replacement therapy (NRT), Champix, or other drugs during this intervention.

Table 3.5: The five major steps in the 5A's intervention

1. Ask about tobacco use:
    - Identify and document tobacco use status for every patient at every visit.
2. Advise to quit:
    - In a clear, strong, and personalized manner urge every tobacco user to quit.
3. Assess willingness to make a quit attempt:
    - Is the tobacco user willing to make a quit attempt at this time?
4. Assist in quit attempt:
    - For the patient willing to make a quit attempt, use counselling to help him or her quit.
5. Arrange follow-up:
    - Schedule follow-up contact, preferably within one week of the quit date.

Source: Fiore *et al.* (2000, updated 2008)

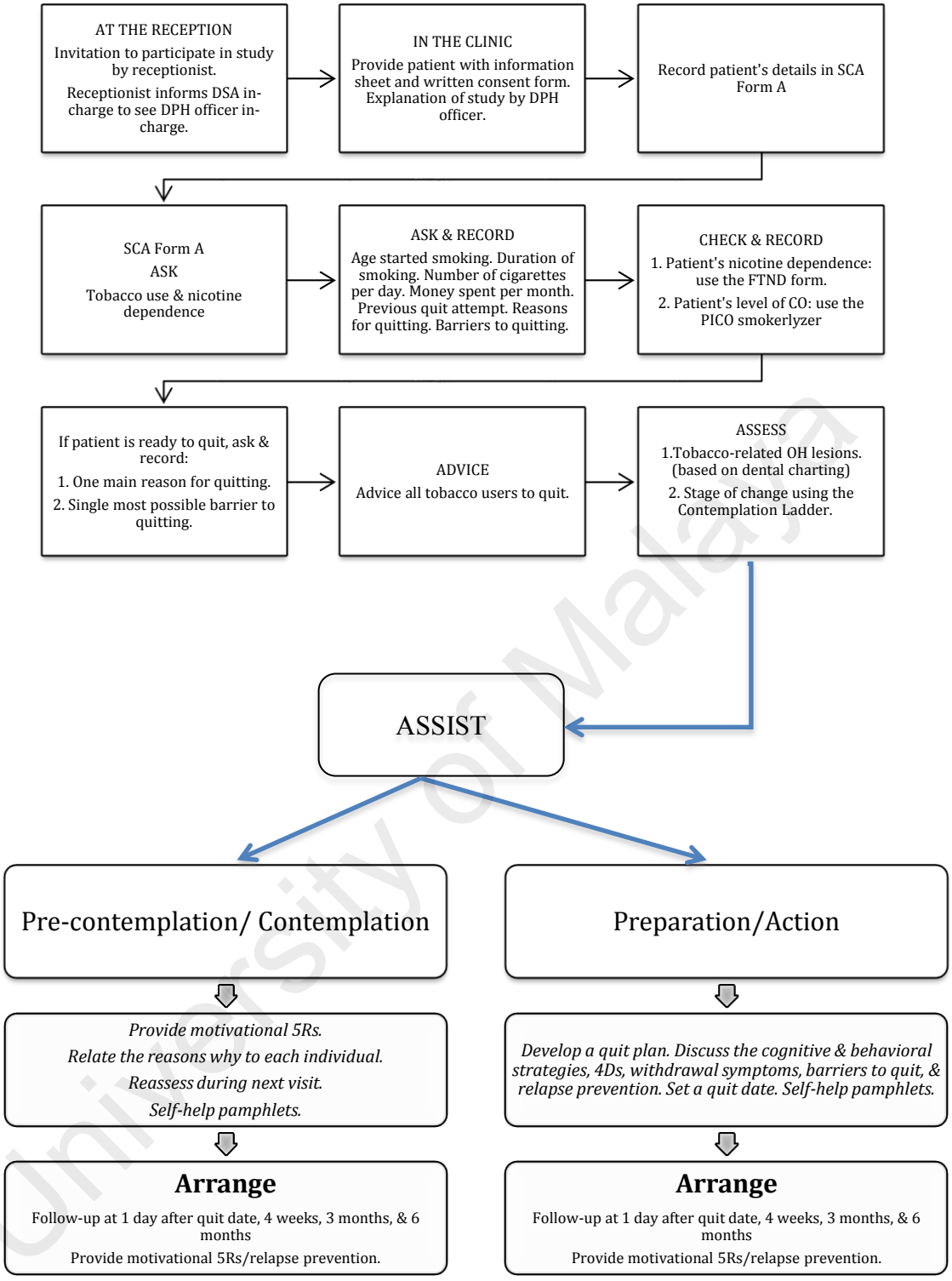


Figure 3.4: Schematic diagram of the 5A's Clinical Protocol

3.3.10.2 Trial for the BA smoking cessation intervention group

First visit (baseline)

Figure 3.5 shows a schematic diagram of the brief advice clinical protocol. At baseline, all patients were asked about their tobacco use and nicotine dependence and assessed and the information was recorded in Smoking Cessation Assessment Form B (Appendix E). They were all asked how old they were when they started smoking, how long they had smoked, the number of cigarettes they smoked in a day, and the amount of money they spent on cigarettes in a month. They were also questioned about their previous quit attempts, asked to identify what their single major reason for quitting smoking would be, and asked to name one major barrier to their efforts to quit smoking. All patients were asked about their nicotine dependence using the FTND questionnaire, and the levels of CO in their lungs were recorded using the piCO+ CO monitor. The patients' stages of change were assessed using the Contemplation Ladder questionnaire (Biener & Abrams, 1991). Each patient received a brief advice message (1–5 minutes) based on the guidelines in Table 3.6.

Table 3.6: Suggested phrasing when giving brief advice to smokers

- "The best thing you can do for your health is to stop smoking, and I would advise you to stop as soon as possible."
- "Tobacco is very addictive, so it can be very difficult to give up, and many people have to try several times before they succeed."
- "How do you feel about your smoking?"
- "The decision not to smoke has many benefits, including better dental health and more attractive teeth."
- "I will give you a pamphlet that contains helpful information about quitting smoking."

Source: Coleman (2004); Lando *et al.* (2007)

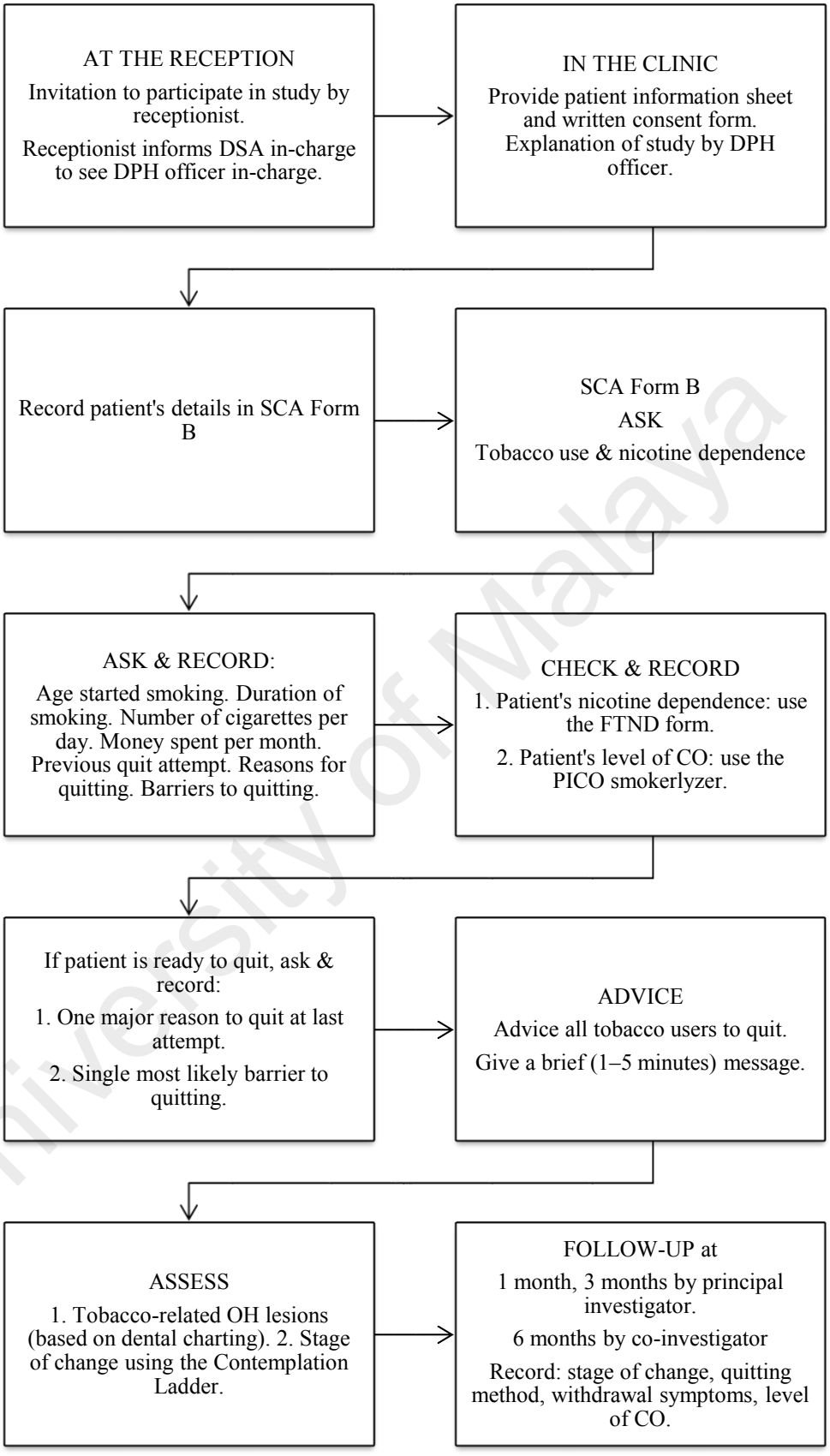


Figure 3.5: Schematic diagram of the Brief Advice Clinical Protocol

3.3.10.3 Follow-ups

(a) One-month and three-month follow-ups

Patients from both intervention groups were followed up via telephone one month and three months after the first visit. These follow-ups were conducted by a DPH specialist (not among the six DPH specialists mentioned earlier) who was the principal investigator for this trial. The protocol for the one-month follow-up and that for the three-month follow-up were similar. The patients' stages of change were assessed using the Contemplation Ladder questionnaire. Each patient's stage of change was determined and recorded by asking him or her to select one statement that best fit his or her readiness to quit smoking. Moreover, the patients were asked about their quitting method, which is, whether they quit cold turkey, gradually decreased, the number of cigarettes they smoked or made no quit attempt. To reduce the dropout rates, a total of three phone calls were made to each patient when there was no response to the first call. All patients were the given advice to stop smoking regardless of their stages of change during these follow-ups.

(b) Six-month follow-up

During the six-month follow-up, patients from both groups were called for appointments with the respective DPH specialists in the dental clinic. The patients' stages of change were assessed using the Contemplation Ladder questionnaire. Each patient was asked to select one statement that best fit his or her readiness to quit smoking. Based on the answer given, the patient's stage of change was determined. Patients were also questioned about their quitting methods, which are, whether they quit cold turkey, gradually decreased the number of cigarettes, or made no quit attempt. The levels of carbon monoxide in the patients' lungs were recorded using the piCO+ CO monitor. It was also used as a tool to confirm or validate any abstinence that the

patients reported. All patients received advice to stop smoking regardless of their stages of change during this follow-up.

3.3.11 Subject Compliance

Patients' compliance was recorded based on the follow-ups. Patients who were not contactable during any of the follow-ups were recorded and included as intention-to-treat (ITT). The reason for analysing all ITT subjects was the necessity for the trial to represent real-world therapeutics. Also, as a fundamental statistical principle associated with ITT analysis, including all ITT subjects meant preserving randomization, which was the best basis for reaching unbiased conclusions from statistical comparisons (Tal, 2011). Participants were excluded if they were not contactable by telephone or gave wrong telephone numbers during their first visits, and they were not replaced due to resource constraints.

3.3.12 Statistical Analysis

3.3.12.1 Intention-to-treat (ITT) analysis

Any dropouts for both interventions in this clinical trial were included as intention-to-treat (ITT) subjects regardless of their behaviour or that of those treating them. Gupta (2011) cited in his article that Fisher *et al.* (1990) defined the ITT analysis set as the inclusion of all patients in the groups to which they were randomly assigned regardless of their adherence to entry criteria, the treatment they actually received, and their subsequent withdrawal from treatment or deviation from the protocol.

3.3.12.2 Descriptive analyses

At baseline, frequencies and percentages were used for all categorical data. Means and standard deviations were used for all continuous data. Chi-square analyses were used for descriptive analyses. The Mann-Whitney U test was used to compare two independent conditions for non-parametric data. The significance level was set at p-value <0.05.

3.3.12.3 Primary outcome

a) Multivariate analyses

Multivariate logistic regression was used to predict abstinence at the six-month follow-up.

3.3.12.4 Secondary outcomes

a) Statistical association analyses

Chi-square tests were used to identify any significant differences in the following:

a. Behaviour changes (stages of change) after the one-month, three-month, and six-month follow-ups by the types of smoking cessation intervention;

b. Seven-day point prevalence abstinence at the one-month, three-month, and six-month follow-ups by the types of smoking cessation intervention;

c. Methods of quitting at the one-month, three-month, and six-month follow-ups by the types of smoking cessation intervention.

3.4 PART 2(a): Survey of Dental Patients

The report of this survey conformed to the STROBE (Strengthening the Reporting of Observational studies in Epidemiology) guidelines (Von Elm *et al.*, 2007).

3.4.1 Objectives

The objectives of this study were to assess the Malaysian dental patients' knowledge of the effects of smoking and their expectations regarding the role of dentists in smoking cessation intervention.

3.4.2 Study Design

In this study, a cross-sectional study using a self-administered questionnaire was conducted among patients attending two private dental clinics in Kedah and two public dental clinics in Negeri Sembilan. Figure 3.6 shows the flow chart of the overall conduct of the study.

3.4.2.1 Development of the questionnaire

The questionnaire was developed to explore three areas (dependent variables): dental patients' knowledge of the oral health and general health effects of smoking, the attitudes of smokers towards smoking cessation counselling, and the perceptions of dental patients regarding the smoking cessation intervention based on the conceptual framework illustrated in Figure 3.7. This framework was adapted from the Knowledge, Attitude, and Perception/Practice (KAP) Model by Schwartz (1976), which is described in the literature review in Chapter 2 (see page 39). The questions for each dimension were derived from previous similar studies (Rikard-Bell *et al.*, 2003; Lung *et al.*, 2005; Terrades *et al.*, 2009, Sood *et al.*, 2014).

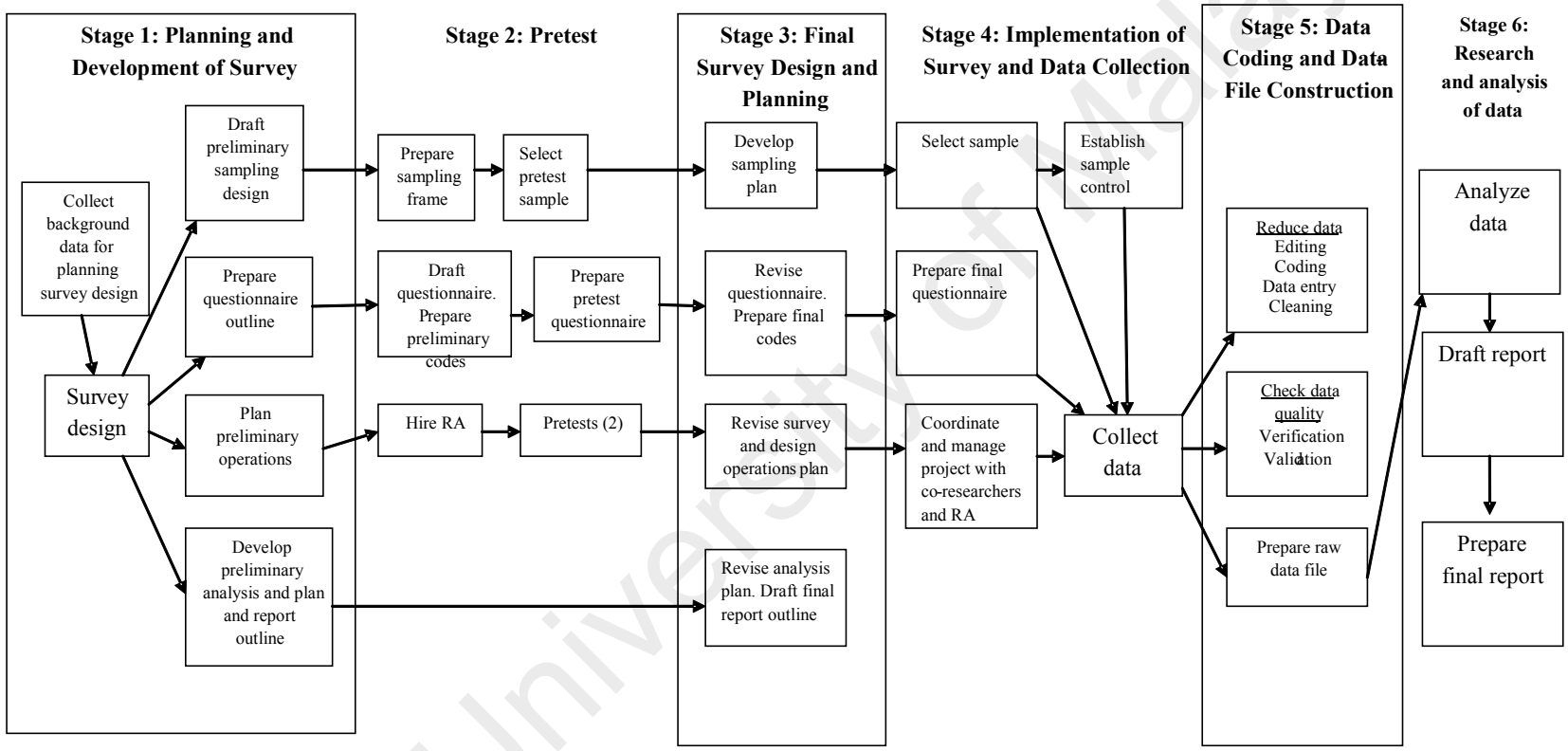


Figure 3.6: Flow chart of the conduct of the study

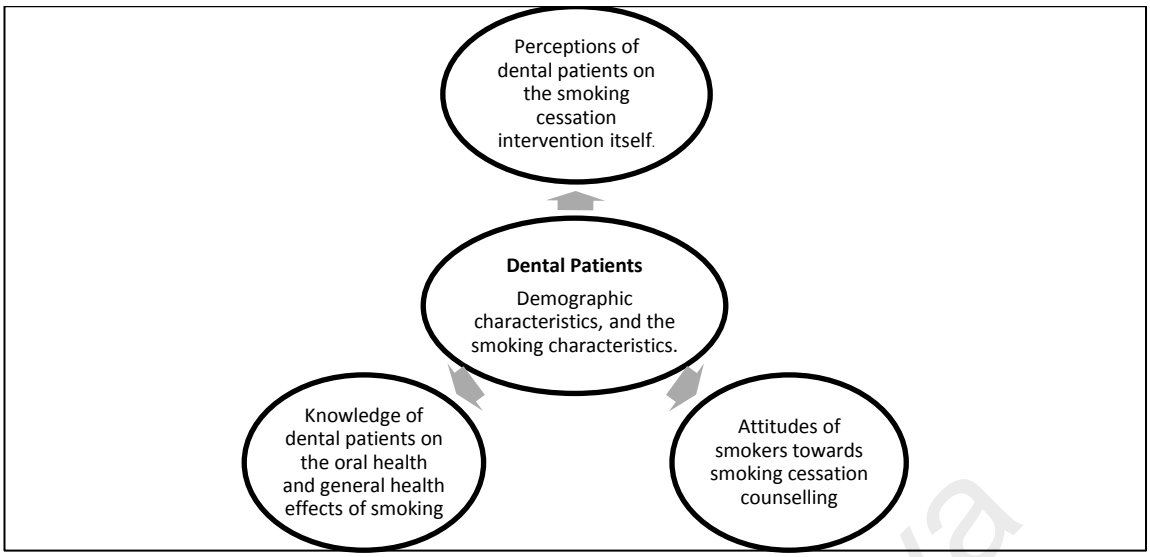


Figure 3.7: The conceptual framework of the knowledge, attitude, and perceptions of dental patients regarding the effects of smoking and their expectations concerning the role of dentists in smoking cessation intervention. Adapted from Schwartz (1976); Badran (1995).

Table 3.7: Comparison of patients' knowledge on smoking-related conditions from different surveys

No.	Smoking effects	Rikard-Bell *et al.* (2003) N=1,160	Lung *et al.* (2005) N=1,071	Terrades *et al.* (2009) N=255	Sood *et al.* (2014) N=486	Present study N=375
1.	Oral health		78%	95%		
2.	Lung cancer	91%		98%	82%	√
3.	Heart disease	94%		92%	71%	√
4.	Oral cancer	74%	12%	85.5%	68%	√
5.	Tooth staining		27%	97%	81%	√
6.	Gum disease		7%	80%	59%	√
7.	Impaired wound healing	49%	1%	59%	21%	√
8.	Does not affect caries	13%	2%	10.5%	57%	√
9.	Hair loss				27%	
10.	Lines on the skin				35%	
11.	Bad smell from the mouth		13%		90%	√
12.	Bad taste		2%		59%	√
13.	Mouth ulcer		2%			√
14.	Periodontal disease		6%			√

A comparison of patients' knowledge on smoking-related conditions from different surveys was tabulated (Table 3.7). Out of 14 items derived from previous studies, 11 of the most related items on smoking's effects on general and oral health were chosen and the questionnaire was modified accordingly. The questions on patients' perceptions regarding dentists providing smoking cessation counselling and smokers' attitudes towards smoking cessation counselling were adapted from Terrades *et al.* (2009) and Sood *et al.* (2014).

The final questionnaire was structured into four sections: patient demographics, tobacco usage (12 questions), knowledge of the effects of smoking on general and oral health (11 questions), perceptions of patients regarding dentists providing smoking cessation counselling (6 questions), and smokers' attitudes regarding smoking cessation counselling (8 questions). The questionnaire included a combination of categorical description, self-reporting, five-point Likert scales, and open-ended questions to gather information on the patients' demographic and smoking characteristics, their knowledge of the effects of smoking, and their expectations concerning the role of dentists in smoking cessation intervention (Appendix J).

The questionnaire was developed in English and was forward-backward translated to Bahasa Malaysia. A secondary school English teacher, a dental specialist, and a senior dental nurse translated the questionnaire from English to Bahasa Malaysia, and two retired lecturers from a teacher's training college and a dental specialist did a backward translation from Bahasa Malaysia to English. The backward-translation English version was then compared to the original English version to check their semantic equivalence. The finalised version of the questionnaire was based on a consensus agreement by the above experts.

Three dental specialists checked the validity of the content. Statements were clear, easy to understand, and in the logical order. The questionnaire was then pretested on 50 dental patients attending dental check-ups and appointments at the Faculty of Dentistry, UKM, to assess its face validity. Only one statement was not clearly understood by one patient. It was "My dentist should provide oral care, nothing more." The sentence was restructured based on the pilot study, and the reliability test of Cronbach's alpha was 0.749.

3.4.3 Study Population

This study was conducted on dental patients aged 15–65 years who were Malaysian citizens, able to read and write Bahasa Malaysia, and visited the selected private dental clinics in Kedah or the government dental clinics in Negeri Sembilan. Only these two states, Kedah and Negeri Sembilan, received permission from the Ministry of Health's Oral Health Division, allowing us to conduct the survey.

3.4.4 Sample Size

Sample size calculation was based on the following formula (Raosoft, 2011):

The sample size n and margin of error E are given by

$$x = Z(c/100)2r\,(100-r)$$

$$n = N\,x/\,((N-1)\,E2 + x)$$

$$E = \mathrm{Sqrt}\,[(N - n)\,x/n\,(N-1)]$$

where N is the population size, r is the fraction of responses that we are interested in, and $Z(c/100)$ is the critical value of the confidence level c.

In order to determine n, a desired margin of error, e = 5%, and a desired level of confidence, z= 95%, were required. Applying the above formula, in order to generalize the findings to the Malaysian population, it was necessary to have 384 dental patients (based on a Malaysian population of nearly 30 million as of July 2011).

3.4.5 Data Collection

The two private clinics involved were in Sungai Petani (urban) and Pendang (rural) in Kedah. The government clinics involved were Klinik Pergigian Jalan Rasah in Seremban (urban) and Klinik Pergigian Linggi (rural) in Linggi, Port Dickson (Figure 3.8). A dental officer from each clinic was identified to assist in the distribution and collection of the questionnaire. The principal investigator briefed all the dental officers on the procedures before conducting the survey.

A self-administered questionnaire with a cover letter was given to participants selected through convenience sampling from a list of patients registered to be treated on that day (Appendix J). All eligible patients who met the inclusion criteria were invited to participate in the study. The respondents were all ensured that the purpose of the survey was to enhance dental knowledge and to improve the future treatment of dental patients who sought to quit smoking. The anonymity and confidentiality of their responses were ensured. Tokens of appreciation in the forms of toothpaste and mouth rinse were given to the respondents after they had answered the questionnaire completely.

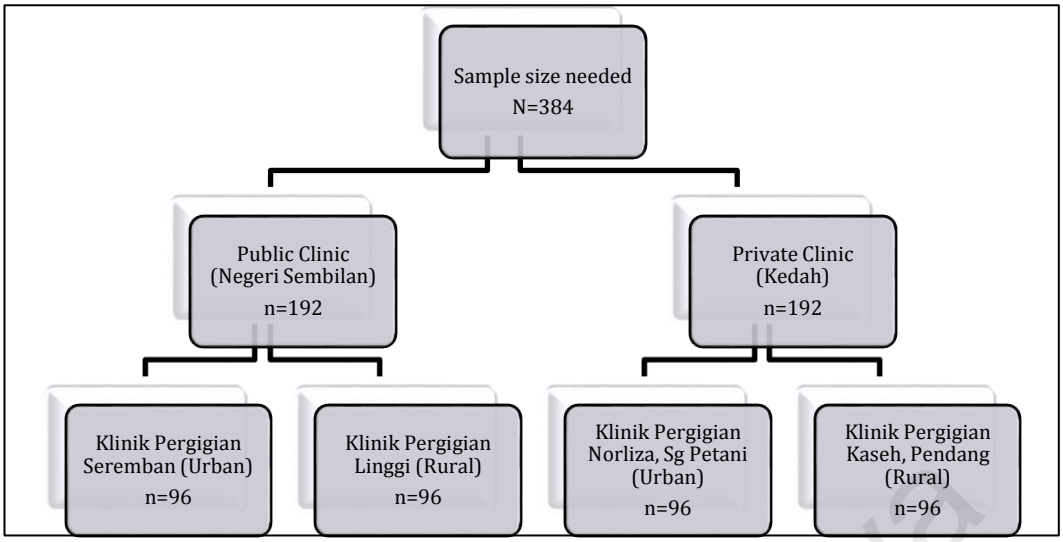


Figure 3.8: Flow chart of the data collection procedure

3.4.6 Data Entry and Analysis

Data collected were entered and analysed using Statistical Package for the Social Science (SPSS) version 22.0 software (SPSS Inc., Chicago, IL, USA). Data cleaning was carried out prior to data analysis. This process was undertaken to identify any inconsistencies and outliers that may have been introduced during data entry. A frequency table or cross-tabulation table was produced for responses to each question. A similar process was undertaken for demographic variables. Each question was reviewed separately and scanned. Any obvious gaps in the data or impossible answers were corrected and recorded.

Frequencies and percentages were used for categorical data, while mean and standard deviations were used for continuous data in this study. Depending on the normality of the continuous data, either the Mann-Whitney U-test or the independent t-test was used to compare two continuous data sets. The chi-square test was carried out to determine the association between the smoking status, knowledge, and perceptions of the subjects. A p-value of < 0.05 was considered statistically significant.

3.5 PART 2 (b): Survey of Dentists

The report of this survey conformed to the STROBE guidelines (Von Elm *et al.*, 2007).

3.5.1 Objectives

The objectives of this study were as follows:

1. To investigate the dentists' motivation for, capabilities in, and opportunities for smoking cessation intervention;

2. To identify the barriers to implementing smoking cessation interventions in dental practice.

3.5.2 Study Design

This was a descriptive cross-sectional study that employed a self-administered questionnaire.

3.5.2.1 Development of the questionnaire

The study used a 35-item Theoretical Domain Questionnaire (TDQ) based on key theoretical domains that were relevant to the implementation behaviours of healthcare providers (Amemori *et al.*, 2011). There were 10 theoretical domains in the questionnaire; which included (1) professional role and identity; (2) emotions; (3) motivations and goals; (4) social influences; (5) beliefs about consequences; (6) knowledge; (7) skills; (8) beliefs about capabilities; (9) memory, attention, and decision process; and (10) environmental context and resources. From these 10 domains, three factors were developed to identify barriers and provide relevant explanations for the difficulties implementing an evidence-based guideline (Figure 3.9). The three factors

were the motivations, capabilities, and opportunities of dentists in smoking cessation counselling. In this survey, the three factors became the dependent variables. The independent variables were the sociodemographic characteristics of the dentists (Figure 3.9).

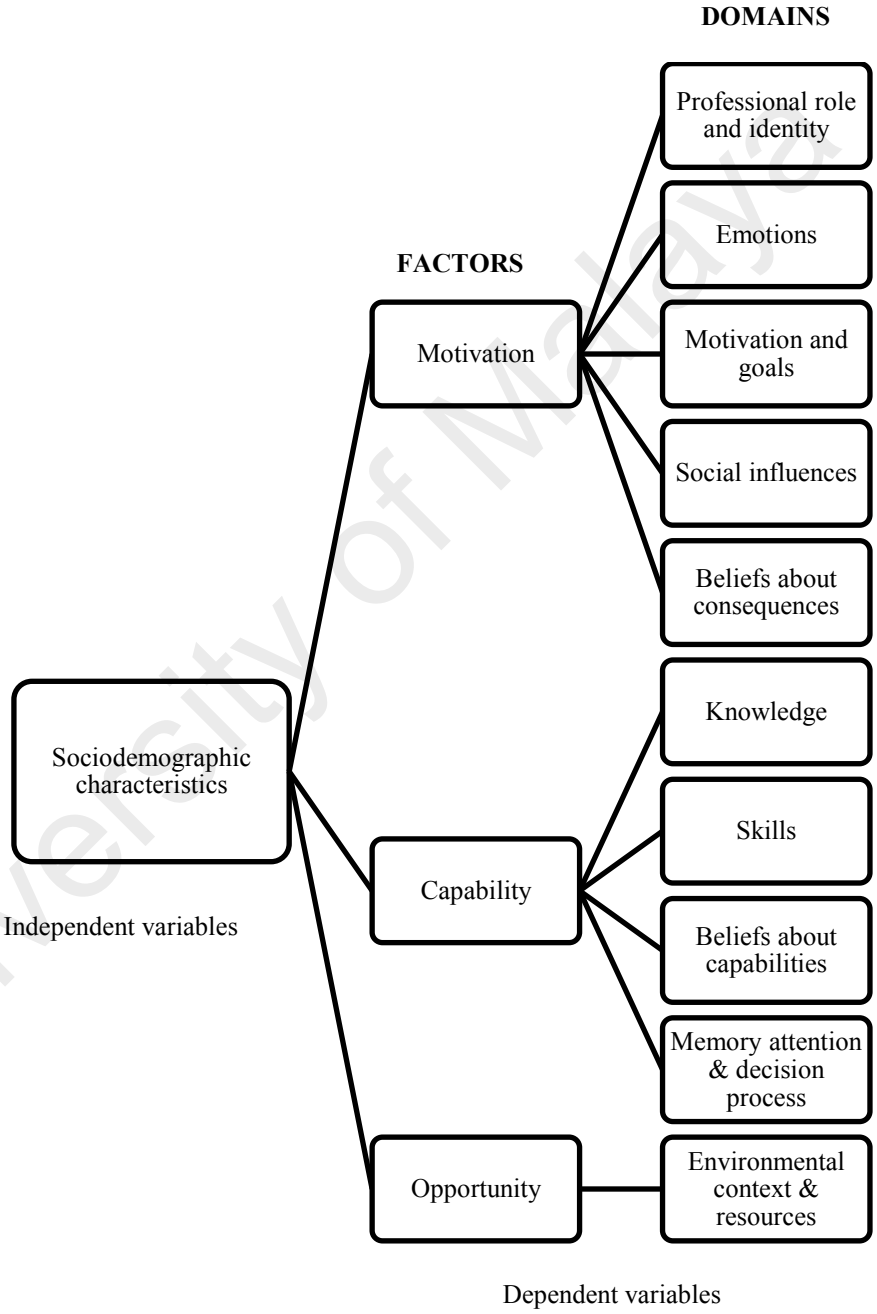


Figure 3.9: The Conceptual Framework: The 3 factors extracted from the 10 domains in the TDQ
Adapted from Amemori *et al.* (2011)

There were 11 sections in the questionnaire. The first section concerned the subject's personal details (age, gender, ethnicity, marital status, years of practice, main place of practice, dental specialty, and smoking status). The remaining sections of the questionnaire covered the following 10 domains (two to six items per domain): knowledge; skills; professional role and identity; beliefs about capabilities; beliefs about consequences; motivation and goals; memory, attention, and decision processes; environmental context and resources; social influences; and emotion.

The five-point Likert scale (the standard agree-disagree ordinal categories response) was used as the response scale for each item from the 10 domains of the TDQ (Appendix K). The questionnaire was in English and no translation was necessary as most dentists in Malaysia were trained in dental schools where English was the main language of instruction.

Three dental specialists, of whom two were from an academic institution and one was from a private hospital, addressed the face validity of the questionnaire. "Face validity" refers to investigators' subjective assessments of the presentation and relevance of the questionnaire. Several questions were of concern but the associated issues were very minor and did not change the meaning of the questions or affect the subjects' responses. Thus, no changes were made.

The questionnaire was later pretested among dentists in Malacca (n=20) during a smoking cessation workshop that the Malacca Dental Health Department in the Ministry of Health Malaysia organized. These dentists were later excluded from the main study. Pretesting revealed that they understood and received the questionnaire well. Thus, no changes were necessary. Internal consistency was measured using the Cronbach's alpha index in SPSS. The respondents' responses to negatively scaled questionnaires were reverse scaled. Cronbach's alpha for the 35-item TDQ questionnaire was 0.615.

3.5.3 Study Population

The target population included all dentists (private and public) in Malaysia who were registered with the Malaysian Dental Council in the year 2014. A systematic, random selection of the subject was done through the Dental Practitioner Management Information System (DPMIS) (Malaysian Dental Council, 2014). The first subject was determined by the tenth dentist on the first page of the list. Next, every tenth dentist from the list was selected as a subject.

3.5.4 Sample Size

The sample size calculation was based on the following formula (Raosoft, 2010):
The sample size *n* and margin of error *E* are given by,

x = Z(c/100)2r (100-r)

n = N x/ ((N-1) E2 + x)

E = Sqrt [(N - n) x/n (N-1)]

Reference: www.raosoft.com/samplesize.html (sample size calculator)

N is the population size, *r* is the fraction of responses that we are interested in, and *Z*(*c*/100) is the critical value for the confidence level *c*. In order to determine *n*, the following were required: a desired margin of error, e = 5%, and a desired level of confidence, z= 95%. The size of the dentist population (2012) was N = 4,253 (public n = 2,452), (private n = 1,801) (Oral Health Division, 2012). Therefore, from the sample size calculator, the minimum sample size needed was, *n* = 353 dentists (95% CI).

3.5.5 Data Collection

The questionnaires with introductory descriptions of the study, invitation letters for participation in the study, and reply paid envelopes were posted to the working addresses (clinics/hospitals) of all selected dentists from March–August 2014. The first

reminder was done via telephone calls after two weeks. Only lost or unreached questionnaires were reposted. A second reminder was done via telephone call again two weeks after the first reminder.

3.5.6 Data Entry and Analysis

Data collected were entered and analysed using SPSS version 22.0 software. Data cleaning was carried out after all variable and questionnaire responses had been entered. This process was undertaken to identify any inconsistencies and outliers in the data that may have been introduced during data entry. A frequency table or cross-tabulation table was produced for responses to each question. Moreover, a similar process was undertaken for demographic variables. Each question was reviewed separately and scanned. Any obvious gaps in the data or impossible answers were corrected and recorded.

In data analysis and reporting, frequencies and percentages were used for categorical data, while mean and standard deviations were used for continuous data. Chi-square analyses were used for descriptive analysis, and the Mann-Whitney U-test was used to compare two independent conditions for non-parametric data. The independent t-test was used to compare two independent conditions for parametric data. P value < 0.05 was considered statistically significant.

3.6 Summary

This chapter has introduced and discussed in detail the methodology used for Part 1 and Part 2 of the study. The clinical trial has explored extensively the possibility of two different methods of smoking cessation intervention (5A's & BA) to be conducted by dentists in a dental setting. The 2 questionnaire surveys on the views of dental patients and dentists in this study have been carefully planned, developed, implemented, and data collected.

The following chapter, Chapter 4 - Results, discusses in detail the findings of all two data collection phases; clinical trial, and questionnaire surveys.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter reports the results for Part 1 and Part 2 of this research study. Part 1 is the randomised controlled trial. Part 2 consists of the two surveys: a) Survey on Dental Patients; b) Survey on Dentists.

4.2 Part 1: Randomised Control Trial (RCT)

4.2.1 Objective

The objective of this study was to assess the effectiveness of the 5A's model of smoking cessation intervention (5A's) with the brief advice (BA).

4.2.2 Enrolment of Dental Public Health (DPH) specialists and dental patients

Out of 14 DPH specialists eligible to participate in this trial, only 6 met the inclusion criteria. These DPH specialists were later recruited and randomized equally into the 5A's model intervention group and the BA group. Later, they were trained according to their allocated intervention during the SCIDD training course (Figure 4.1). There were 193 patients participated for the 5A's group and 207 patients for the BA group. Retention rates at 1-month follow-up were 65.3% for 5A's group and 79.2% for BA group. Retention rates at 3-month follow-up were 53.9% for 5A's group and 71.5% for BA group. Retention rates at 6-month follow-up were 33.2% for 5A's group and 38.2% for BA group. All patients who were lost to follow-up were mostly not contactable through telephone call either for the 1-month, 3-months follow-up or to make an appointment for the 6-months follow-up in the clinic. All patients recruited from both groups were included in the intention-to-treat analysis for all follow-ups (Figure 4.1).

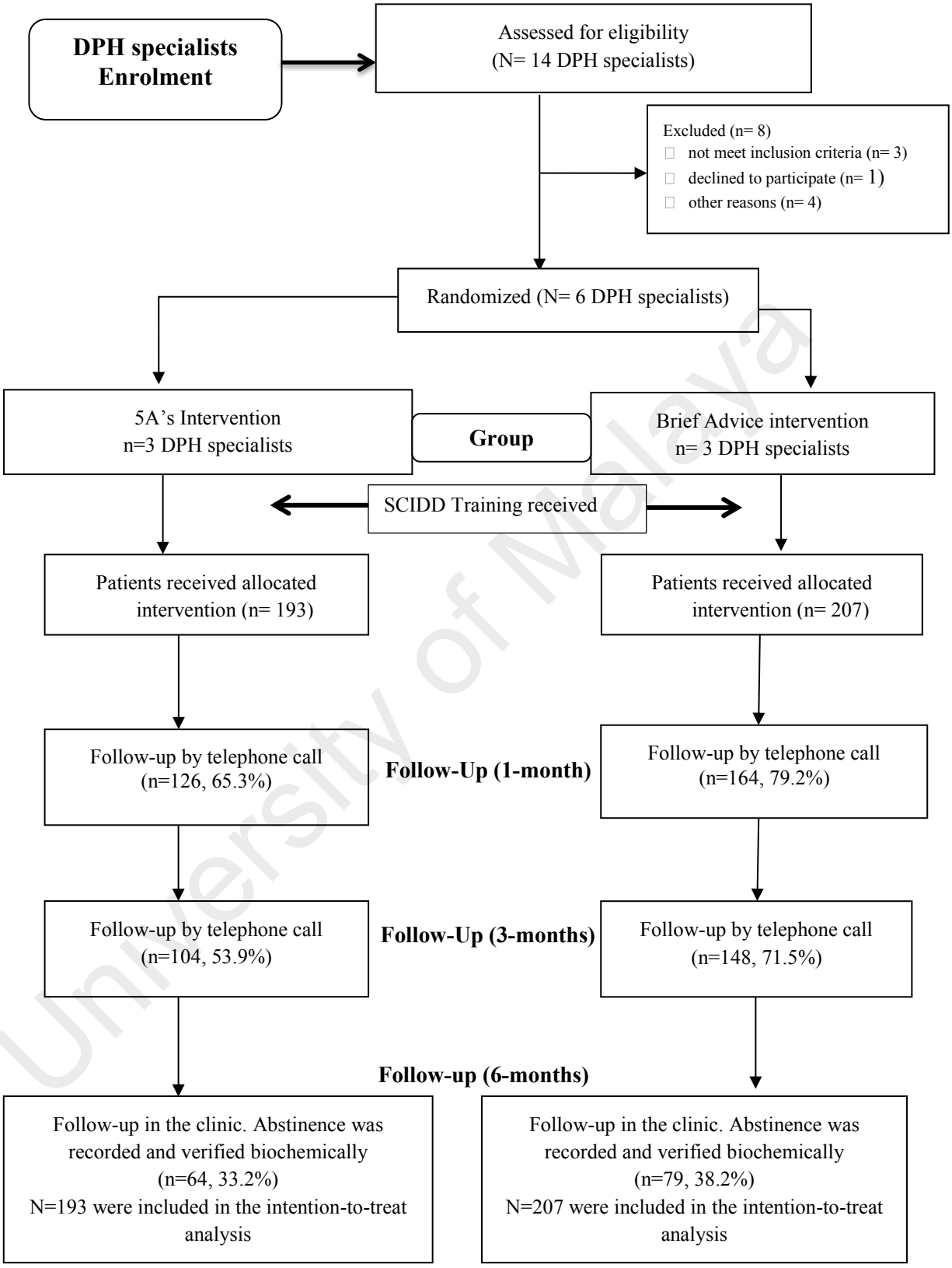


Figure 4.1: Flow Diagram of the Dental Public Health Specialists and participants in the 5A's model group and the BA group
Adapted from CONSORT (2010)

4.2.3 Social demographic characteristics of the participants

Table 4.1 shows the social characteristics of participants for 5A's and BA smoking cessation interventions. Frequencies and percentages were used for all categorical data. Means and standard deviations were used for all continuous data.

The mean age for participants in the 5A's group was 26.07 ±12.12 years old. The mean age for participants in the BA group was 35.38 ±10.24 years old. The Kolmogorov-Smirnov test (K-S) showed that the data was not normally distributed. Therefore, a non-parametric Mann-Whitney U test was used. The Mann-Whitney U test showed that there was a significant difference in the age of participants between the 5A's and the BA interventions (p<0.001). The age range of smokers in the 5A's group was mostly from 15 to 19 years old age group (n=88, 46%), while for the BA group was mostly from 25 to 29 years old age group (n=51, 25%).

Most participants in both interventions were males (5A's n=190, 98.4%; BA n=207, 100%), Malays (5A's n=178, 92.2%; BA n=180, 87%) and have the highest level of education of secondary school (5A's n=140, 72.5%; BA n=114, 55.1%). Chi squared test showed a significant difference in the participants' level of education (p<0.001). A significant difference (p<0.001) was similarly observed in terms of marital status whereby; most participants in the 5A's group were single (n=117, 60.7%), while most participants the BA group were married (n=153, 73.9%).

Table 4.1: Social characteristics of participants enrolled for 5A's model and BA smoking cessation interventions

Characteristics	Types of smoking cessation intervention		
	5As (N=193) n (%)	**BA (N=207) N (%)**	***p*-value**
Age (years) Mean ±SD	26.07 ± 12.12	35.38 ± 10.24	$p<0.001$[a]
SE	0.87	0.71	
Range (15-19)	88 (46)	3 (2)	
(20-24)	22 (11.4)	18 (9)	
(25-29)	21 (11)	51 (25)	
(30-34)	23 (12)	46 (22.2)	
(35-44)	20 (10.4)	43 (21)	
(45-54)	11 (6)	35 (17)	
(55-64)	8 (4)	10 (5)	
Gender:			
Male	190 (98.4)	207 (100)	0.230[b]
Female	3 (1.6)	0 (0)	
Ethnic:			
Malay	178 (92.2)	180 (87)	0.009 [b]
Chinese/Others	2 (1)	15 (7.2)	
Indian	13 (6.74)	12 (5.8)	
Marital status:			
Single	117 (60.7)	53 (25.6)	$p<0.001$ [b]
Married	76 (39.4)	153 (73.9)	
Highest level of education:			
Primary school	3 (1.6)	22 (10.6)	$p<0.001$ [b]
Secondary school	140 (72.5)	114 (55.1)	
Certificate/Diploma	32 (16.6)	51 (24.6)	
Degree	16 (8.3)	6 (2.9)	

[a] Mann-Whitney U test ; [b] χ^2 test

4.2.4 Smoking characteristics and nicotine dependency

Table 4.2 describes the smoking characteristics and nicotine dependence of participants in the 5A's and BA smoking cessation interventions. Frequencies and percentages were used for all categorical data. Means and standard deviations were used for all continuous data.

The mean age of participants started smoking were significantly younger in the 5A's group (14.92± 3.11 years old) compared to participants in the BA group (17.71 ±4.02 years old). The mean duration of being a smoker was significantly shorter for 5A's (11.35 ±10.23 years) compared to BA (17.40 ±9.94 years).

Table 4.2: Smoking characteristics and nicotine dependence of participants in 5A's and BA smoking cessation interventions

Characteristics	Types of smoking cessation intervention		*p*-value
	5A's (N=193) n (%)	**BA (N=207) n (%)**	
Age started smoking (years)			
Mean ±SD	14.92 ± 3.11	17.71 ± 4.02	$p<0.001$ [a]
SE	0.22	0.28	
Duration of smoking (years)			
Mean ±SD	11.35 ± 10.23	17.40 ± 9.94	$p<0.001$ [a]
SE	0.74	0.69	
No. of cigarettes per day (sticks)			
Mean ±SD	9.94 ± 8.3	11.60 ± 7.86	0.042 [a]
SE	0.60	0.55	
Money spent per month (RM)			
Mean ±SD	147.09 ± 121.96	169.43 ± 129.68	0.085 [a]
SE	8.92	9.38	
Tried quitting before:			
Yes	165 (85.5)	173 (83.6)	0.348 [b]
No	28 (14.5)	34 (16.4)	
If Yes, how many times?			0.161 [a]
Mean ±SD	2.73 ± 3.07	2.35 ± 2.10	
SE	0.23	0.15	
[c]Level of nicotine addiction:			
Very low dependence	107 (55.4)	129 (62.3)	0.404 [b]
Low dependence	46 (23.8)	50 (24.2)	
Moderate dependence	18 (9.3)	11 (5.3)	
High dependence	15 (7.8)	17 (8.2)	
[d]Level of CO in lungs:			
Low (1-6ppm)	38 (19.7)	17 (8.2)	0.001 [b]
Moderate (7-10ppm)	47 (24.4)	41 (19.8)	
High (11ppm or more)	108 (56.0)	149 (72.0)	

[a] Mann-Whitney U test; [b] χ^2 test

[c] Fagerström test for nicotine dependence (FTND) ; [d] CO breath analyser

All participants enrolled for both interventions were mostly cigarette smokers. The mean number of cigarettes taken by the smokers per day was 9.94 ± 8.3 sticks for 5A's while for BA was 11.60 ±7.86 sticks. The difference was statistically significant (p=0.042). The participants in the BA group spent more money on cigarettes per month, which was 169.43 ± 129.68 MYR compared to 5A's group (147.09 ± 121.96 MYR). However, the difference was not statistically significant (p=0.085). The proportion of participants with high level of CO in lungs was significantly higher in the BA group than the 5A's group (Table 4.2).

4.2.5 Stage of change at baseline

Table 4.3 shows the stage of change of participants at baseline by both types of smoking cessation interventions. Most participants were at the preparation stage of smoking cessation for both interventions (5A's n=108, 56%; BA n= 145, 70%). There was a statistically significant difference between the smoking cessation interventions and stages of change at baseline (p=0.001).

Table 4.3: Stage of change at baseline by types of smoking cessation intervention

Stage of change at baseline	Types of smoking cessation intervention		χ^2 test *p*-value
	5A's (N=193) n (%)	BA (N=207) n (%)	
Precontemplation	30 (15.6)	10 (4.8)	0.001
Contemplation	55 (28.5)	52 (25.1)	
Preparation	108 (56.0)	145 (70.0)	

4.2.6 Abstinence at 1-month, 3-months and 6-months follow-up

Table 4.4 shows the participants abstinence rate at 1-month, 3-months and 6-months follow-up. Chi-squared test showed a statistically significant difference between the smoking cessation interventions and abstinence of participants at 1-months (p=0.006), 3-months (p=0.015) and 6-months of follow-up (p<0.001). The rate of abstinence increased at 1-month and 3-months follow-up for both interventions. However, quitting decreased by 1.1% for 5A's group and by 4.8% for BA group at 6-months follow-up. Only 34 (17.6%) participants in 5A's group quit smoking compared to 11 (5.3%) participants in BA group at 6-months follow-up.

The percentage of participants with no abstinence for both interventions was seen decreasing during the 3-months follow-up. However, at 6-months follow-up, the trend increases slightly for both interventions. About 94.5% (n=196) of participants in the BA group did not quit smoking compared to 82.4% (n=159) of participants in the 5A's group.

Table 4.4: Abstinence at 1-month, 3-months and 6-months follow-up for BA and 5A's model of smoking cessation interventions

Interventions	**Abstinence from smoking**					
	1-month n (%)		3-months **n (%)**		6-months **n (%)**	
	Quit	**No quit**	**Quit**	**No quit**	**Quit**	**No quit**
5A's (N=193)	32 (16.6)	161 (83.4)	36 (18.7)	157 (81.3)	34 (17.6)	159 (82.4)
BA (N=207)	16 (7.7)	191 (92.3)	21 (10.1)	186 (89.9)	11 (5.3)	196 (94.5)
$\chi 2$ p value	0.006		0.015		<0.001	

Table 4.5 categorizes smokers according to the level of carbon monoxide breath analysis. Sixty-four participants from the 5A's group and 79 participants from the BA group came for follow-up at 6-months in the dental clinic. Therefore, only these participants were able to conduct the biochemical validation test for abstinence. A statistically significance was seen for each intervention between the type of smokers and quitting ($p < .0001$). A point of more than 11 ppm of CO is considered as a smoker, 7-10 ppm as a light smoker and 0-6 ppm as a non-smoker (Bedfont Scientific Ltd., 2012). It was observed that participants who quitted had a low CO level in their lungs (0-6 ppm).

Table 4.5: Level of carbon monoxide (ppm) at 6-months follow-up for BA and 5A's model of smoking cessation interventions

Interventions		**Level of carbon monoxide (ppm)**				***P*-value**
		0-6 ppm (Non-smoker) n (%)	**7-10 ppm (Light smoker) n (%)**	**>11 ppm (Smoker) n (%)**	**Total n**	
5A's (n=64)	Quit	29 (51.8)	4 (7.1)	0 (0)	33	<0.001
	No quit	9 (16.1)	12 (21.4)	10 (18.0)	23	
BA (n=79)	Quit	8 (10.1)	3 (3.8)	0 (0)	11	<0.001
	No quit	9 (11.4)	18 (22.8)	41(51.9)	68	

Table 4.6 shows the different methods of abstinence by participants who quitted at 1-month, 3-months and 6-months follow-ups. During the first follow-up (1-month), all of participants in the action stage of both group quit smoking cold turkey. There was an increasing trend of quitting cold turkey during the 3-months follow-ups for both interventions with one participants quit by reducing their cigarette gradually. However, the trend decreased at 6-months follow-up for both interventions.

Table 4.6: Methods of abstinence at 1-month, 3-months and 6-months follow-up for BA and 5A's model of smoking cessation interventions (action stage only)

Follow-up	Methods of Abstinence	5A's n (%)	BA n (%)
1-month	Cold turkey	32 (100)	16 (100)
	Reduce gradually	0 (0)	0 (0)
	Total	32 (100)	16 (100)
3-months	Cold turkey	36 (100)	21 (95.5)
	Reduce gradually	0 (0)	1 (4.5)
	Total	36 (100)	22 (100)
6-months	Cold turkey	33 (97.1)	8 (72.7)
	Reduce gradually	1 (2.9)	3 (27.3)
	Total	34 (100)	11 (100)

4.2.7 Predictors of abstinence

Table 4.7 shows the predictors of quitting at 6-months follow-up using multivariable logistic regression. A multivariable logistic regression analysis using abstinence at 6-months follow-up as the dichotomous criterion variable (code 0=no quit; code1= quit) and type of smoking cessation interventions (5A's and BA) as predictor variable were carried out. The OR (95% CI) for those who quit in the 5A's group was 3.81(1.871-7.76) higher compared to BA. There was a statistically significant difference between the smoking cessation interventions and quitting (p<0.001). Therefore, the types of intervention did predict quitting at 6 months follow-up as shown in model 1 in Table 4.7.

Table 4.7: Predictors of abstinence at 6-months follow-up using multivariable logistic regression

Variables	Model 1 OR (95% CI)	*p*-value	Model 2 OR (95% CI)	*p*-value	Model 3 OR (95% CI)	*p*-value
Smoking cessation interventions						
BA(reference)	3.81(1.871-7.76)	0.000	2.11(0.917-4.889)	0.079	1.90(0.652-5.547)	0.240
5A's						
Age			1.044(0.989-1.103)	0.117	1.126(0.846-1.499)	0.416
Ethnic						
Malay (reference)			0.872(0.277-2.748)	0.815	0.550 (0.109-2.780)	0.470
Others						
Marital status						
Single (reference)			0.583(0.198-1.713)	0.326	0.407(0.106-1.569)	0.192
Married						
Highest level of education						
Primary/SecondarySchool (reference)			0.856(0.378-1.935)	0.708	1.240(0.422-3.647)	0.696
Diploma/Degree						
Age started smoking					0.925(0.674-1.268)	0.627
Duration of smoking					0.892(0.672-1.185)	0.430
No. of cigarettes taken per day					1.053(0.952-1.165)	0.318
Money spent on cigarette per month					1.006(1.0-1.013)	0.055
Previous attempt to quit						
Yes (reference)					0.974(0.358-2.651)	0.959
No						
Level of nicotine addiction (FTND)						
Low (reference)					2.583(0.569-11.721)	0.219
Mod/High						
Level of CO in lungs						
Low/Moderate (reference)					0.326(0.139-0.766)	0.010
High						

When the social demographic variables (age, ethnic, marital status, and highest level of education) were controlled, the OR (95%CI) for the 5A's was 2.11(0.917-4.889) higher compared to BA. Nonetheless, there was no significant difference between the smoking cessation interventions and quitting after controlling age, ethnic, marital status, and highest level of education as shown in Model 2 (Table 4.7). Finally, the smoking characteristics of the participants (age started smoking, duration of smoking, number of cigarettes taken per day, money spent per month, tried quitting before, FTND and level

of CO in lungs) were added to create the third model. In this model, the OR (95%CI) for the 5A's was 1.90 (0.652-5.547) higher compared to BA. Again, there was no significant difference found between the smoking cessation interventions and quitting after controlling social demographic variables and smoking characteristics of the participants (Table 4.7). Only the level of CO in lungs was significant.

4.2.8 Changes in motivation stage

a) Behaviour change at 1-month, 3-months and 6-months follow-ups for 5A's and BA smoking cessation interventions

Table 4.8 shows the distribution of stage of change at different time points in both types of interventions. An increasing number of smokers were at the preparation stage in both interventions at 6-months follow-up (5A's n=148, 76.7%; BA n= 183, 88.4%) compared to baseline.

Table 4.8: Distribution of Stage of Change at different time points in both types of interventions

Interventions	Time points	Precontemplation stage	Contemplation stage	Preparation stage	Action stage
			n (%)		
5A's n=193	Baseline	30 (15.6)	55 (28.5)	108 (56)	0 (0)
	1 month	11(5.7)	12(6.2)	138(71.5)	32(16.6)
	3-months	7(3.6)	9(4.7)	141(73.1)	36(18.7)
	6-months	6(3.1)	5(2.6)	148(76.7)	34(17.6)
BA N=207	Baseline	10(48)	52(25.1)	145(70)	0(0)
	1-month	18(8.7)	15(7.2)	158(76.3)	16(7.7)
	3-months	16(7.7)	16(7.7)	154(74.4)	21(10.1)
	6-6-months	0(0)	13(6.3)	183(88.4)	11(5.3)

Table 4.9 shows the distribution of behaviour change at 1-month, 3-months and 6-months follow-ups. In this study, a positive change means that the participants have moved from to a higher level of change. A negative change means that the participants fall to the lower level of change. While no change means that the participants maintain at the same stage of change. There was a statistically significant difference between the smoking cessation interventions and behaviour change of participants after 1-month, 3-months and 6-months of follow-up (p<0.001). Overall, there was higher positive change in the 5A's group compared to BA at 1-month, 3-months and 6 months follow-up.

Table 4.9: Behaviour change at 1-month, 3-months and 6-months follow-ups for BA and 5A's smoking cessation interventions

Interventions	Behaviour change								
	1-month n (%)			3-months n (%)			6-months n (%)		
	+ve change	No changes	-ve change	+ve change	No changes	-ve change	+ve change	No changes	-ve change
5A's (N=193)	97 (50.3)	82 (42.5)	14 (7.3)	102 (52.8)	82 (42.5)	9 (4.7)	108 (56)	78 (40.4)	7 (3.6)
BA (N=207)	68 (32.9)	111 (53.6)	28 (13.5)	71 (34.3)	111 (53.6)	25 (12.1)	66 (31.9)	136 (65.7)	5 (2.4)
p-value		0.001			<0.001			<0.001	

b) Distribution pattern of Stage of Change from Baseline, at 1-Month Follow-Up

The pattern of stages of change at baseline with 1-month follow-up for both types of smoking cessation interventions was shown in Table 4.10. Chi-squared test showed a significant difference only for preparation stage at baseline between the smoking cessation interventions and stages of change (p=0.047), where 22 (20.4%) participants in the 5As group had moved from preparation to action as compared to only 9% in the BA group Nevertheless, most participants remain in the preparation stage at 1-month follow-up (5A's n=138, 71.5%; BA n=158, 76.3%).

Table 4.10: Distribution pattern of stage of change from baseline to 1-month follow-up for BA and 5A's of smoking cessation interventions

Stage of change at baseline	Stage of Change at 1-months Follow-up	Types of smoking cessation intervention		χ2 *p*-value
		BA (N=207) n (%)	5As (N=193) n (%)	
Precontemplation	Precontemplation	2 (20.0)	3 (10.0)	0.255
	Contemplation	0 (0.0)	1 (3.3)	
	Preparation	8 (80.0)	18 (60.0)	
	Action	0 (0.0)	8 (26.7)	
	Total	10 (100)	30 (100)	
Contemplation	Precontemplation	2 (3.8)	2 (3.6)	0.882
	Contemplation	3 (5.8)	5 (9.1)	
	Preparation	44 (84.6)	46 (83.6)	
	Action	3 (5.8)	2 (3.6)	
	Total	52 (100)	55 (100)	
Preparation	Precontemplation	14 (9.7)	6 (5.6)	0.047
	Contemplation	12 (8.3)	6 (5.6)	
	Preparation	106 (73.1)	74 (68.5)	
	Action	13 (9.0)	22 (20.4)	
	Total	145 (100)	108 (100)	

c) Distribution pattern of Stage of Change from Baseline to 3-Months Follow-Up

Table 4.11 shows the pattern of behaviour change from baseline and at 3-months follow-up for both types of smoking cessation interventions. Chi-squared test showed, a significant difference between the smoking cessation interventions and stages of change at preparation stage (p=0.011) at baseline. Higher proportion of participants in the 5A's group (24%) had moved to action stage compared to BA (12%). However, during the 3-months follow-up, many participants stayed in the preparation stage (5A's n= 141, 73.1%; BA n=154, 74.4%).

Table 4.11: Distribution pattern of stage of change from baseline to 3-months follow-up for BA and 5A's of smoking cessation interventions

Stage of Change at Baseline	**Change at** 3-months **Follow-up (2nd follow-up)**	**Types of smoking cessation intervention**		**χ2 *p*-value**
		BA (N=207) n (%)	**5As (N=193) n (%)**	
Precontemplation	Precontemplation	2 (20.0)	2 (6.7)	0.242
	Contemplation	0 (0)	1 (3.3)	
	Preparation	8 (80.0)	20 (66.7)	
	Action	0 (0)	7 (23.3)	
	Total	10 (100)	30 (100)	
Contemplation	Precontemplation	2 (3.9)	3 (5.5)	0.954
	Contemplation	5 (9.6)	4 (7.3)	
	Preparation	42 (80.8)	45 (81.8)	
	Action	3 (5.8)	3 (5.5)	
	Total	52 (100)	55 (100)	
Preparation	Precontemplation	12 (8.3)	2 (1.9)	0.011
	Contemplation	11 (7.6)	4 (3.7)	
	Preparation	104 (71.7)	76 (70.4)	
	Action	18 (12.4)	26 (24.1)	
	Total	145 (100)	108 (100)	

d) Distribution pattern of Stage of Change from Baseline to 6-Months Follow-Up

Table 4.12 displays the pattern of behaviour change (stages of change) from baseline and at 6-months follow-up for both types of smoking cessation interventions. A statistically significant difference between the smoking cessation interventions and stages of change at preparation stage (p=0.011) was seen at baseline. Higher proportion of participants in the 5As group (25.9%) had moved to action stage compared to BA (6.9%). Yet, there were more participants in the preparation stage at 6-months (5A's n=148, 76.7%; BA n=183, 88.4%) compared to baseline (5A's n=108, 56%; BA n=145, 70%).

Table 4.12: Distribution pattern of stage of change from baseline to 6-months follow-up for BA and 5A's of smoking cessation interventions

Stage of Change at Baseline	**Change at** 6-months **Follow-up (3rd follow-up)**	**Types of smoking cessation intervention**		**χ2 *p*-value**
		BA (N=207) n (%)	**5As (N=193) n (%)**	
Precontemplation	Precontemplation	0 (0)	1 (3.3)	0.061
	Contemplation	2 (20.0)	0 (0)	
	Preparation	8 (80.0)	26 (86.7)	
	Action	0 (0)	3 (10)	
	Total	10 (100)	30 (100)	
Contemplation	Precontemplation	0(0)	3 (5.5)	0.113
	Contemplation	6 (11.5)	2 (3.6)	
	Preparation	45 (86.5)	47 (85.5)	
	Action	1(1.9)	3 (5.5)	
	Total	52 (100)	55 (100)	
Preparation	Precontemplation	0 (0)	2 (1.9)	<0.001
	Contemplation	5(3.4)	3 (2.8)	
	Preparation	130 (89.7)	75 (69.4)	
	Action	10 (6.9)	28 (25.9)	
	Total	145 (100)	108 (100)	
Total	Precontemplation	0 (0)	6 (3.1)	<0.001
	Contemplation	13 (6.3)	5 (2.6)	
	Preparation	183 (88.4)	148 (76.7)	
	Action	11 (5.3)	34 (17.6)	
	Total	207 (100)	193 (100)	

e) Distribution pattern of Stage of Change from 1-month Follow-up to 3-Months Follow-Up

Table 4.13 shows the stage of change at 3-months follow-up for both types of smoking cessation interventions after the 1-month follow-up. An increasing number of participants moved to the action stage were seen at 3-months follow-up. A total of 21 participants (10.1%) from BA group and 36 participants (18.7%) from the 5A's group quit smoking (action stage) at 3-months follow-up. Within the action stage, 14 participants from the BA group and 25 participants from the 5A's model group sustained abstinence for approximately in the last 2 months. Relapsed (from action stage moved to preparation stage) were seen more in the 5A's group (n=7, 21.9%) compared to BA group (n=2, 12.5%).

Table 4.13: Distribution pattern of stage of change from 1-month follow-up to 3-months follow-up for BA and 5A's of smoking cessation interventions

Stage of Change at 1-month follow-up (1st follow-up)	**Stage of Change at** 3-months **follow-up (2nd follow-up)**	**Types of smoking cessation intervention**		**$\chi 2$ *p*-value**
		BA (N=207) n (%)	**5As (N=193) n (%)**	
Precontemplation	Precontemplation	13 (72.2)	6 (54.5)	0.346
	Contemplation	0 (0)	1 (9.1)	
	Preparation	5 (27.8)	4 (36.4)	
	Total	18 (100)	11(100)	
Contemplation	Precontemplation	1 (6.7)	0 (0)	0.298
	Contemplation	11 (73.3)	6 (50)	
	Preparation	3 (20.0)	5 (41.7)	
	Action	0 (0)	1 (8.3)	
	Total	15 (100)	12 (100)	
Preparation	Precontemplation	2 (1.3)	1 (0.7)	0.542
	Contemplation	5 (3.2)	2 (1.4)	
	Preparation	144 (91.1)	125 (90.6)	
	Action	7 (4.4)	10 (7.2)	
	Total	158 (100)	138 (100)	
Action	Preparation	2 (12.5)	7 (21.9)	0.433
	Action	14 (87.5)	25 (78.1)	
	Total	16 (100)	32 (100)	

f) Distribution pattern of Stage of Change from 3-months Follow-up to 6-months Follow-up

Table 4.14 shows changes in stage of change at 6-months follow-up for both types of smoking cessation interventions after the 3-months follow-up. The chi-squared test showed that there was a significant difference between the smoking cessation interventions and all stages at 6-months follow-up (p<0.001). Significant differences were also seen for subjects at 2nd follow-up in the preparation stage (p=0.011) and the action stage (p=0.038). However, a drop in the number of participants was seen in the action stage at 6-months follow-up. A total of 11(5.3%) participants from BA group and 34 (17.6%) participants from the 5A's group quit smoking (action stage) at 6-months follow-up. Within the action stage, 6 (28.6%) participants from the BA group and 18 (50%) participants from the 5A's group sustained abstinence for approximately the last 3 months. Relapse (moved to preparation stage) was seen more in the 5A's group compared to BA group. Yet, there were more participants from the BA group reverted to contemplation stage and about 2 participants from the 5A's group reverted to precontemplation after initially were in the preparation stage.

Table 4.14: Distribution pattern of stage of change from 3-months follow-up to 6-months follow-up for BA and 5A's model of smoking cessation interventions

Stage of Change at 3-months follow-up (2nd follow-up)	Changes at 6-months follow-up (3rd follow-up)	Types of smoking cessation intervention		$\chi 2$ *p*-value
		BA (N=207) n (%)	5As (N=193) n (%)	
Precontemplation	Preparation	16 (100)	6 (85.7)	0.122
	Action	0 (0)	1 (14.3)	
	Total	16 (100)	7 (100)	
Contemplation	Contemplation	3 (18.8)	0 (0)	0.262
	Preparation	12 (75.0)	9 (100)	
	Action	1 (6.3)	0 (0)	
	Total	16 (100)	9 (100)	
Preparation	Precontemplation	0 (0)	2 (1.4)	0.011
	Contemplation	10 (6.5)	5 (3.5)	
	Preparation	140 (90.9)	119 (84.4)	
	Action	4 (2.6)	15 (10.6)	
	Total	154 (100)	141 (100)	
Action	Precontemplation	0 (0)	4 (11.1)	0.038
	Preparation	15 (71.4)	14 (38.9)	
	Action	6 (28.6)	18 (50.0)	
	Total	21 (100)	36 (100)	

Table 4.15: Distribution pattern of stage of change from 1-month follow-up to 6-month follow-up for BA and 5A's model of smoking cessation interventions

Stage of Change at 1-month follow-up (1st follow-up)	Change at 6-months follow-up (3rd follow-up)	Types of smoking cessation intervention		$\chi 2$ *p*-value
		BA (N=207) n (%)	5As (N=193) n (%)	
Precontemplation	Contemplation	1 (5.6)	1 (9.1)	0.390
	Preparation	17 (94.4)	9 (81.8)	
	Action	0 (0)	1 (9.1)	
	Total	18 (100)	11 (100)	
Contemplation	Contemplation	3 (20.0)	0 (0)	0.153
	Preparation	12 (80.0)	11 (91.7)	
	Action	0 (0)	1 (8.3)	
	Total	15 (100)	12 (100)	
Preparation	Precontemplation	0 (0)	3 (2.2)	0.01
	Contemplation	9 (5.7)	3 (2.2)	
	Preparation	145 (91.8)	114 (82.6)	
	Action	4 (2.5)	18 (13.0)	
	Total	158 (100)	138 (100)	
Action	Precontemplation	0 (0)	3 (9.4)	0.503
	Contemplation	0 (0)	1 (3.1)	
	Preparation	9 (56.3)	14 (43.8)	
	Action	7 (43.8)	14 (43.8)	
	Total	16 (100)	32 (100)	

g) Distribution pattern of Stage of Change from 6-months Follow-up to 1-month Follow-up

Table 4.15 displays the changes in stage of change at 6-months follow-up for Brief Advice and 5A's model of smoking cessation interventions after the 1-month follow-up visit. The chi-squared test showed that there was a significant difference between the smoking cessation interventions and stages of change only at preparation stage (p=0.01). A significant difference was also seen between the smoking cessation interventions and all stages of change at 6-months follow-up (p<0.001). Fourteen participants in the 5A's group sustained abstinence for at least 5months compared to 7 participants in the BA group. Out of 34 (17.6%) participants in the 5A's group who quitted at 6-months follow-up, 20 participants quit smoking after initially being in the

precontemplation/ contemplation or preparation group. Meanwhile, only 4 smokers from the BA group moved to action stage from initially were in the preparation stage at 1-month follow-up. More of quitters in the 5A's model group relapse at 6-months follow-up compared to the BA group. However, more participants in the BA group relapse to either precontemplation/contemplation stage after initially were in the preparation stage compared to 5A's group.

4.2.9 Smokers reasons to quit smoking

Table 4.16 describes the participants' main reason for quitting on their last attempt by 5A's model and brief advice smoking cessation interventions.

Table 4.16: Smokers main reason for quitting on their last attempt by types of smoking cessation interventions

Reasons for quitting	**Types of smoking cessation intervention**	
	5A's (N=165) n (%)	**BA (N=173) n (%)**
Addicted	1 (0.6)	0 (0)
Effects on Dental health	2 (1.2)	0 (0)
Desire to stop	17 (10.3)	36 (20.8)
Family	19 (11.5)	12 (6.9)
Financial problems	31 (18.8)	38 (22.0)
Friends	3 (1.8)	3 (1.7)
Effects on General health	74 (44.8)	63 (36.4)
Sports related activity	10 (6.1)	2 (1.2)
Work related reasons	0 (0)	4 (2.3)
Other reasons	8 (4.8)	15 (8.6)

This response was an open-ended question. About 165 (85.5%) participants in 5A's group and 173 (83.6%) participants in BA group had a quit attempt. Similar answers from the participants' response were group together according to themes. The two most quoted reasons for both interventions were effects on general health (5A's n=74, 44.8%; BA n= 63, 36.4%) and financial problems (5A's n=31, 18.8%; BA n=38, 22%).

4.2.10 Smokers' barriers to quitting smoking

Table 4.17 describes the participants' main possible barrier to quitting by types of smoking cessation interventions. The two main possible barriers were peer pressure (5A's n= 106, 54.9%; BA n= 57, 27.5%) and addiction (5A's n= 35, 18.1%; BA n= 34, 16.4%).

Table 4.17: Smokers main possible barrier to quitting by types of smoking cessation interventions

Barriers to quit	**Types of smoking cessation intervention**	
	5As (N=193) **n (%)**	**BA (N=207)** **n (%)**
Addiction	35 (18.1)	34 (16.4)
Work related	0 (0)	4 (1.9)
Bored	12 (6.2)	17 (8.2)
No willpower	13 (6.7)	0 (0)
Have money	3 (1.6)	1 (0.5)
Peer Pressure	106 (54.9)	57 (27.5)
Withdrawals	16 (8.3)	37 (17.9)
TOTAL*	185 (95.9)	150 (72.5)

*Total is not 100% due to missing values.

4.2.11 Smokers' oral health conditions at baseline

Table 4.18 shows the participants' oral health conditions checked and recorded at baseline by types of smoking cessation interventions.

Table 4.18: Smokers oral health conditions at baseline by types of smoking cessation interventions

Oral health conditions	Types of smoking cessation intervention	
	5As (N=193) n (%)	**BA (N=207) n (%)**
Teeth staining	106 (35.5)	184 (44.8)
Halitosis	91 (30.4)	151 (36.7)
Periodontal disease	85 (28.4)	72 (17.5)
Mucosal lesions	1 (0.3)	0 (0)
Dry mouth	15 (5.0)	0 (0)
Dental caries	1 (0.3)	4 (1.0)

The oral health conditions recorded were either a single condition or multiple conditions. Teeth staining were the highest oral health condition recorded for both interventions (5A's n= 106, 35.5%; BA n= 184, 44.8%). Next was halitosis (5A's n= 91, 30.4%; BA n= 151, 36.7%) and then followed by periodontal disease (5A's n= 85, 28.4%; BA n= 72, 17.5%).

4.3 PART 2: a) Survey on Dental Patients

4.3.1 Objectives

The objectives of this part of study were 1) to assess and compare the dental patients' knowledge of the effects of smoking and perceptions by smoking status and 2) to assess smokers' attitude towards smoking cessation counselling.

4.3.2 Social demographic characteristics

Table 4.19 shows the social demographic characteristics of the participants who participated in the survey. Overall, a total of 375 dental patients participated in the survey. Of those, 206 (54.9%) participants were public dental clinic patients with mean age of 33.79±13.79 years old and 169 (45.1%) were participants from private dental clinic with mean age of 33.01±12.17 years old. Generally, most participants were female (n=193, 51.5%), Malays (n=289, 77.1%), married (n=203, 54.1%) and had secondary or primary school (n=196, 52.3%). In general, at least one member in their family smokes cigarette. It was observed, that more non-smokers (n=263, 70.1%) participated in the survey compared to smokers (n=91, 24.3%) and ex-smokers (n=17, 4.5%). There were statistically significant differences between private and public dental patients for ethnicity ($p<0.001$) and highest level of education ($p<0.001$).

Table 4.19: Social and Demographic Characteristics of Study Subjects

Social and demographic characteristics	Private Dental Practice (N=169) n (%)	Public Dental Practice (N= 206) n (%)	Total (N=375)	*p*-value
Age (years)				
Mean ± SD	33.01±12.17	33.79±13.79	33.44±13.1	0.570[a]
Gender*				
Male	76 (45)	94 (45.6)	170(45.3)	0.821[b]
Female	84 (49.7)	109 (52.9)	193(51.5)	
Ethnic*				
Malay	154 (91.1)	135 (65.5)	289(77.9)	0.000[b]
Chinese	7 (4.1)	23 (11.2)	30(8.1)	
Indian /Others	5(3.0)	47 (22.8)	52(13.9)	
Marital status*				
Single/Divorced	83 (49.1)	89 (43.2)	172(45.9)	0.253[b]
Married	86 (50.9)	117 (56.8)	203(54.1)	
Highest Level of Education*				
University	60 (35.5)	42 (20.4)	102(27.2)	0.002[b]
College	28 (16.6)	39 (18.9)	67(18.4)	
Primary School /Sec. School	74 (43.8)	122 (59.2)	196(52.3)	
Number of family member who smokes cigarette				
Mean ± SD	1.32±1.86	1.29±1.48	1.3± 1.66	0.880[a]
Smoking Status*				
Never smoke	118 (69.8)	145 (70.4)	263(70.7)	0.233[b]
Ex-smoker	11 (6.5)	6 (2.9)	17(4.5)	
Smoker	39 (23.1)	53 (26.0)	92(24.7)	

*Denominators vary due to missing value

[a] Independent sample T-test; [b] Chi-square test

4.3.3 Smokers' profile

Out of 375 respondents, 92 were smokers. Table 4.20 presents the smokers profile among the respondents. Most of the smokers were male (n=87, 94.6%). The mean age of the smokers was 33.01 ±11.7 years old. The smokers mainly smoked cigarettes (n=85, 97.7%), had about 11.39 (11.7 SD) cigarette sticks per day and were smokers for 13.34 years (9.2 SD).

Table 4.20: Smokers' Profile (N=92)

Characteristics	n(%)	Mean ±SD
Gender		
Male	87(94.6)	
Female	5(5.4)	
Age		33.01± 11.7
No. of cigarette sticks per day		10.11 ± 5.84
No. of years smoking		13.34± 9.2
Types of tobacco use		
Cigarette	85 (97.7)	
Marijuana	2 (2.3)	

4.3.4 Knowledge about the effects of smoking on general and oral health

Table 4.21 shows dental patients' knowledge on the effects of smoking on general and oral health based on smoking status. The question 'Which of these diseases do you think are affected by tobacco use?' Most participants answered correctly except for dental caries, which only 8.7% answered correctly. Statistically significance difference was observed between smokers and non-smoker with the facts that smoking can affect the gums (p=0.022); periodontal disease (p=0.002); oral cancer (p<0.001); bad breath (p=0.046); dental decay (p=0.03); altered taste (0.03); impaired wound healing (p=0.028) and lung cancer (p<0.001).

4.3.5 Perceptions of dental patients on dentists providing quit smoking advice

a) Expectation of dentists on discussing smoking habits

Table 4.22 illustrates perceptions of participants on dentists providing quit smoking advice based on smoking status. More non-smokers (n=213, 85.5%) expected their dentist to be interested in the smoking status of their participants compared to smokers (n=77, 72.6%). However, a higher percentage of smokers (18.9%) disagree with the statement compared to non-smokers (7.2%). The chi-squared test showed a statistically significant difference between the smoking status and expectation on their dentist to be interested in the smoking status of their participants (p=0.004).

Similarly, more of non-smokers (n=218, 86.9%) expected their dentist to discuss smoking with their participants compared to smokers (n=81, 76.4%). Nevertheless, a higher percentage of smokers (17.9%) disagree with the statement compared to non-smokers (8.4%). A statistically significance difference was also seen between the smoking status and expectation on their dentist to discuss smoking with their participants (p=0.028).

b) Perceptions on the role of dentists in smoking cessation

Mostly non-smokers (n=147, 59.5%) disagree/strongly disagree about changing to another dentist if the dentist asked them about their smoking status during **this visit** compared to smokers (n= 49, 46.2%). However, a slightly higher percentage of smokers (29.2%) compared to non-smokers (23.1%) agree/strongly agree on changing to another dentist if the dentist asked them about their smoking status during **this visit**. Moreover, statistically significant difference was not found between smoking status and the statement on *"I would not change to another dentist if the dentist asked me about smoking during this visit"* (p=0.067).

More of non-smokers (n=149, 61.3%) disagree/strongly disagree about changing to another dentist if the dentist asked them about their smoking status at **every visit**

compared to smokers (n=53, 51%). The chi-squared test showed a statistically significant difference between the smoking status and the statement on *"I would not change to another dentist if the dentist asked me about smoking at every visit"* (p=0.037).

More of non-smokers (n= 118, 47.4%) disagreed/strongly disagreed that their dentist should provide nothing more than oral care compared to smokers (n= 34, 32.4%). However, a higher percentage of smokers (51.4%) agreed/strongly agreed that their dentist should provide nothing more than oral care compared to non-smokers (41.7%). A statistically significant difference (p=0.028) was observed in this statement among smokers and non-smokers.

In spite of that, 84.9% (n=174) non-smokers disagree/strongly disagree that dentist should not give smoking cessation advice to their participants compared to smokers (n=62, 59%). However, a higher percentage of smokers (33.3%) agree/strongly agree that dentist should not give smoking cessation advice to their participants compared to non-smokers (22%). A statistically significant difference (p=0.08) was not found in this statement among smokers and non-smokers (Table 4.22).

Table 4.21: Knowledge on the Effects of Smoking on General and Oral Health by Smoking Status

No.	Oral health conditions and health diseases	Smoking status			X^2 *p*-value
		Never smoke (n=263)	Smoker/ex-smoker (n=108)	Total (N=375)	
		n (%)			
1.	Effect on gums*				
	Yes	200 (78.4)	64 (64.6)	264(70.4)	0.022
	No	21 (8.2)	11 (11.1)	32(8.5)	
	Don't Know	34 (13.3)	24 (24.2)	58(15.5)	
	Total	255 (100)	99(100)		
2.	Periodontal disease*				
	Yes	187 (74.8)	57 (57.6)	244(65.1)	
	No	21 (8.4)	19 (19.2)	40(10.7)	0.002
	Don't Know	42 (16.8)	25 (25.3)	67(17.9)	
	Total	250(100)	101(100)		
3.	Oral cancer*				
	Yes	213 (84.5)	66 (66.7)	279(74.4)	<0.001
	No	25 (9.9)	19 (19.2)	44(11.7)	
	Don't Know	14 (5.6)	15 (15.2)	29(7.7)	
	Total	252(100)	100(100)		
4.	Stained teeth*				
	Yes	241 (94.5)	94 (94.9)	335(89.3)	0.606
	No	9 (3.5)	6 (6.1)	15(4.0)	
	Don't Know	5 (2.0)	2 (2.0)	7(1.9)	
	Total	255(100)	102(100)		
5.	Bad breath*				
	Yes	234 (92.9)	86 (86.9)	320(85.3)	0.046
	No	13 (5.2)	11 (11.1)	24(6.4)	
	Don't Know	5 (2.0)	5 (5.1)	10(2.7)	
	Total	252(100)	102(100)		
6.	Dental decay*				
	Yes	217 (85.4)	75 (75.8)	292(77.9)	0.030
	No	18 (7.1)	13 (13.1)	31(8.3)	
	Don't Know	19 (7.5)	14 (14.1)	33(8.8)	
	Total	254(100)	102(100)		
7.	Mouth ulcer*				
	Yes	152 (62)	53 (53.5)	205(54.7)	0.502
	No	47 (19.2)	21 (21.2)	68(18.1)	
	Don't Know	46 (18.8)	22 (22.2)	68(18.1)	
	Total	245(100)	96(100)		
8.	Altered taste*				
	Yes	109 (44.5)	32 (32.3)	141(37.6)	0.030
	No	59 (24.1)	37 (37.4)	96(25.6)	
	Don't Know	77 (31.4)	30 (30.3)	107(28.5)	
	Total	245(100)	99(100)		
9.	Impaired wound healing*				
	Yes	95 (38.9)	26 (26.3)	121(32.3)	0.028
	No	67 (27.5)	40 (40.4)	107(28.5)	
	Don't Know	82 (33.6)	31 (31.3)	113(30.1)	
	Total	244(100)	97(100)		
10.	Heart disease*				
	Yes	200 (79.4)	69 (69.7)	269(71.7)	0.068
	No	32 (12.7)	22 (22.2)	54(14.4)	
	Don't Know	20 (7.9)	10 (10.1)	30(8.0)	
	Total	252(100)	101(100)		
11.	Lung cancer*				
	Yes	221 (86.7)	69 (69.7)	290(77.3)	<0.001
	No	25 (9.8)	18 (18.2)	43(11.5)	
	Don't Know	9 (3.5)	15 (15.2)	24(6.4)	
	Total	255(100)	102(100)		

*Denominators vary due to missing value

Table 4.22: Perceptions of Dental Patients on Dentist Providing Quit Smoking Advice Based on Smoking Status

	Statements	Smoking status (N=375)		χ^2 *p*-value
		Never smoke n=263	Smoker/ex-smoker n=108	
1.	I would expect my dentist to be interested in the smoking status of his/her participants.			
	Strongly agree/agree	213(85.5)	77 (72.6)	
	Neither	18 (7.2)	9 (8.5)	
	Strongly disagree/disagree	18 (7.2)	20 (18.9)	0.004
	Total	249	106	
2.	I would expect my dentist to discuss smoking with their participants.			
	Strongly agree/agree	218 (86.9)	81 (76.4)	
	Neither	12 (4.8)	6 (5.7)	
	Strongly disagree/disagree	21 (8.4)	19 (17.9)	0.028
	Total	251	106	
3.	I would change to another dentist if the dentist asked me about my smoking during **this visit.**			
	Strongly agree/agree	57 (23.1)	31 (29.2)	
	Neither	43 (17.4)	26 (24.5)	
	Strongly disagree/disagree	147 (59.5)	49 (46.2)	0.067
	Total	247	106	
4.	I would change to another dentist if the dentist asked me about my smoking at **every visit.**			
	Strongly agree/agree	55 (22.6)	22 (21.2)	
	Neither	39 (16)	29 (27.9)	
	Strongly disagree/disagree	149 (61.3)	53 (51)	0.037
	Total	243	104	
5.	My dentist should provide oral care, nothing more.			
	Strongly agree/agree	104 (41.7)	54 (51.4)	
	Neither	27 (10.8)	59 (56.2)	
	Strongly disagree/disagree	118 (47.4)	34 (32.4)	0.028
	Total	249	147	
6.	Dentist should not give smoking cessation advice to their patient.			
	Strongly agree/agree	55 (22)	35 (33.3)	
	Neither	21 (8.4)	8 (7.6)	
	Strongly disagree/disagree	174 (84.9)	62 (59.0)	0.08
	Total	250	105	

4.3.6 Smokers' attitudes towards smoking cessation counselling

Table 4.23 shows the smokers' attitudes towards smoking cessation counselling. More than half of the smokers expected their dentist to discuss smoking on that visit (n=57, 65.5%) and at every visit (n=59, 64.1%) and appreciated their dentist in helping them to stop smoking (n=67, 77.9%).

Eighty one point eight percent of smokers (n=72) had positive attitudes towards dentists giving advice on the effects of smoking on oral health and 80.7% (n=71) on how to stop smoking. Smokers also appreciated their dentist giving them written information about quitting (n=71, 79.8%).

Slightly more than half of smokers 52 (58.4%) would see a medical general practitioner to quit smoking if they were to be referred to. However, one-third of them were neither agree nor disagree (n=27, 30.3%). Nonetheless, 71.9% (n=64) smokers admitted that they would try to quit smoking their dentist suggested them to do so (Table 4.23).

Table 4.23: Smokers' Attitudes towards Smoking Cessation Counselling (n=92)

	Statements	Strongly disagree/ Disagree n(%)	Neither n(%)	Agree/ Strongly agree n(%)
1.	I would expect my dentist to discuss smoking at **every visit.**	19 (20.7)	14 (15.2)	59 (64.1)
2.	I would expect my dentist to discuss smoking at **this visit.**	19 (21.8)	11 (12.6)	57 (65.5)
3.	I would appreciate my dentist helping me to stop smoking.	13 (15.1)	6 (7.0)	67 (77.9)
4.	I would appreciate my dentist advising me about the effects of smoking on my oral health.	9 (10.2)	7 (8.0)	72 (81.8)
5.	I would appreciate my dentist giving me practical advice about how to stop smoking.	9 (10.2)	8 (9.1)	71 (80.7)
6.	I would appreciate my dentist giving me written information about quitting.	10 (11.2)	8 (9.0)	71 (79.8)
7.	If my dentist referred me to a GP, I would go.	10 (11.2)	27 (30.3)	52 (58.4)
8.	If my dentist suggested that I quit smoking, I would try.	11 (12.4)	14 (28.1)	64 (71.9)

4.4 PART 2: b) Survey on Dentists

4.4.1 Objectives

The objectives of this survey were:

1. To compare the motivation for, capabilities in, and opportunities for smoking cessation intervention between private and public dentists.
2. To identify the barriers to implementing smoking cessation interventions in dental practice.

4.4.2 Social and Demographic Characteristics

Table 4.24 shows the social and demographic characteristics of the respondents. Two hundred eighty five dentists (public, n=158, 53.6%; private, n= 127, 43.1%) replied to the questionnaire survey. Sixty three point seven percent (n=188) of the respondents were females, 56.9% (n=168) were from the Malay ethnic, 66.4% (n=196) were married, and 88.8% (n=262) never smoke cigarettes. The dentists mean age were 37.07± 10.30 years old. Eighty one point seven percent (n=241) dentists who responded to the survey were non-specialists. The average years of practice for dentists were 11 ± 9.11years.

4.4.3 Dentists' Motivation in Smoking Cessation Intervention

Motivation in smoking cessation intervention was assessed by five domains: professional role and identity, emotion, motivation and goals, social influences and beliefs about consequences. Table 4.25 shows the results of dentists' motivation in smoking cessation intervention.

Table 4.24: Social and Demographic Characteristics of the Study Subjects

Social and demographic characteristics	Total N=28 5
Age in the year 2014	
Mean ±SD	37.07± 10.30
Gender*	
Male	95(32.2)
Female	188(63.7)
Ethnicity*	
Malay	168(56.9)
Chinese	83(28.1)
Indian	26(8.8)
Others	7(2.4)
Marital Status*	
Single	88(29.8)
Married	196(66.4)
Years of practice	
Mean ±SD	11± 9.11
Types of practice*	
Public practice	158 (53.6)
Private practice	127 (43.1)
Dental Specialist*	
Yes	43(14.6)
No	241(81.7)
Smoking status*	
Smoker	4(1.4)
Never smoke	262(88.8)
Ex-smoker	17(5.8)

*Denominators vary due to missing values.

a) Dentists' perceptions of their professional role and identity

Statistically significant differences were found between the types of the dentist with their perceptions of their professional role and identity ($p<0.05$) (Table 4.25). Sixty five point one percent (n=103) of public dentists believed that promoting tobacco abstinence is an important part of their professional identity compared to 51.2% (n=65) private dentists. Furthermore, 62.0% (n=98) of public dentists disagreed that counselling for cessation was not an efficient use of their time in the clinic compared to 37.8% (n=48) of private dentists.

b) Dentists' motivation and goals in smoking cessation intervention

Overall, 68.5% (n=202) dentists were willing to work on improving their provision of tobacco cessation services. Among them, 79.7% (n=126) public dentists were significantly willing to work to improve their provision of tobacco cessation services compared to 59.8% (n=76) private dentists. Apart from that 75.3% (n=119) public dentists agreed that the importance of patient health helps them to overcome barriers such as lack of time and reimbursement in promoting a tobacco-free lifestyle compared to 66.1% (n=84) private dentists. However, an almost similar number of public (n=65, 41.1%) and private dentists (n=64, 50.4%) reported that they received insufficient reimbursement for promoting tobacco abstinence to their patients. Although not statistically significant, both types of dentists also claimed that they had insufficient time to promote tobacco abstinence (n=146, 49.5%) (Table 4.25).

c) Dentists' emotions towards smoking cessation intervention

Although not statistically significant, both types of dentists agreed that helping with tobacco cessation do make them feel useful to their patients (Table 4.25). Overall, only 29.8% (n=88) dentists found that counselling about tobacco to be frustrating, with 31.2% (n=92) others reported that they were not sure. Slightly more of public dentists (n=60, 38.0%) found it is not frustrating compared to private dentists (n=44, 34.6%). Overall, less than one third of the dentists claimed that burnout prevents them from providing more tobacco use cessation counselling (Table 4.25).

d) Dentists' social influences in smoking cessation intervention

Though not statistically significant, 66.5% (n=105) public dentists, agreed that their clinic or department generally supports improving the way in which we promote a tobacco-free lifestyle compared to 59.8% (n=76) private dentists. However, 43.1%

(n=127) dentists claimed that most patients do not want to receive tobacco counselling. Forty six point four percent (n=137) of dentists, also claimed that they do not have at least one respected individual in their dental clinic that is personally committed to lead their efforts to improve their provision of tobacco cessation services. Nevertheless, a statistically significant difference (p=0.049) was found whereby 70.3% (n=111) public dentists disagreed that their role does not involve in assisting patients to stop tobacco use compared to 57.5% (n=73) private dentists (Table 4.25).

e) Dentists' beliefs about consequences (outcomes) of smoking cessation intervention

About half of public dentists significantly (n=80, 50.6%) (*p*=0.009) were not sure that their counselling will increase a patient's likelihood of quitting compared to private dentists (n=54, 42.5%). However, 52.5% (n=83) public dentists agreed that patients do appreciate it when they promote tobacco abstinence compared to 46.5 % (n=59) private dentists. Although not statistically significant, 63.3% (n=100) public dentists also believed that patients in their clinic/department have so many other problems in their lives that stopping tobacco use was a very low priority for them compared to 56.7% (n=72) private dentists.

Table 4.25: Comparison of dentists' motivation domains in smoking cessation intervention with types of dentists

No.	Domains	Statement	Public n=158	Private n=127	Total N=295	*p*-value
			n(%)			
	Professional role and identity					
1.	Most of my colleagues in this clinic believe that promoting tobacco abstinence is an important part of their professional identity.	Agreed Not sure Disagreed	103(65.1) 28(17.7) 26(16.5)	65(51.2) 35(27.6) 26(20.5)	168(56.9) 63(21.4) 52(17.6)	0.049
2.	Counselling for cessation is not an efficient use of my time.	Agreed Not sure Disagreed	40(25.3) 20(12.7) 98(62.0)	50(39.4) 29(22.8) 48(37.8)	90(30.5) 49(16.6) 146(49.5)	<0.001
	Motivation and goals					
1.	I am unwilling to work on improving my provision of tobacco cessation services.	Agreed Not sure Disagreed	18(11.4) 13(8.2) 126(79.7)	21(16.5) 30(23.6) 76(59.8)	39 (13.2) 43 (14.6) 202(68.5)	<0.001
2.	The importance of patient health helps me to overcome barriers such as lack of time and reimbursement in promoting a tobacco-free lifestyle.	Agreed Not sure Disagreed	119(75.3) 32(20.3) 5(3.2)	84(66.1) 30(23.6) 12(9.4)	203(68.8) 62 (21.0) 17(5.8)	0.054
3.	I receive insufficient reimbursement for promoting tobacco abstinence.	Agreed Not sure Disagreed	65(41.1) 48(30.4) 41(25.9)	64(50.4) 42(33.1) 20(15.7)	129(43.7) 90 (30.5) 61 (20.7)	0.087
4.	I have insufficient time to promote tobacco abstinence.	Agreed Not sure Disagreed	83(52.5) 20(12.7) 53(33.5)	63(49.6) 15(11.8) 48(37.8)	146(49.5) 35 (11.9) 101(34.2)	0.773
	Emotions					
1.	Helping with tobacco cessation makes me feel useful to patients	Agreed Not sure Disagreed	141(89.2) 14(8.9) 2(1.3)	105(82.7) 17(13.4) 5(3.9)	246(83.4) 31(10.5) 7(2.4)	0.156
2.	I find counselling patients about tobacco to be frustrating.	Agreed Not sure Disagreed	51(32.3) 46(29.1) 60(38.0)	37(29.1) 46(36.2) 44(34.6)	88(29.8) 92(31.2) 104(35.3)	0.464
3.	Burnout prevents me from providing more tobacco use cessation counselling.	Agreed Not sure Disagreed	53(33.5) 56(35.4) 47(29.7)	38(29.9) 49(38.6) 40(31.5)	91(30.8) 105(35.6) 87(29.5)	0.765

Table 4.25: Comparison of dentists' motivation domains in smoking cessation intervention with types of dentists *(continued)*

No.	Domains	Statement	Public n=158	Private n=127	Total N=295	*p*-value
			n(%)			
	Social influences					
1.	Our clinic/department generally supports improving the way in which we promote a tobacco-free lifestyle.	Agreed Not sure Disagreed	105(66.5) 36(22.8) 16(10.1)	76(59.8) 27(21.3) 24(18.9)	181(61.4) 63(21.4) 40(13.6)	0.110
2.	Most patients do not want to receive tobacco counselling.	Agreed Not sure Disagreed	68(43.0) 52(32.9) 37(23.4)	59(46.5) 43(33.9) 25(19.7)	127(43.1) 95(32.2) 62(21.0)	0.722
3.	There is at least one respected individual in our dental clinic who is personally committed to leading our efforts to improve our provision of tobacco cessation services.	Agreed Not sure Disagreed	48(30.4) 39(24.7) 70(44.3)	31(24.4) 29(22.8) 67(52.8)	79(26.8) 68(23.1) 137(46.4)	0.359
4.	My role does not involve assisting patients to stop tobacco use.	Agreed Not sure Disagreed	28(17.7) 18(11.4) 111(70.3)	37(29.1) 17(13.4) 73(57.5)	65 (22.0) 35(11.9) 184(62.4)	0.049
	Beliefs about consequences					
1.	My counselling will increase a patient's likelihood of quitting.	Agreed Not sure Disagreed	66(41.8) 80(50.6) 11(7)	49(38.6) 54(42.5) 24(18.9)	115(39.0) 134(45.4) 35(11.9)	0.009
2.	Patients appreciate it when I promote tobacco abstinence.	Agreed Not sure Disagreed	83(52.5) 51(32.3) 23(14.6)	59(46.5) 43(33.9) 25(19.7)	142(48.1) 94(31.9) 48(16.3)	0.434
3.	The patients we see in our clinic/department have so many other problems in their lives that stopping tobacco use is a very low priority for them.	Agreed Not sure Disagreed	100(63.3) 31(19.6) 26(16.5)	72(56.7) 34(26.8) 21(16.5)	172(58.3) 65 (22.0) 47 (15.9)	0.353

4.4.4 Dentists' capability in smoking cessation intervention

Capability comprised of these domains, which were knowledge; skills beliefs about capabilities; and memory, attention, and decision processes. Table 4.26 describes the dentists' capability on smoking cessation intervention.

a) Dentists' knowledge in smoking cessation intervention

A statistically significant difference was found between the types of dentists with the knowledge domains ($p<0.05$) (Table 4.26). Slightly less than half of dentists reported that they were aware of the meaning and objectives of the 5A's in the Malaysian Clinical Practice Guidelines (CPG) on tobacco dependence treatment (n=129, 43.7%). However, public dentists (n=95, 60.1%) were significantly more aware of the CPG compared to private dentists (n=34, 26.8%).

This study also showed that younger dentists (n= 76, 66.7%) were more aware of the 5A's compared to senior dentists (n=38, 33.3%)(Figure 4.2). Again, there was a statistically significant difference in the response of this statement by age groups with a p-value of 0.016.

Although 35.6% (n=105) of dentists said they do have sufficient therapeutic knowledge of the pharmaceutical products for tobacco cessation, however, 33.6% (n=99) claimed that they do not, while 27.5% (n=81) were still not sure of it (Table 4.26). In comparison with the types of dentists, public dentists (n=66, 41.8%) significantly claimed to have more knowledge of the pharmaceutical products for tobacco cessation than private dentists (n=39, 30.7%) (p=0.038).

Among dentists, a majority (n=182, 61.7%) reported that they know how to promote a tobacco-free lifestyle among youth. However, public dentists (n=117, 74.1%) had

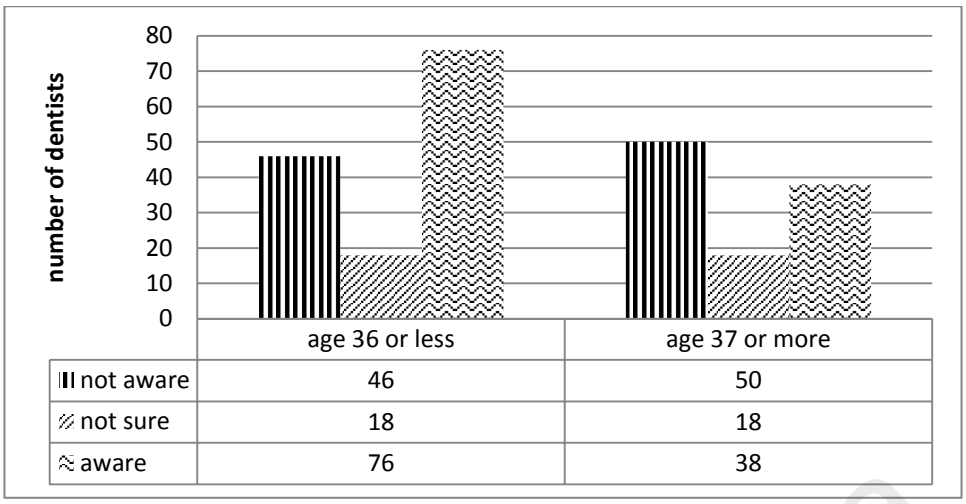
significantly better knowledge in the promotion of tobacco-free lifestyle among youth than the private dentists in comparison to the private practices (n=65, 51.2%) (p<0.001).

Table 4.26: Comparison of capabilities in smoking cessation intervention by types of dentists

No.	Domains	Statement	Public n=158	Private n=127	Total N=295	*p*-value
				n (%)		
	Knowledge					
1.	I'm unaware of the meanings & objectives of the 5A's in the Malaysian Clinical Practice Guidelines on tobacco dependence treatment.	Agreed Not sure Disagreed	44(27.8) 19(12.0) 95(60.1)	69(54.3) 23(18.1) 34(26.8)	113(38.3) 42 (14.2) 129(43.7)	<0.001
2.	I have sufficient therapeutic knowledge of the pharmaceutical products for TC.	Agreed Not sure Disagreed	66(41.8) 47(29.7) 45(28.5)	39(30.7) 34(26.8) 54(42.5)	105(35.6) 81(27.5) 99(33.6)	0.038
3.	I don't know how to promote a tobacco-free lifestyle among youth.	Agreed Not sure Disagreed	22(13.9) 19(12.0) 117(74.1)	39(30.7) 23(18.1) 65(51.2)	61 (20.7) 42 (14.2) 182(61.7)	<0.001
	Skills					
1.	I know the appropriate questions to ask patients when providing tobacco use cessation counselling.	Agreed Not sure Disagreed	84(53.2) 39(24.7) 34(21.5)	47(37) 36(28.3) 43(33.9)	131(44.4) 75 (25.4) 77 (26.1)	0.016
2.	I know how to prescribe pharmaceutical products for those ready to quit.	Agreed Not sure Disagreed	13(8.2) 47(29.7) 98(62.0)	26(20.5) 32(25.2) 69(54.3)	39 (13.2) 79 (26.8) 167(56.6)	0.011
3.	I am unsure how to assess patients in their efforts to stop tobacco use.	Agreed Not sure Disagreed	66(41.8) 31(19.6) 61(38.6)	72(56.7) 28(22.0) 27(21.3)	138(46.8) 59(20) 88 (29.8)	0.006
4.	Sufficient opportunities are available to learn about promoting a tobacco-free lifestyle.	Agreed Not sure Disagreed	71(44.9) 28(17.7) 44(27.8)	55(43.3) 28(22.0) 44(34.6)	126(42.7) 56(19.0) 101(34.2)	0.690

Table 4.26: Comparison of capabilities in smoking cessation intervention by types of dentists *(continued)*

No.	Domains	Statement	Public n=158	Private n=127	Total N=295	*p*-value
				n (%)		
	Beliefs in capabilities					
1.	I am confident in my abilities to prevent patients from using tobacco products.	Agreed Not sure Disagreed	43(27.2) 77(48.7) 37(23.4)	35(27.6) 41(32.3) 51(40.2)	78 (26.4) 118(40) 88(29.8)	0.004
2.	I am able to make decisions about the risks/benefits of the appropriate use of nicotine replacement therapy.	Agreed Not sure Disagreed	37(23.4) 66(41.8) 54(34.2)	35(27.6) 38(29.9) 54(42.5)	72(24.4) 104(35.3) 108(36.6)	0.107
3.	I have the skills to monitor and assist patients throughout their quit attempt.	Agreed Not sure Disagreed	34(21.5) 44(27.8) 79(50.0)	20(15.7) 36(28.3) 71(55.9)	54 (22.9) 80 (33.9) 150(50.8)	0.426
	Memory, attention and decision process					
1.	Deciding whether to promote tobacco abstinence is sometimes difficult.	Agreed Not sure Disagreed	90(57.0) 13(8.2) 54(34.2)	69(54.3) 21(16.5) 37(29.1)	159(53.9) 34 (11.5) 91(30.8)	0.095
2.	Reinforcing tobacco abstinence is easy for me to remember.	Agreed Not sure Disagreed	83(52.5) 58(36.7) 19(12.0)	62(48.8) 37(29.1) 28(22.0)	142(48.1) 95(32.2) 47(15.9)	0.063



***Statistically significant with p=0.016.*

Figure 4.2: Dentists awareness of the meanings and objectives of the 5A's Malaysian CPG on tobacco dependence treatment according to age group

b) Dentists' skills in smoking cessation intervention

A statistically significant difference was found between the types of dentists with the question on whether they knew the appropriate questions to ask patients when providing tobacco use cessation counselling (p=0.016) (Table 4.26). Fifty three point two percent (n=84) of public dentists, agreed to this statement compared to 37.0% (n=47) private dentists. However, 62.0% (n=98) of public dentists significantly (p=0.011) did not know how to prescribe pharmaceutical products for those ready to quit compared to 54.3% (n=69) private dentists. Despite that, 56.7% (n=72) of private dentists were significantly (p=0.006) were unsure of how to assess participants in their efforts to stop tobacco use compared to 41.8% (n=66) public dentists. Although not statistically significant, 44.9% (n=71) public dentists reported that they had sufficient opportunities to learn about promoting a tobacco-free lifestyle when compared with 43.3% (n=55) of private dentists.

c) Dentists' beliefs about their capabilities in smoking cessation intervention

A statistically significant difference was found between the types of dentists with the question on their confidence in their abilities to prevent patients from using tobacco products (p= 0.004) (Table 4.26). Forty eight point seven percent (n=77) of public dentists were not sure they have the confidence compared to 32.3% (n= 41) of private dentists. Furthermore, although not statistically significant, 41.8% (n= 66) of public dentists again were not sure of their ability to make decisions about the risks/benefits of the appropriate use of nicotine replacement therapy compared to 29.9% (n=38) of private dentists. However, a fair distribution of public dentists (n=79, 50.0%) and private dentists (n=71, 55.9%) disagreed that they don't have the skills to monitor and assist patients throughout the patients quit attempt.

d) Dentists' memory, attention and decision process in smoking cessation intervention

There was no statistically significant difference between the types of dentists with the questions in this domain. In this study, 53.9% (n=159) of dentists found that deciding whether to promote tobacco abstinence in the clinic was sometimes difficult, although reinforcing tobacco abstinence to patients was easy for them to remember (n=142, 48.1%)(Table 4.26).

4.4.5 Dentists' opportunity in smoking cessation intervention

Table 4.27 shows the comparison of opportunities in smoking cessation intervention between private and public dentists. There was a statistically significant difference between the statement on 'their dental clinic has no tobacco-related self-help materials/pamphlets to distribute to patients' and the type of dentists (p<0.001). In this study, 84.3% (n=107) of private dentists claimed they do not have tobacco-related self-

help materials/pamphlets to distribute to patients' compared to 51.9% (n=82) of public dentists.

However, although not statistically significant, 64% (n=101) of public dentists disagreed that their dental clinic had a system to provide follow-up support between clinics visits compared to 58.3% (n=74) of private dentists.

In this study, 65.8% (n=104) of public dentists significantly (p=0.04) disagreed that their dental clinic has a system to cue/prompt providers to counsel against tobacco use compared to 74% (n=94) of private dentists (Table 4.27).

Both public (n=70, 44.3%) and private dentists (n=70, 55.1%) disagreed that their clinic management took actions to remove barriers to the provision of tobacco use counselling. Nonetheless, there was no statistically significant difference found for this statement with the types of dentists (Table 4.27).

In the dental clinic where they work, 62% (n=98) of public dentists agreed that they did not receive feedbacks from promoting tobacco abstinence compared to 69.3% (n=88) of private dentists. Again, there was no statistically significant difference found for this statement with the types of dentists (Table 4.27).

However, an equal number of private (n=88, 69.3%) and public dentists (n=88, 55.7%) also claimed that their dental clinic provides insufficient reimbursement for promoting tobacco abstinence. Additionally, there was a statistically significant difference found for this statement (p=0.045) with the types of dentists (Table 4.27).

Table 4.27: Comparison of opportunities (environmental context and resources) in smoking cessation intervention between private and public dentists

No.	Domains	Statement	Public Dentists N=158	Private Dentists N=127	Total N=295	*p*-value
			n(%)			
1.	My dental clinic has no tobacco-related self-help materials/pamphlets to distribute to patients.	Agreed	82 (51.9)	107(84.3)	189(64.1)	<0.001
		Not sure	11 (7.0)	5 (4.0)	16(5.4)	
		Disagreed	65 (41.1)	15 (11.8)	80(27.1)	
2.	Our dental clinic has a system to provide follow-up support between clinic visits.	Agreed	35 (22.2)	35 (28.0)	70 (23.7)	0.527
		Not sure	22 (14.0)	16 (12.6)	38 (12.9)	
		Disagreed	101(64.0)	74 (58.3)	175(59.3)	
3.	Our dental clinic has a system to cue/prompt providers to counsel against tobacco use.	Agreed	29 (18.4)	10 (7.9)	39 (13.2)	0.04
		Not sure	25 (15.8)	22 (17.3)	47 (15.9)	
		Disagreed	104 (65.8)	94 (74.0)	198(67.1)	
4.	Our clinic management has taken actions to remove barriers to the provision of tobacco use counselling.	Agreed	34 (22.0)	17 (13.4)	51 (17.3)	0.09
		Not sure	54 (34.2)	37 (29.1)	91 (30.8)	
		Disagreed	70 (44.3)	70 (55.1)	140(47.5)	
5.	In the dental clinic where I work, I receive no feedback from promoting tobacco abstinence.	Agreed	98 (62.0)	88 (69.3)	186(63.1)	0.471
		Not sure	29 (18.4)	20 (16.0)	49 (16.6)	
		Disagreed	30 (19.0)	19 (15.0)	49 (16.6)	
6.	My dental clinic provides insufficient reimbursement for promoting tobacco abstinence.	Agreed	88 (55.7)	88 (69.3)	176(59.7)	0.045
		Not sure	46 (29.1)	23 (18.1)	69 (23.4)	
		Disagreed	24 (15.2)	15 (11.8)	39 (13.2)	

4.5 Summary of Main Findings

This chapter has covered extensively the outcomes from this study. Summary of the main findings are discussed below according to parts of the study.

In the RCT, most of the participants enrolled for both 5A's and BA were males, of Malay ethnicity and attended at least secondary school. However, there were statistically significant differences in terms of mean age, ethnicity, marital status and level of education between 5A's and BA groups. Statistically significant differences were also seen in the mean age of started smoking, duration of smoking, number of

cigarettes taken in a day and the level of CO in the lungs between smokers in 5A's and BA groups. At 6-months follow-up, the OR (95% CI) for participants who quit in the 5A's group was 3.81(1.871-7.76) higher compared to BA and was statistically significant (p<0.001). However, after the social demographic variables (age, ethnic, marital status, and highest level of education) were controlled, the OR (95%CI) for the 5A's was 2.11(0.917-4.889) higher compared to BA but was not statistically significant. Lastly, the smoking characteristics of the participants (age started smoking, duration of smoking, number of cigarettes taken per day, money spent per month, tried quitting before, FTND and level of CO in lungs) were added to create the third model. Now, the OR (95%CI) for the 5A's was 1.90 (0.652-5.547) higher compared to BA but was not statistically significant.

In the dental patients' survey, overall most of the respondents were middle age, female, of Malay ethnicity, married and never smoke. Generally, respondents had good knowledge on the diseases or conditions caused by smoking. Statistically significance differences were observed between smokers and non-smoker on the knowledge that smoking can affect the gums (p=0.022); periodontal disease (p=0.002); oral cancer (p<0.001); bad breath (p=0.046); dental decay (p=0.03); altered taste (0.03); impaired wound healing (p=0.028) and lung cancer (p<0.001). More non-smokers (n=213, 85.5%) expected their dentist to be interested in the smoking status of their participants compared to smokers (n=77, 72.6%). The chi-squared test showed a statistically significant difference between the smoking status and expectation on their dentist to be interested in the smoking status of their participants (*p*=0.004). Significantly (p=0.037) more non-smokers (n= 55, 22.6%) were likely to consider changing dentist if they were ask about smoking at every visit than non-smokers (n=22, 21.2%). Among smokers, most of them had positive attitudes towards dentists giving advice on the effects of smoking on oral health (n=72, 81.8%) and on how to stop smoking (n=71, 80.7%).

Additionally, most smokers admitted that they would try to quit smoking their dentist suggested them to do so (n=64, 71.9%).

In the dentists' survey, 285 responded (public, n=158, 53.6%; private, n= 127, 43.1%) with most of them were females (n=188, 63.7%), were from the Malay ethnic (n=168, 56.9%), married (n=196, 66.4%) and never smoke cigarettes (n=262, 88.8%). A majority of public dentists (n=103, 65.1%) believed that promoting tobacco abstinence is an important part of their professional identity compared to private dentists (n=65, 51.2%). Moreover, statistically significant differences were found between the types of the dentist with their perceptions of their professional role and identity ($p<0.05$). Most public dentists (n=126, 79.7%) were significantly willing to work to improve their provision of tobacco cessation services compared to private dentists (n=76, 59.8%). A statistically significant difference was found between the types of dentists with the knowledge domains ($p<0.05$). Surprisingly, slightly less than half of dentists reported that they were aware of the meaning and objectives of the 5A's in the Malaysian Clinical Practice Guidelines (CPG) on tobacco dependence treatment (n=129, 43.7%). However, most dentists whom were significantly more aware of the CPG were from public practices. More of private dentists (n=107, 84.3%) significantly claimed they do not have tobacco-related self-help materials/pamphlets to distribute to patients' compared to public dentists (n=82, 51.9%) ($p<0.001$). Nonetheless, More public dentists (n=104, 52.5%) significantly ($p=0.04$) disagreed that their dental clinic has a system to cue/prompt providers to counsel against tobacco use compared to private dentists (n=94, 47.5%). Yet, an equal number of private (n=88, 50%) and public dentists (n=88, 50%) claimed that their dental clinic provides insufficient reimbursement for promoting tobacco abstinence.

The following chapter, Chapter 5- Discussion, discusses in detail on the findings of results for Part1 and Part 2 of the study.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter discussed the findings for Part 1 and Part 2 of the research studies. In part 1, the population profiles of the providers and participants enrolled for the clinical trial and the effectiveness of the smoking cessation interventions are reviewed. In part 2 (a) sociodemographic of the population are discussed, alongside with the findings on the dental patients' knowledge of the effects of smoking, perceptions and attitude toward the role of dentists in smoking cessation intervention. Finally, findings for part 2(b) on the sociodemographic of the population and the motivation for, capabilities in and opportunities for Malaysian dentists in smoking cessation intervention in dental practices were also deliberated.

5.2 Part 1: The 5 A's Model in Behavioural Therapy Versus Brief Advice on Smoking Cessation Delivered by Dentists in a Dental Setting

5.2.1 Introduction

This clinical trial enabled us to compare the effectiveness of two types of smoking cessation interventions, which are the 5A's model, and the brief advice (BA) delivered by dentists in a dental setting. This trial was one of the few studies assessing changes in motivation to quit smoking among Malaysian dental patients who smokes cigarettes.

5.2.2 Population Profile

5.2.2.1 Providers (Dentists)

The unit of randomization in this trial was the DPH specialists and their age range was 49 to 54 years old; five were females and had clinical practice experience of 25 to 30 years. As these specialists were assigned to different clinics, thus this was similar to

5 dental offices studies in the Carr and Ebbert (2012) review where the dental office was the unit of randomization. However, the 6 DPH specialists were trained and standardized according to the smoking cessation interventions they were allocated to, and followed strict clinical protocol. A post hoc subgroup analysis of studies conducted in dental practices (settings) found that a minimum brief counselling to adult smokers showed a significant benefit of intervention compared to usual care or less treatment intensive controls with no evidence of heterogeneity (Carr & Ebbert, 2012). Apart from the smoking cessation interventions, the specialists in this trial conducted routine oral examination, personalised counselling from the examination as to oral effects to tobacco use, and self-help materials in accordance with the majority of the studies reported in Carr & Ebbert's Cochrane review (2012).

5.2.2.2 Smokers

Smokers participated in this trial were mostly men, middle-aged, had high nicotine dependency and wanting to stop smoking mainly for health reasons. The majority of men participated in this trial may reflected the 43.9% (4.64 million) of Malaysian men aged 15 years or older were current cigarette smokers in 2011 and only 1.0% (0.10 million) are women from a national survey (Institute for Public Health, 2012). A similar result was also reflected by Wee *et al*. (2011b), where most smokers were male but again these data were collected in a health setting. Nonetheless, a study in Japan by Hanioka *et al*. (2010) found the smokers attended quit smoking clinics in dental clinic were predominantly male. However, trials conducted by Nohlert *et al*. (2009) & Gordon *et al*. (2007) recruited more females due to the fact that women were more willing to seek and accept support for smoking cessation compared to men. Unfortunately, smoking status of dental patients in Malaysia was not available for comparison to be made, although similar proportions of males and females utilized the dental health facilities (Institute of Public Health, 2015).

Globally, the prevalence of current tobacco smoking ranges from 39% in Russian Federation to 4% in Nigeria, where, 40% or above were men (Asma *et al.,* 2015). According to the Malaysian GATS (2011), the highest percentage of smokers was also found among men in the 25-44 age groups (54.9% smoked tobacco) (Institute for Public Health, 2012). Stop smoking clinics in Malaysia had similar middle-aged smokers' attendees (Wee *et al*., 2011b). However, in this study the highest proportion of smokers recruited for the 5A's group were among the age group of 15-19 years and 25-29 years-old for the BA group. Findings from the National Oral Health Survey of Adults (NOHSA) in 2010 found that the highest proportion of adults who sought oral health care were those in the youngest age group of 15-19 years (Oral Health Division, 2013). Thus, the differences in the mean and standard deviation of participants' age between the two interventions groups could be due to the recruitment of patients participating in this study. The most active clinician in the 5A's group recruited mainly patients' aged 15-19 years old from the school dental program which she is currently involved. Others recruited their patients in the primary dental care settings, involving mostly adult patients aged above 20 years old. Thus, there was a disproportion of age recruitment at baseline.

More Malay smokers were significantly recruited for this trial for both interventions (5A's and BA) compared to other ethnics. This was contrary with the GATS (2011) which reported that adults of other than the Malays, Chinese and Indians, had a higher prevalence (Institute for Public Health, 2012). In the GATS (2011), the Malays were of the second highest group (Institute for Public Health, 2012). However, NOHSA (2010) reported that public dental healthcare was most often sought by the Malays (Oral Health Division, 2013). Additionally, Wee *et al.* (2011b) also found that stop smoking clinics in Malaysia were mainly attended by Malay smokers.

In this trial, most smokers recruited had secondary school as their highest level of education for both interventions. This was similar to the GATS report (2011) and those attending stop smoking clinics in Malaysia (Wee *et al.,* 2011b). However, GATS only captures education level for adults aged 25 and older. For this trial, smokers who were still studying in school, secondary school were considered as their highest level of education. By education level, the proportion of dental patients who sought oral health care less than a year ago was highest among those with tertiary education, followed by secondary school (Oral Health Division, 2013).

There was a significant difference between marital status and the types of smoking cessation interventions in this trial. In the 5A's group, more of single smokers were in this group. More of married smokers were in the BA group. The range age for single smokers was 15-19 years-old for 5A's group and was 19-41 years-old for BA group. While the age range for married smokers for both interventions was 20-64 years old. According to a recent survey, Malaysian men married at the average age of 28 years old (Department of Statistics Malaysia, 2010).

5.2.2.3 Tobacco Use Assessment and Nicotine Dependence

The first step in treating tobacco use and dependence is to identify tobacco users. Identification of smoking status and assessing tobacco use helps clinicians to identify appropriate interventions for it to be successful (Fiore *et al.,* 2008). In this trial, the mean age at initiation was 14.9 years for 5A's group and 17.7 years for BA group. This was almost similar to the overall findings from the GATS (2011) where more than half of those aged 20-34 years who had ever smoked on a daily basis started smoking daily before the age of 18 (Institute for Public Health, 2012). The average duration of smoking by smokers was 12 years for the 5A's group and 17 years for the BA group. As stated earlier, these differences were also due to the disproportion of age recruitment of

patients at baseline. Younger smokers would have a shorter duration of smoking compared to older smokers.

A typical daily cigarette smoker in Malaysia smoked 14 cigarettes per day (Institute for Public Health, 2012; Wee *et al.,* 2011b). The average numbers of cigarettes smoked per day for smokers in the 5A's group were lower (9 sticks, SD 8.3) than those in the BA group (12 sticks, SD 8). The lower number for 5A's group could be due to the majority of the smokers were aged 15-19 years-old with dependency on allowances given by parents or have fewer monthly income. In addition to that, they might have bought cigarettes in loose packaging or received/shared from their smoking peers. Thus, the actual number of cigarettes per day reported may vary and not accurate. GATS (2011) reported that the average amount spent on a pack of 20 manufactured cigarettes was MYR 10.10 (Ringgit Malaysia) (Institute for Public Health, 2012). Thus, a typical a current cigarette smoker could spend about MYR 178.80 per month on manufactured cigarettes. The average price of a cigarette pack of 20 sticks in Malaysia during this trial period (2014) was MYR 12. The average money spent on cigarette per month found in this trial for the 5A's group were MYR 150 and MYR 170 for the BA group.

In this trial, more than 80% of smokers in both groups 5A's and BA, had tried to quit smoking at least twice before participating in this trial. According to the GATS (2011), among those who had ever smoked on a daily basis, only 9.5% had quit smoking (Institute for Public Health, 2012). Interestingly, one-half of smokers aged 15 years or above had made an attempt to quit smoking in the past 12 months. It was also reported that 4 out of 5 smokers who attempted to quit smoking in the past 12 months tried to quit without any assistance (Institute for Public Health, 2012).

The level of nicotine addiction for smokers in this trial was assessed using the FTND questionnaire. A similar proportion of smokers for both interventions 5A's and BA were

in the low dependence category, with, slightly more smokers from the BA group were categorized as very low dependence compared to smokers from the 5A's group. GATS 2011 reported only 12.3% of daily smokers in Malaysia were considered as high nicotine dependency (Institute for Public Health, 2012). In most instances, people who were heavily smoking were most likely did not make visit to the dentist.

Measuring breath CO levels using the CO breath analyser provides an immediate, non-invasive, simple, and effective way of confirming a patient's smoking status (Middleton & Morice, 2000). A significant difference between the levels of CO was seen in comparison among the smokers in the 5A's and BA groups in this trial. More than 50% of smokers in in the 5A's group and more than 70% in the BA group had a high level of CO in their lungs (> than 11 ppm/ 2.39% COHb) which categorized them as heavy smokers while others had either moderate (7-10 ppm, 1.75-2.23% COHb) or low level (<6 ppm/1.59% COHb) of CO during their tobacco use assessment at baseline. Higher percentage of smokers in BA had high level of CO could be due to the participants in BA smoke more number of cigarettes per day when compared to participants in 5A's group.

In this study, there were more smokers in the 5A's group with low level of CO in their lungs compared to the BA group. This could be due to the smokers' cigarette smoking habit differs individually. For example number of cigarettes and at which time taken in a day may differ. In the body, CO displaces oxygen in the erythrocyte to form carboxyhemoglobin (COHb) following inhalation. Middleton & Morice (2000) cited in their literature that CO in COHb has a half-life of about 5 to 6 hours and may remain in the blood for up to 24 hours depending on a number of factors, such as gender, physical activity, and ventilation rate. Thus, these factors apart from gender could also be the possible causes of the differences seen in this study.

5.2.3 Effectiveness of the smoking cessation intervention

The ultimate goal for the smoking cessation is abstinence. It is also considered as success if the intervention can bring the smoker from one stage to next level of change. Therefore, the effectiveness of the smoking cessation in this study was measured based on both the abstinence and behaviour change. We accepted the null hypothesis for this trial which was, there is no difference between the effectiveness of the 5A's model of smoking cessation intervention (5A's) and that of brief advice (BA) which dentists delivered in a dental setting and are discussed below.

5.2.3.1 Abstinence of smoking

In this study, abstinence during all follow-ups was significantly found to be higher for participants in the 5A's group compared to BA group. However, the data fluctuate with increasing number of patients with 7-day abstinence at 3-month but later decreased at 6-month follow-up. However, after controlling for age, ethnic, marital status and level of education, patients in the 5A's group was 2.11 times likely to quit at 6-month compared to brief advice, but was not statistically significant. Gender was not controlled, as the vast majority of the smokers in this study were male. Consequently, when the smoking characteristics of smokers were controlled, only the type of smoker (level of CO in lungs) had a statistically significant influence on the probability of abstinence at 6-month follow-up. At this time, patients in the 5A's group were 1.9 times likely to quit at 6-month compared to brief advice but was also not statistically significant. These results were similar to a US study comparing 5A's and 3A's, where more patients quitted in the 5A's condition than those in the 3A's but was not significant (Gordon *et al*., 2007). The higher abstinence in the 5A's group were because the 5A's behavioural therapy in this study assessed participants' readiness to change as a guide to identify which appropriate method to apply on patients to assist them to quit

smoking. On the contrary, BA only provides brief advice regardless of assessing participants' readiness to change. This is due to the following reasons pertaining to the behavioural therapy aspects.

Firstly, using the stage of change as a guide in the step- assess in 5A's, participants in the preparation stage allows them to decide to commit to making changes, ready to start taking action in the future or likewise. Motivational questions propose to smokers opportunistically even in the dental setting may trigger and can initiate them to decide to quit smoking. However, as stated by Báezconde-Garbanati, Reyna, Portugal, Barahona & Noltenius (2011), the plans to quit at preparation stage should focus on dealing with obstacles to quitting and possible withdrawal symptoms. Certain situations either socially or psychologically may trigger them to start smoking again. Such situations include drinking coffee or alcoholic drinks, after meal time or being around smoking friends (Báezconde-Garbanati *et al*., 2011).

For patients who were unwilling to make a quit attempt the 5A's intervention were more towards promoting motivation to quit (Fiore *et al*., 2000, Fiore *et al.,* 2008). These patients were either in the contemplation or precontemplation stage. Patients who are in the contemplation stage indicated that they are beginning to aware that change is necessary but is ambivalent about it (Biener & Abrams, 1991). In order to increase quit attempts, motivational interviewing strategies using the 5R's (relevance, risks, rewards, roadblocks and repetition) is effective if used for contemplators (Fiore *et al*., 2000, Fiore *et al.,* 2008). Smokers in the precontemplation stage are not interested in quitting and can be very defensive when given advice to quit (Biener & Abrams, 1991). Asking pre-contemplators to give reasons on what would make them consider quitting may help them to move to the contemplation stage (Báezconde-Garbanati *et al*., 2011). Thus, first step of 5A's (Ask) could be a possible initiation of the smoking cessation treatment on the chair-side.

The strength of the 5A's intervention is explained by the motivation component in behaviour change method. The 5A's is also consistent with MI technique which focuses on exploring a smokers' feelings, beliefs, ideas, and values on tobacco use to uncover any ambivalence about tobacco use (Fiore *et al*., 2000, Fiore *et al*., 2008). When these theories were discussed with the clinicians, the reasons, ideas, and needs to eliminate tobacco use may initiate an action to change smoking behaviour. The components of steps- Assess, Assist and Arrange in the 5A's were the extra strength that BA do not have. Additionally, motivation in TDF also highlighted emotions, social support, beliefs about consequences, and role and identity as theories in behaviour change (Phillips *et al.,* 2015). Combining self-regulation and social support involving families, friends or colleagues are important to increase their motivation to quit smoking (Ochsner *et al.,* 2014).

In this study, BA was not delivered as extensive as the 5A's regardless of the motivational component that both had to change behaviour. Although, a recent Cochrane review by Stead *et al.* in 2013 suggested that providing a follow-up appointment may increase the effect, however our study shows otherwise. Despite the same number of follow-ups given to participants in both interventions, only about a third quit smoking with BA. However, researchers found that BA is effective for smokers who are strongly motivated to quit (Coleman, 2004; Fiore *et al*, 2008). Thus, BA intervention may be a preferable option as the first treatment option since it is cheaper and less time consuming, although the effect might not be equivalent as of 5A's (Stead *et al.,* 2013). In his review, Stead *et al.* (2013) also pointed out that the proportion of physicians offering advice to quit is more important and provides greater public health benefits. Thus, BA could be suggested as a treatment for smoking cessation integrated with other dental treatments treating smoking-related oral diseases or conditions in the primary dental care. Studies have shown that brief advice is one of

the most cost-effective interventions in medicine and is shown to be an effective means of smoking cessation in smokers with established smoking-related disease (Coleman, 2004; Lancaster & Stead, 2005). Moreover, West *et al*. 2015 analysed in his review that BA from a trained health care worker can have a small but important effect in promoting smoking cessation in any health-care system.

This clinical trial found that the smokers' oral health condition during the clinical examination at baseline was mainly teeth staining, halitosis, and periodontal disease. Therefore, dentists should assess patients' oral health status and highlight these effects, as it is the easiest and most prominent to be detected as shown in these studies when advising the patient to stop smoking. Findings from this study also upkeep the importance of personalising advice by adding oral health related disease to tobacco use as an additional component to the smoking cessation counselling (Coleman, 2004; Lancaster & Stead, 2005). Emphasising smoking cessation counselling by incorporating personalise advice related to oral health and a strong involvement of smokers in the planning process will heighten the smokers' motivation to quit smoking and preventing relapse. In fact, Ojima *et al.* (2013) found that there is a need for dentists to tackle patients smoking habit due to the detrimental effects of smoking on oral health however; the smoking status of patients must first be identified.

In this study, abstinence was verified biochemically only at 6-month follow-up because it was done in the clinic, whereas at 1-month and 3-month follow-ups it was done via telephone calls. A trial done by An *et al*., (2006) found that at 3-month follow-up, a 7-day abstinence in the telephone care group was higher compared with the standard care group (mailed self-help pamphlet) (OR, 5.84; 95% CI, 4.02-8.50). In addition to that, Zhu *et al*. (2002) found that proactive telephone counseling increased the percentage of smokers making attempts to quit and reduced the probability of relapse. Thus, it is possible to suggest that telephone counseling during follow-up may

increase abstinence rate. Moreover, the highest rate of abstinence for both interventions in this study was at 3-month follow-up. A review of trials found that telephone counselling can be effective and multiple sessions are likely to be most helpful (Stead, Perera & Lancaster, 2006). This could also suggest that frequent follow-up intervals in this study may increase abstinence rate. However, a recent review concluded that there is limited evidence about the optimal number of calls (Stead, Hartmann-Boyce, Perera, & Lancaster, 2013).

At 6-month follow-up almost half quitters from BA group relapsed/defaulters compared to only 2 quitters from 5A's group. The probable reason was that relapse prevention was included in the training module and study protocol for 5A's and not for BA. Thus, relapse prevention was not discussed with patients during the BA intervention. Most relapse occurs early in the quitting process and some occurs months or even years after quitting. At present the best strategy to produce high long-term abstinence rates is the use of evidence-based cessation medication and intense cessation counselling (Fiore *et al.,* 2008). However, to suggest medication and intense counselling as a smoking cessation intervention in the dental setting might be appropriate for dental specialists and not general dental practitioners.

In this study, the methods of abstinence were categorized as cold turkey or reduce gradually. The majority of smokers who quitted in both interventions during all follow-ups chose to quit cold turkey over reducing their cigarette consumption gradually. Quitting cold turkey is the standard way to quit smoking, which is to smoke until a quit day at a point the smokers stop using all cigarettes. Although reducing the amount of cigarette is not popular in this study, proposing this approach could encourage more smokers to quit smoking.

5.2.3.2 Behaviour change

This clinical trial practices the transtheoretical model (TTM) developed by Prochaska & DiClemente (1983) to assess smokers behaviour change. TTM or the stage of change model was chosen as it is one of the frequently cited frameworks for understanding the stages of behaviour change in smokers (Cahill, Lancaster, & Green, 2010). The principle of the stage of change model is about how people change and not why people do not change (Naidoo & Wills, 1994). The stage of change model showed that any change that we make is not final but part of an ongoing cycle of change.

In this clinical trial, the patients enrolled can be at any level of the stages of change. This study found that most smokers were at the preparation stage at baseline for both smoking cessation interventions (5A's and BA), comparable with a study by Yasin *et al.* (2011), which had about 60% of smokers in the similar stage upon joining their program. Consequently, more than 25% of smokers in both groups were contemplators, while others were in the precontemplation stage. Hence, this indicates that smokers who attended dental clinics probably already have the intention to quit smoking similar to other smokers attended other health facilities (Yasin *et al.,* 2011). Therefore, asking about their smoking status and habit may initiate them to start thinking about quitting.

Hall and Rossi (2008), explained that initiation of behaviour change occur by looking at two intermediate indicators of change in the stages of change which are the decisional balance (the pros and cons); and self-efficacy (the situational confidence or temptation). In this study, smokers who were at the preparation stage (baseline) in the 5A's model group were twice likely to quit smoking (action stage) compared to the BA group at 1-month follow-up. In the preparation stage, the benefit of quitting (pros) clearly outweighs the costs of changing (cons) (Hall & Rossi, 2008). Smokers in this stage of

change are intending to take action and are assisted to be well prepared for the action to take place (Prochaska, 2013).

Additionally, smokers who were at the preparation stage at baseline for both interventions are more likely to quit compared to smokers who were at the contemplation and precontemplation stage. The reason is that the cons of quitting are obviously greater than the pros in precontemplation stage and the pros of quitting are clearly higher in contemplation stage (Hall & Rossi, 2008). Participants in the precontemplation stage were probably uninformed or under-informed about the consequences of their smoking behaviour or they may have tried to change a number of times and become demoralized about their abilities to change (Prochaska, 2013). Meanwhile, participants in the contemplation stage are aware of the pros of changing and are also aware on the cons of changing. This balance between the costs and benefits of changing can produce profound ambivalence and keeps people held in contemplation for long periods of time (Prochaska, 2013). However, as discussed earlier, participants in the preparation have taken significant steps toward behaviour change. Thus, the first principle of progress to positive change (Hall & Rossi, 2008) is to raise the pros. This was done by relating their tobacco-use with the manifestation of their oral diseases or condition will increase the likelihood of them wanting to quit. Thus, identifying an individual's stage of change is necessary to apply a specific smoking intervention based on their readiness to change (Riemsma *et al.,* 2003, Fiore *et al.,* 2008).

Interestingly, there were smokers in the 5A's model group who initially were in the precontemplation stage at baseline moved to action stage during the 1-month follow-up. However, Yasin *et al.,* 2011 has predicted that smokers with lower motivation stage (contemplation or precontemplation) were to relapse three times more compared to those with a higher motivation stage (preparation) Thus, smokers with low motivation should be observed with extra attention as they have an increased risk of developing

relapse. A rapid stage transition may suggest that smokers who were less prepared to make a quit attempt, might eventually relapse (Yasin *et al.,* 2011).

Most quitters (action stage) were found during the 3-month follow-up for both interventions compared to another period of follow-ups. More than two-third of these quitters had sustained abstinence for at least 2 months from both interventions. However, there were more sustained quitters in the 5A's group compared to the BA group. Nonetheless, during the 3-month follow-up most smokers were in the preparation stage for both interventions, however slightly more were from the 5A's group compared to the BA group. At 6-month follow-up, the number of quitters reduced slightly, while smokers in the preparation stage increased for both interventions. However, sustained abstinence was also seen during this period. Seven from BA group and 14 from 5A's group managed to sustain abstinence for at least 5 months (from the 1-month follow-up). This clinical trial suggests that frequent follow-ups by telephone calls can be helpful in optimising the intensity of the smoking cessation treatment. A study by Bhang, *et al*. (2013) reported that the intensity and continuity of the smoking cessation intervention positively affect the treatment outcome. Frequent attendance at clinical sessions could also reduce the likelihood of relapse among smokers who have recently quit (Yasin *et al.*, 2013).

Relapse is not a failure, but it is a situation that the individual may go backwards and forwards through a series of cycles of change, like a revolving door (Naidoo & Wills, 1994). The process of relapse is determined by multiple psychological and treatment factors. At 1 month and 3-month follow-up, more smokers in the BA group regressed to either contemplation or precontemplation after initially being in the preparation stage at baseline compared to the smokers from the 5A's group. Then again, at 6 months the number of regressed increased to either contemplation, precontemplation or preparation stage. According to Yasin *et al.* (2011), this could be due to the feeling of despair and

hopelessness felt by smokers after failing to quit. Moreover, a study by Hughes, Keely & Naud (2004) reported that the smokers' intention to quit may change over a short period of time, as short as one week to one month.

5.2.3.3 Breath carbon monoxide analyser

The strength of this trial was the use of a confirmative evaluation of the smoking cessation interventions with a comparison of abstinence verified chemically using a carbon monoxide analyser on an intent-to-treat basis. The piCO^{+} Smokerlyzer® (Bedfont Scientific Ltd., 2012) used in this trial is a breath carbon monoxide (CO) monitor act a biochemical marker of cigarette smoking used by healthcare professionals for smoking cessation programmes or research. In this trial, the cut-off of CO ≤6ppm (Bedfont Scientific Ltd., 2012) was considered as a non-smoker. There were 4 patients from the 5A's group and 3 patients from the BA group reported abstinence at 6-month follow-up but had CO reading between 7-10ppm. These elevated measures could potentially be due to exposure to second-hand smoke, the speed of exhalation and CO measures (Raiff, Faix, Turturici, & Dallery, 2010). The same authors also reported that heavy smokers switched from exhaling slow to exhaling fast, showed a 30% reduction in CO. Additionally, some exposure to CO may occur in normal day-to-day life, due to environmental pollution, passive smoking, and occupational exposure, but the most likely cause of high levels of exposure is smoking (Middleton & Morice, 2000).

5.2.4 Limitations of research

There were several limitations that needed to be addressed. The recruitment of Dental Public Health (DPH) specialists was considered for this study due to the high turnover rate of general dentists in the health system. The smoking cessation provider needs to be allocated at the designated dental clinic for at least one year during the trial period. The age range and years of clinical experience of the DPH specialists were

almost similar. This will minimise the variations in counselling patients. In reality, the variation in personality traits of the specialist or dentists may affect the outcomes of the counselling. Future study may want to look for information on how dentists' personality characteristics may be effect the success of smoking intervention.

We were allowed only to recruit six DPH specialists for this study. Thus, this reduced the ability to recruit more patients. The lack of statistical significance in the analysis for this trial was probably due to not meeting the estimated sample size thus, insufficient statistical power. The post hoc statistical power calculation for BA group was 0.77 with 23% error; while for 5A's group was 0.73 with 27% error. Time constraints and other organisational barriers such as time allocated for appointments contributed to the limitations. The lack of significance in the analysis could probably be the sample size was not met and high dropout rates for both BA and 5A's group. A larger sample would provide greater power and better accuracy. However, since this trial was the first conducted in Malaysia, it was difficult to calculate the precise required sample size and thus it could be accepted as a discovery research (Rahman, 2013). There were other problems in contacting the patients for their follow-ups. Patients were not easily contactable or had to be contacted more than twice for the follow-ups to be done. Some patients requested to be contacted at odd hours away from the time allocated for the investigators to conduct the follow-ups via telephone calls. Some patients tend to provide their telephone numbers, answered the first follow-up call, but were reluctant to answer the next time. Again, if an appointment were given to them for their 6-month follow-up, some failed to attend. Thus, our inability to recruit patients as expected and to deliver the full intervention to patients who did enrol raises important issues and a cautionary note for future research and intervention.

In this study, patients in the BA group were older than the 5A's group. In Korean smokers, the stages of change for smoking cessation were associated with age, where

older smokers tend to be in the precontemplation stage (Leem *et al.,* 2017). Moreover, those who had smoked for a longer time and who smoked more cigarettes per day were more likely to be in the precontemplation stage (Leem *et al.,* 2017). Therefore, it is recommended for future research to randomize smokers according to their age group as different counselling technique may differ according to the stage of change.

A number of challenges related to the research setting itself. Because this was a research protocol, it was necessary and appropriate to follow informed consent procedures. Only behavioural intervention was used in this trial due to limited access of NRT for dentists to prescribe it, as it was not the standard practice of smoking cessation intervention in the dental practice in the Ministry of Health (Oral Health Division, 2005). Additionally, the recent Cochrane Review (Carr & Ebbert, 2012) has stated that behavioural counselling is a consistent component in most trials for smoking cessation in the dental settings.

5.3 Part 2(a): Dental Patients' Knowledge of the Effects of Smoking and Their Perceptions of and Attitudes toward the Role of Dentists in Smoking Cessation Intervention.

5.3.1 Introduction

This study provides an insight on how much knowledge does dental patients had on the general and oral health effects of tobacco use. It serves as an educational diagnosis of the community. Furthermore, their perceptions on dentists providing quit smoking advice were explored.

5.3.2 Characteristics of the study population

Participants in this study were dental patients. Most people are afraid to come for dental care. Individuals seeking dental care only if a problem appeared had significantly more anxiety than regular attendees (Sitheeque, Massoud, Yahya & Humphris, 2015). Dental patients in this study could be more either health conscious or came for a symptomatic relief of dental pain. They tended to be middle-aged, female, and Malay and having completed secondary or primary school education. The sample contained around 25% current smokers, which is higher than the percentage in a similar study on dental patients by Sood *et al*. (2014) but lower than in the study by Terrades *et al*. 2009. However, men dominated the number of smokers in this study, comparable to the findings of population studies by Lim *et al*. (2013) and the GATS in 2011.

In this study, the number of cigarettes smoked per day was lower than in the population study done by Lim *et al*. (2013) and GATS (Institute of Public Health, 2012). The decrease in the average number of cigarettes smoked may be due to the continuous increasing cigarette price; the recent hike in the price of a pack of 20 branded cigarettes was RM 18.00 (Hana, 2015). It was previously estimated that regular

smokers in Malaysia spent an average of RM 400 per month on branded cigarettes (Institute for Public Health, 2012). An increased monthly expenditure on cigarettes could be seen as an economic burden to smokers. Moreover, tobacco use can worsen poverty among smokers because they are at risk for diseases and premature death, depriving their families of income (World Health Organization, 2003). In the Global Adult Tobacco Survey (2011), 7% of cigarette smokers were estimated to not have enough money for food during the last 6 months due to spending money on cigarettes (Institute for Public Health, 2012).

This study has found that participants in rural areas were more likely to be smokers compared to participants living in urban areas. This is consistent with other studies, where the uptake of smoking was found to be higher among those with low socioeconomic status (Hiscock *et al*., 2012; Lim *et al*., 2013). Hiscock *et al*. (2012) suggested that this may be the result of reduced social support for quitting, low motivation to quit, stronger addiction to tobacco, not completing smoking cessation support sessions, psychological differences such as lack of self-efficacy, and targeted marketing by the tobacco industry. The possibility that urban residents experience greater exposure to anti-smoking campaigns and measures could also be a contributing factor (Lim *et al*., 2013).

The influence of having a family member who smokes cigarettes on motivating those who had never smoked to begin smoking was found to be significant in this study. This is similar to other studies that indicate having a friend or family member who smokes predicts a higher risk of experimentation with smoking (Huang *et al*., 2013) and is associated with lifetime cigarette use in male adolescents (Baheiraei *et al*., 2013).

5.3.3 Dental Patients' Knowledge of the Effects of Smoking

Knowledge can and does lead to behaviour change. However, this kind of knowledge that appears to be needed is that there is a problem and that there is a behavioural response that can solve the problem. In this study, stained teeth and bad breath, which can affect aesthetics and social health, were the most well-known effects of smoking among the participants. There was a moderate level of knowledge and awareness of the effects of smoking on oral cancer in this study. Almost three-quarters of participants (74.4%) in this study knew oral cancer occurs due to smoking habits, which is higher in comparison to other studies (Saleh *et al*., 2012) but lower compared to the findings from NOHSA (2010) which was 86.9%. The level of awareness may differ between different ethnic subgroups, as health campaigns conducted were not uniformly extended across all ethnicities (Saleh *et al*., 2012). Early detection of oral cancer could improve the likelihood of successfully treating patients (Warnakulasuriya, 2009). However, it is difficult to detect oral cancer and this condition does not develop immediately; thus, it is not a suitable motivator for smoking cessation at an earlier stage. Therefore, dentist should highlight stained teeth and bad breath when advising patients to stop smoking, because detection is easy and these conditions are the most prominent, as shown in this study.

Effects on periodontal disease, mouth ulcers, altered taste, and impaired wound healing were ranked as the least known effects of smoking in this study. Our study showed that patients were less concerned and knowledgeable about periodontal disease related to smoking habits. Recent data revealed that about 94% of dentate Malaysian adults had periodontal disease (Oral Health Division, 2013). Lack of knowledge and awareness and therefore not seeking treatment could be one of the explanations of the situation here. Lung *et al*. (2005) found that patients' lack of awareness of the relationship between smoking and periodontal diseases, with only 6% of respondents

knowing of the link between tobacco and periodontal diseases. The same author also found that an increased awareness about the oral problems caused by smoking increased when the respondents were non-smokers and when they were registered with a general dental practitioner. In our study, this could likely be similar as the non-smokers who attended the dental clinics are more knowledgeable compared to smokers. In another situation, Hujoel *et al.* (2002) argued that a periodontitis epidemic driven by smoking were remained hidden for most of the 20th century. This situation could be similar in Malaysia, where the disease may be silent and not known until detection. Hence, dentists should inform their patients about the effects of smoking when providing their routine oral health education advice prior to periodontal treatment. Furthermore, as curative treatments are not a sustainable approach addressing the burden of oral diseases, prevention of oral diseases and promotion of oral health should be the core of national policies and programmes (World Health Organisation, 2015). This includes reducing risk factors of oral diseases and their associated determinants by improving awareness of healthy behaviours and health literacy (World Health Organisation, 2015). NOHSA (2010) has recommended oral health promotion efforts to the emphasis on prevention and control of periodontal disease and the need to further strengthen the common risk factor approach as a strategy to reduce periodontal disease (Oral Health Division, 2013).

There was also a moderate level of knowledge and awareness of the effects of smoking on lung cancer (77.3%) and heart disease (71.7%) in this study. Other studies showed higher knowledge on smoking causes lung cancer (Terrades *et al.,* 2009; Rikard-Bell *et al.,* 2003; Sood *et al.,* 2014). However, the knowledge about smoking and heart disease was comparatively less compared to smoking and lung cancer (Terrades *et al.,* 2009; Rikard-Bell *et al.,* 2003; Sood *et al.,* 2014). This could be due to the immediate effect of smoking on heart disease was not specifically known to cause

by smoking but were caused by other dominant factors such as high cholesterol (Sood *et al.,* 2014). Lim *et al*. (2013) reported that despite several population interventions over the past decade, the prevalence of smoking among Malaysian males has remained high. Thus, this shows that these public health efforts were probably not broad and comprehensive enough in raising awareness. Public health policies should consider focusing on high-risk subpopulations for it to be a success.

5.3.4 Dental Patients' Perceptions of and Attitudes toward the Role of Dentists in Smoking Cessation Intervention

The majority of patients from this study showed positive perceptions of dentists providing smoking cessation advice. Most patients agreed that their dentists should be interested in their patients' smoking status, similar to studies conducted previously (Terrades *et al*., 2009; Kadanakuppe & Aradhya, 2009; Sood *et al*., 2014). Most of these patients also think that their dentists should discuss smoking with their patients whether to highlight the oral or the general health effects of smoking. Moreover, these patients felt that dentists should provide smoking cessation advice and that they would not change to another dentist if their dentists asked them about smoking when the opportunity arose. However, smoking patients are significantly more likely to indicate that they may change dentist if asked about smoking every time. Nonetheless, WHO (2003) reported that dentists can build their patients' interest in stopping tobacco use by showing the actual effects of tobacco on the mouth.

Interestingly, more than half of the smokers from this study would expect their dentists to discuss their smoking habits and would appreciate assistance to quit smoking. A higher percentage of smokers indicated their willingness to attempt to quit smoking if their dentists suggested they do so. Rankin *et al*. (2010) stated that if dentists could routinely encourage their patients to quit smoking, even with modest success

rates, the effect on public health would be massive. Attitudes are beliefs about consequences or outcomes and the personal evaluation of such beliefs (Ramseier & Suvan, 2010). Thus, the smokers' belief that smoking may harm them (smokers) will not be motivating unless it is evaluated as important (Ramseier & Suvan, 2010).

The majority of smokers from this study would appreciate it if their dentists provided practical advice and written information on quitting smoking. Routinely establishing patients' smoking history during dental check-ups using a simple questionnaire to determine each patient's level of addiction could be a starting point for assisting them to quit (Ramseier & Fundak 2008). Dentists play a crucial role in terms of advising and supporting their patients in smoking cessation due to the regularity of patient–dentist contact. In addition, according to the World Health Organization (2003), dentists often spend more time with patients than other clinicians do, providing opportunities to integrate education and intervention. Furthermore, the public views dentists as trustworthy and credible; thus, dentists have the ability to affect people's knowledge, attitudes, and beliefs (Naidoo & Wills, 2000). Additionally, oral health promotion in healthcare settings is often opportunistic, where patients identified as 'at risk' may be offered advice, information on quitting, or a further referral (Naidoo & Wills, 2000).

5.3.5 Strength of this study

The strength of this study was the participation of dental patients attending private and public dental clinic in both urban and rural areas. This study can contribute to the paradigm shift in dental healthcare by creating more dental health education materials on smoking and oral diseases or conditions.

5.3.6 Limitations of study

There were several limitations in conducting this survey. Firstly, this survey used a convenient sampling method, thus the findings would not represent the study population. It was used due to time- and money constrains. In addition, the Ministry of Health only allowed this survey to be conducted in Negeri Sembilan. The reason behind the selection of the chosen states was that there was too many research conducted in the clinical settings of the Ministry of Health within the proximate area of the university, which is the Klang Valley.

5.4 Part 2(b): Motivation for, Capabilities in and Opportunities for Malaysian Dentists in Smoking Cessation Intervention in Dental Practices

5.4.1 Introduction

This study provides encouraging evidence on issues in relation to smoking cessation activity perceived by dentists in Malaysia. The TDQ questionnaire aimed to understand dentists' behaviour and challenges to implement smoking cessation intervention based on the existing CPG.

5.4.2 Socio-Demographics of the Study Population

A similar proportion of dentists from the public and private practices participated in this study. Their average age was 37 years old, were mainly female, married, of Malay ethnicity and never smokes. In comparison with Malaysian Dental Council's annual report 2013, the majority of dentists were also female and of Malay ethnicity (Malaysian Dental Council, 2013). The majority of the participants in this study had 11 years of working experience; however, most were not dental specialists. The response rate was slightly less than half of the study population. However, 285 dentists (158 public dentists and 127 private dentists) responded to the mailed questionnaire. Yet, this total number of response is still within the estimated sample size for the level of confidence at 90% based on the total number of 4,253 dentists (Division 1) with annual practicing certificates (Malaysian Dental Council, 2012).

5.4.3 Dentists Motivation as Smoking Cessation Counsellors

In the TDQ questionnaire, motivation in smoking cessation intervention was assessed by five domains. They were 1) professional role and identity, 2) emotion, 3) motivation and goals, 4) social influences and 5) beliefs about consequences.

In this study most public dentists compared to private dentists were significantly positive about their professional role in smoking cessation. This means that public dentists perceived that their role in smoking cessation is considered appropriate compared to private dentists who might not think the same way. In another manner, public dentists also recognised smoking cessation intervention to be related to, connected with and suitable for their profession. Although dentists are not certified counsellors, they do have the communication skills to educate and advice patients particularly on oral health diseases or conditions related tobacco-use. The positive perception on the professional role of dentists in smoking cessation was also found similar to other studies (Saito *et al*., 2010; Vaithilingam *et al*., 2012; Hanioka *et al*., 2013; Amer Nordin *et al*., 2014).

Most dentists in this study were significantly motivated to improve the provision of tobacco cessation services. Motivation could be either intrinsic or extrinsic. Many too agreed that the importance of their patients is more essential then the barriers in providing such intervention. This intrinsic motivation could actually come from the dentists' genuine interest and ambition and sometimes assumes no reward. However, the lack of time and no remuneration for conducting such treatment may reduce their enthusiasm in some dentists. Yet, it does not mean that they do not expect some external rewards for instance approval and attention particularly from their bosses or managers (extrinsic motivation). Indeed, the most common reported barrier to providing smoking cessation interventions is the lack of time (Vaithilingam *et al.,* 2012), while others are lack of training, lack of patient interest, lack of confidence and fear of damaging dentist-patient relationship (British Dental Association, 2015).

In this study, most dentists also felt emotionally good (intrinsic motivation) on assisting patients to quit smoking but their heavy workload, which sometimes requires extensive treatment time, may prevent them from providing smoking cessation

counselling. A focus group study by Watt, McGlone, Dykes, & Smith (2004) found that dentists do perceived that if smoking was discussed during dental treatment it would result in a lengthy and detailed discussion. Thus, again time is the main issue in providing smoking cessation intervention here.

Apart from dentists recognising their role in smoking cessation in this study, they also claim that their clinic or organisations do support a tobacco-free lifestyle and that their services would be improved by having a committed person leading the effort. Thus, social support will help dentists to cope with a variety of biological, psychological and social stressors. Such support could be from their social network involving colleagues, managers and even patients or patients' family members. However, this study found that dentists still perceived that most of their patients do not want to receive smoking cessation counselling. Yet, quite a number of dentists were unsure of patients' compliance. However, they positively perceived that patients do appreciate them when helping to quit smoking but were again unsure of their counselling ability. Likewise, as indicated by most dentists, they also perceived that quit smoking treatment might be of a low priority in patients.

5.4.4 Dentists Capability in Smoking Cessation Intervention

In this study, the dentists' ability to deliver smoking cessation counselling was assessed based on their knowledge, skills, beliefs, memory, attention and decision-making processes. Overall, most dentists do have some knowledge on smoking cessation counselling. The study findings show that among all respondents, public dentists were more aware with the existing 5A's of the Malaysian CPG on tobacco dependence and treatment. Additionally, comparing with the age groups, younger dentists were more aware of the existing 5A's of the Malaysian CPG on tobacco dependence and treatment. This may suggests that lack of training is a major reason for

nonadherence to the guideline (Hu *et al*., 2006). Thus, younger dentists were most likely were trained during their undergraduate curriculum (Yahya, Rani, Abdullah, & Kadir, 2012) or on job training (Oral Health Division, 2005; Amer Nordin *et al*., 2014) compared to senior dentists. Only recently, most dental schools in Malaysia have included smoking cessation as part of the dental curriculum.

The significant difference in knowledge between public and private dentists may be due to their different job priorities in different sectors. Consequently, their continuous professional development also differs in terms of their needs. Public dentists are likelier to attend courses on smoking cessation compared to private dentists. A more hands-on money oriented kind of course would be preferred by private dentists. However, in the UK, private dental practices deliver more smoking cessation activities and report fewer barriers than their NHS counterparts or mixed practices (Csikar, Williams & Beal, 2009).

This study found that dentists do have the skills to ask appropriate questions pertaining to smoking and to reinforce patients during smoking cessation counselling. However, most were not confident or belief in their capabilities in assessing, assisting and monitoring patients' tobacco use and to prescribe pharmaceutical product such as nicotine replacement therapy (NRT). Because of this, it is not yet a standard practise in the dental sector to run a quit-smoking clinic (Oral Health Division, 2005b). Although evidence on pharmacotherapy to date is promising, it should be more widely examined in dental settings (Needleman, *et al*., 2010). Findings from a study by Amer Nordin *et al*. (2014) suggest that dentists have a strong potential to contribute significantly to providing smoking cessation treatment if they are adequately trained. Addition to that, dentists in this study found it difficult to decide to promote tobacco abstinence to patients in their clinic. Thus, smoking cessation intervention would be suitable to conduct before any dental treatment began due to the nature of dental work which prevents conversations during treatment particularly for patients. Nonetheless, reinforcing tobacco abstinence

was rather easier for them to deliver probably due to the increase confidence of dentists in patients' acceptance on the smoking cessation advice given earlier. Therefore, dentists have a strong potential to contribute significantly to providing smoking cessation treatment if adequately trained and confident in their capabilities to do so.

5.4.5 Dentists opportunities in smoking cessation intervention

This study found that certain environmental context and resources to facilitate the implementation of smoking cessation in the dental practice vary according to the type of practice, private or public. The environmental context and resources creates the opportunities that encourage dentists to conduct of smoking cessation intervention in the dental clinic. In this study, significantly more private dentists claimed that they do not have self-help materials/pamphlets on quit smoking to distribute to patients compared to public dentists. Public dentists have the advantage of direct access to obtain these pamphlets from the Ministry of Health Promotion Board and can have them available in their clinic. But, for private dentists they probably need to request formally from an organisation or from pharmaceutical companies, which have these self-help materials/pamphlets.

Most dentists either private or public in this study claimed that there was no system that allows them to provide follow-up support between clinical visits. Most of them also claimed that the system does not cue/prompt them to counsel against tobacco use. Thus, most of them claimed that the clinical management did not remove the barriers to the provision of tobacco use counselling.

Most dentists, regardless of their type of practice reported that they received no feedback in the clinic from promoting tobacco abstinence. Most of them also claimed that there were insufficient reimbursements for them for promoting such activity. In public practice, reimbursement would be as their key performance index in number of

cases done on tobacco abstinence within a year. Treatment price for tobacco abstinence might not be of financial benefit for private dentists as it could take extra time compared to doing other dental treatment. Additionally, the risk of losing patients could be a greater concern to private dentists compared to public dentists. However, researchers suggested two factors to facilitate delivering of smoking cessation (Watt, McGlone, Dykes, & Smith, 2004; Johnson, Lowe, & Warnakulasuriya, 2006; John, Thomas, & Richards, 2003). These factors could be of use as a result from this study. The first factor, patients with oral health problems or conditions are more likely to be motivated than other patients. Thus, personalising advice using oral health related diseases or conditions to tobacco use might have an impact on the uptake of smoking cessation intervention. Secondly, reimbursement of smoking cessation advice or NRT prescribed by dentists can increase their interest in providing smoking cessation (British Dental Association, 2015). More funding on preventive services in the health systems could be another way forward. Reforms of prescribing policy and tailored cessation resources for use in clinical dental settings are needed to enable cessation advice to become routinely incorporated into daily practice (Watt *et al*., 2006). Information on local helplines and cessation services should also be made available in waiting areas.

5.4.6 Strength of study

This study has several strengths. First is the adoption of a systematic randomised sampling method through DPMIS's list of active dental practitioners for subject selection. Next, the study was able to capture both public and private dentists practising in dental health clinics and hospital-based clinics, academicians in private or public universities and dental administrators.

5.4.7 Limitations of study

The limitation of the research study is the limited sample size. The inability to obtain the expected sample size due to poor response rate was the study's limitation. Several factors were identified as the cause of the poor response rate after 2 follow-ups was done: 1) Dentists do not wish to participate and request to be excluded after a follow-up phone call was made; 2) Dentists could not be contacted via telephone calls; 3) Change or transfer of workplace; 4) Have multiple workplace addresses, receiving the questionnaire late or lost; 5) The questionnaires were lost during postal, either to the subjects or by the subjects back to the researcher; 6) Dentists received the questionnaire but did not respond to it as a priority.

5.5 Summary

This chapter has discussed extensively on the findings of Part 1 and Part 2 of this study. The clinical trial in part 1 facilitated us to compare the effectiveness of two types of smoking cessation interventions, which are the 5A's model, and the brief advice (BA) delivered by dentists in a dental setting. This trial was one of the few studies assessing changes in motivation to quit smoking among Malaysian dental patients who smokes cigarettes. The higher abstinence in the 5A's group were due to that it assessed participants' readiness to change and use it as a guide to identify which appropriate method to apply on patients to assist them to quit smoking. By controlling the sociodemographic factors and smoking characteristics of the participants, higher abstinence is still seen in the 5A's group although it was not statistically significant. In contrast, BA only provides brief advice regardless of the participants' stage of change.

Part 2(a) of this study has provided an understanding on how much knowledge does dental patients have on the general and oral health effects of tobacco use. It assists as an educational analysis of the community and exploration of their perceptions on dentists

providing quit smoking advice. In this study, stained teeth and bad breath were the most well-known effects of smoking among the participants. There was a moderate level of knowledge and awareness of the effects of smoking on oral cancer in this study. The least known effects of smoking in this study were on periodontal disease, mouth ulcers, altered taste, and impaired wound healing. Dental patients' in this study have positive perceptions of and attitudes toward the role of dentists in smoking cessation intervention.

Part 2(b) of this study provides helpful evidence on issues in relation to smoking cessation activity perceived by dentists in Malaysia. The dentists' behaviour and challenges to implement smoking cessation intervention based on the existing CPG were understood. Most public dentists compared to private dentists were significantly positive about their professional role in smoking cessation. Moreover, a majority of dentists in this study were significantly motivated to improve the provision of tobacco cessation services. However, this study found that dentists still perceived that most of their patients do not want to receive smoking cessation counselling thus were unsure of patients' compliance. Dentists in this study have the knowledge and skills to ask appropriate questions pertaining to smoking and to reinforce patients during smoking cessation counselling. On the other hand, most were not confident or belief in their capabilities in assessing, assisting and monitoring patients' tobacco use and to prescribe NRT. Most dentists claimed that they could not provide follow-up support to patients between clinical visits. Most of them also claimed that the system does not support them to counsel against tobacco use and that the clinical management did not remove the barriers to the provision of tobacco use counselling.

The following chapter, Chapter 6- Conclusion and Recommendation, concludes in detail on the findings for Part1 and Part 2 of the study.

CHAPTER 6: CONCLUSION & RECOMMENDATIONS

6.0 Introduction

This chapter provide the conclusion for Part 1 and Part 2 of this research. This present study adds evidence to the existing literature in the provision of smoking cessation in the dental practice.

6.1 Part 1: The 5 A's Model in Behavioural Therapy Versus Brief Advice on Smoking Cessation Delivered by Dentists in a Dental Setting

6.1.1 Conclusions

In this study, dentists are can help smokers to quit regardless of either by the used of 5A's or BA in smoking cessation intervention. BA intervention may be a preferable option as the first treatment option integrated with other dental treatments treating smoking-related oral diseases or conditions in the primary dental care since it is cheaper and less time consuming.

6.1.2 Recommendations for future research

Our inability to recruit patients as expected and to deliver the full intervention to patients who did enrol raises important issues and a cautionary note for future research and intervention. Due to the relatively small sample size and limitations of logistics in a longitudinal study, a larger sample size is desirable in future. However, this type of study requires a long term co-operation and commitment from dentists or public health officers involve as researchers to engage their patients in smoking cessation intervention for dental care.

6.2 Part 2(a): Dental Patients' Knowledge of the Effects of Smoking and Their Perceptions of and Attitudes toward the Role of Dentists in Smoking Cessation Intervention

6.2.1 Conclusions

Dental patients have a good knowledge of the effects of smoking on oral and general health. Stained teeth and bad breath are the most well known effects of smoking among the participants in this study. Additionally, there was a moderate level of knowledge and awareness on effects of smoking towards lung cancer and oral cancer. However, the effects on periodontal disease, mouth ulcer, altered taste and impaired wound healing was reported the least known effects of smoking. Therefore, dentist should highlight stained teeth and bad breath when advising patients to stop smoking, because it is easily detected and these conditions are the most prominent, as shown in this study.

Dental patients have positive perception about dentist giving smoking cessation counselling. They agreed that their dentists should be interested in patients' smoking status, should discuss smoking with their patients whether to highlight the oral or the general health effects of smoking. Moreover, these patients felt that dentists should provide smoking cessation advice, would appreciate dentist's assistance to quit smoking and that they would not change to another dentist if their dentists asked them about smoking. The regularity of patient–dentist contact makes the dentists' role in advising and supporting their patients in smoking cessation an advantage.

6.3 Part 2(b): Motivation for, capabilities in, and opportunities for Malaysian dentists in smoking cessation intervention in dental practices

6.3.1 Conclusions

Dentists whether in public or private practice have the motivation to conduct smoking cessation intervention; however, their capabilities are compromised. The barriers for the dentist to conduct smoking cessation at their clinic are time, and the possibility of burn out, whereby conducting other dental treatment in the clinic could prevent them from providing smoking cessation intervention. Dentists' perception that patients do not want to receive smoking cessation counselling and feeling that it would be patients' very low priorities were also found to be the barrier. Dentists also felt that although they have knowledge but they have insufficient skills to assess, assist and monitor their patients to stop smoking. Addition to that, they do not have the confidence to conduct such intervention specifically in prescribing nicotine replacement therapy. The lack of support from the clinical management in the smoking cessation services itself and in providing tobacco-related self-help materials and information to patients were also contributing barriers. Although dentists are not certified counsellors, they do have the communication skills to educate and advice patients particularly on oral health diseases or conditions related tobacco-use

6.3.2 Recommendations for future research

For future research in this area, we would like to suggest the use of The Behaviour Change Wheel (BCW) which was recently developed by Michie et al. (2011). The BCW was developed from 19 frameworks of behaviour change identified in a systematic literature review. It uses the COM-B ('capability', 'opportunity', 'motivation' system involving all these components. The BCW provides a systematic way of identifying relevant intervention functions and policy categories based on what is

understood about the target behaviour. General intervention functions can be translated into specific techniques for changing behaviour.

6.4 Recommendations for Clinical Practice

Below are the key recommendations for clinical practice based on findings from the clinical trial and surveys:

1) BA in smoking cessation intervention conducted by general dental practitioners

BA intervention is inexpensive and less time consuming and is a preferable option as the first treatment of smoking cessation. Furthermore, regardless of at which sector dentists are practicing, our study found that although their capabilities are compromised, they have the motivation to conduct smoking cessation intervention. However, support from the health systems seems to be lacking. Therefore, it is recommended that BA to be used by the general dental practitioners and should be integrated into the existing primary dental care services with operational targets set and regularly monitored.

2) Training in smoking cessation

In order to increase the practice in smoking cessation among dentists, proper training would be suggested. The SCIDD modules developed for this clinical trial could be suggested as a training package for dentist in smoking cessation. In addition to that, the existing training on tobacco dependence treatment incorporated into the curricula of dental professional training at pre- and post-qualification levels should be sustained. BA module would be recommended for undergraduate training, while 5A's module for postgraduate training.

3) Involvement of dentists in national policies and health promotion programmes

A key element of health promotion is placing oral health onto the policy agendas of influential decision-makers ensuring the equity of oral healthcare. From our study on dental patients, the smoking effects on periodontal disease, mouth ulcer, altered taste and impaired wound healing was ranked the least known effects of tobacco on oral health.

4) Create supportive environments for smoking cessation activities

This study found that there were fewer resources to facilitate the implementation of smoking cessation in dental practice. Systems to provide a follow-up support or one to cue/prompt providers to counsel against tobacco use and self-help materials for smokers were not readily available. By creating a supportive environment, it recognizes the impact of the environment on oral health and seeks to identify opportunities to make changes conducive to better oral health. Thus, we would recommend that self-help materials be readily available in the dental clinic to provide dental patients who wish to quit smoking, information on the health and oral health effects of smoking and the benefits of quitting. This will support dentist in providing smoking cessation advice in their clinic to assist their patient who smokes to at least thinking about quitting.

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