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EFFECTS OF RAMADAN ENVIRONMENT ON NICOTINE DEPENDENCE AMONG MALAY MALE SMOKERS AT A MUNICIPAL COUNCIL, SELANGOR, MALAYSIA

NURAISYAH HANI BINTI ZULKIFLEY

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NURAISYAH HANI BINTI ZULKIFLEY

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February 2017

Chairman : Suriani Binti Ismail, PhD
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Introduction: Nicotine dependence is one of the major issues that are causing massive failure in the effort to stop or quit smoking. Various strategies and preventive methods have been planned and implemented, but smoking is still a major public health issue in Malaysia. Fasting during Ramadan is one of the major challenges for smokers to abstain from smoking.

Objective: The aim of this study is to identify the effect of Ramadan environment on the nicotine dependence of the smokers who work at Majlis Perbandaran Subang Jaya (MPSJ), Selangor.

Methodology: The study was conducted from June to August 2015 as the quasi experimental; one-group pretest-posttest study design to evaluate the effect of Ramadan environment on nicotine dependence among a group of male smokers who work at MPSJ. The respondents for this study were selected by using systematic sampling method. Both nicotine dependence self-reported measurement and biomarker measurement were used which were FTND and saliva cotinine biomarker. The data was collected three times which were one week before Ramadan, 21 days of Ramadan, and 21 days after Ramadan. The FTND questionnaire used in this study was already translated into Bahasa Malaysia and validated from previous study. The saliva cotinine were measured by using SalivaBio oral swab (SOS) and cotinine biomarker research salivary assay kits and protocols by Salimetrics with the sensitivity of 0.15ng/ml. Data analysis was conducted by using repeated measure One-way ANOVA, paired t-test, Pearson correlation, simple linear regression, Chi square test, Fisher's exact test, and logistic regression by using IBM Statistical Package for the Social

Sciences version 22. All hypothesis tests were two-sided and level of significance is set at 0.05.

Results: A total of 61 Malay, Muslim, male and current smokers were recruited. The mean ± SD age was 32 ± 6.6 years old. Most respondents have good level (70.5%) of knowledge on environment related smoking behaviour. By using paired sample t-test, the result of the study found that there is a significant positive changes of FTND score from before to during Ramadan (t (60) = 3.47, *p* = 0.001) and also from before to after Ramadan (t (60) = 3.25, *p* = 0.002). Similarly, there is also a significant positive changes in the saliva cotinine level from before to during Ramadan (t (60) = 3.66, *p* = 0.001). Factors that are associated with the changes of FTND are marital status (*p*= 0.017 & 0.035), level of attitude (*p*= 0.031), educational level (*p*= 0.023), and employment position (*p*= 0.020). Marital status (*p*= 0.044) is the only factor that is associated with the changes of saliva cotinine. The predictors of changes in FTND are marital status (AOR= 4.871, 95% CI: 1.160, 20.444), educational level (AOR= 3.523, 95% CI: 1.081, 11.486) and level of attitude (AOR= 3.250, 95% CI: 1.094, 9.651).

Conclusion: Majority of the respondents have positive changes in the nicotine dependence during Ramadan. Marital status, educational level and level of attitude are the significant predictor of nicotine dependence changes. This information should be used as golden opportunity to support the smoker in quitting smoking through smoking cessation programs during Ramadan.

Keywords: Ramadan environment, nicotine dependence, male, Malay, smokers, MPSJ

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Sarjana Sains

KESAN PERSEKITARAN RAMADAN PADA KEBERGANTUNGAN NIKOTIN DALAM KALANGAN PEROKOK LELAKI MELAYU DI MAJLIS PERBANDARAN, SELANGOR, MALAYSIA

Oleh

NURAISYAH HANI BINTI ZULKIFLEY

Februari 2017

Pengerusi : Suriani Binti Ismail, PhD
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Pengenalan: Kebergantungan nikotin adalah salah satu isu utama yang menyebabkan kegagalan besar dalam usaha untuk berhenti merokok. Pelbagai strategi dan kaedah untuk menggalakkan berhenti merokok telah dirancang dan dilaksanakan, tetapi merokok masih menjadi isu kesihatan awam yang utama di Malaysia. Puasa pada bulan Ramadhan adalah salah satu cabaran utama bagi perokok untuk menahan diri daripada merokok.

Objektif: Tujuan kajian ini adalah untuk mengenalpasti kesan persekitaran Ramadan terhadap kebergantungan nikotin dikalangan perokok yang bekerja di Majlis Perbandaran Subang Jaya (MPSJ), Selangor.

Metodologi: Kajian ini telah dijalankan dari Jun hingga Ogos 2015 sebagai eksperimen kuasi; dengan menggunakan reka bentuk kajian ujian pra-pasca satu kumpulan untuk menilai kesan alam sekitar Ramadan pada kebergantungan nikotin dalam sekumpulan perokok lelaki yang bekerja di MPSJ. Responden untuk kajian ini telah dipilih dengan menggunakan kaedah persampelan sistematik. Kedua-dua pengukuran nikotin pergantungan iaitu laporan sendiri dan penanda bio ukuran digunakan iaitu FTND dan penanda bio air liur cotinine. Data dikumpulkan sebanyak tiga kali iaitu satu minggu sebelum Ramadan, 21 hari Ramadan dan 21 hari selepas Ramadan. Soal selidik FTND yang digunakan dalam kajian ini telah diterjemahkan ke dalam Bahasa Malaysia dan disahkan daripada kajian sebelumnya. Air liur cotinine diukur dengan menggunakan SalivaBio swab mulut (SOS) dan kit assay penyelidikan penanda bio air liur cotinine dan protokol oleh Salimetrics dengan sensitiviti 0.15ng/ml. Analisis data telah dijalankan dengan menggunakan ukuran berulang sehala

ANOVA, berpasangan ujian-t, korelasi Pearson, regresi linear mudah, Chi ujian persegi, ujian tepat Fisher, dan regresi logistik dengan menggunakan IBM SPSS versi 22. Semua ujian hipotesis dua belah bahagian dan tahap signifikan ditetapkan pada 0.05.

Keputusan: Seramai 61 Melayu, lelaki, Muslim dan perokok telah diambil. Usia min ± SD responden adalah 32 ± 6.6 tahun. Kebanyakan responden mempunyai tahap pengetahuan yang baik (70.5%) mengenai tingkah laku perokok yang berkaitan persekitaran. Dengan menggunakan berpasangan sampel ujian-t, hasil daripada kajian ini mendapati bahawa terdapat perubahan ketara positif skor FTND dari sebelum ke semasa Ramadan (t (60) = 3.47, p = 0.001) dan juga dari sebelum ke selepas Ramadan (t (60) = 3.25, p = 0.002). Begitu juga, terdapat juga perubahan ketara yang positif dalam tahap cotinine air liur dari sebelum ke semasa Ramadan (t (60) = 3.66, p = 0.001). Faktor-faktor yang dikaitkan dengan perubahan FTND adalah status perkahwinan (p = 0.017 & 0,035), tahap sikap (p = 0.031), tahap pendidikan (p = 0.023), dan kedudukan pekerjaan (p = 0.020). Taraf perkahwinan (p = 0,044) adalah satu-satunya faktor yang dikaitkan dengan perubahan air liur cotinine. Peramal perubahan FTND adalah status perkahwinan (AOR = 4,871, 95% CI: 1,160, 20,444), tahap pendidikan (AOR = 3,523, 95% CI: 1,081, 11,486) dan tahap sikap (AOR = 3.250, 95% CI : 1,094, 9,651).

Kesimpulan: Majoriti responden mempunyai perubahan yang positif dalam kebergantungan nikotin pada bulan Ramadan. Status perkahwinan, tahap pendidikan dan tahap sikap adalah peramal yang signifikan bagi perubahan kebergantungan nikotin. Maklumat ini harus digunakan sebagai peluang keemasan untuk menyokong perokok berhenti merokok melalui program berhenti merokok pada bulan Ramadan.

Kata kunci: persekitaran Ramadan, kebergantungan nikotin, lelaki, Melayu, perokok, MPSJ

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Thank you very much.

I certify that a Thesis Examination Committee has met on 17 February 2017 to conduct the final examination of Nuraisyah Hani binti Zulkifley on her thesis entitled "Effects of Ramadan Environment on Nicotine Dependence among Malay Male Smokers at a Municipal Council, Selangor, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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Name of Member of Supervisory Committee: Dr. Rosliza Binti Abdul Manaf

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LIST OF ABBREVIATIONS

CI	Confidence Interval
CIA	Central Intelligence Agency
COPD	Chronic Obstructive Pulmonary Disease
DNA	Deoxyribonucleic Acid
ELISA	Enzyme-Linked Immunosorbent Assay
FTND	Fagerstrom Test for Nicotine Dependence
HONO	Ambient Nitrous Acid
ITT	Intention to Treat
JKEUPM	Jawatankuasa Etika Universiti untuk Penyelidikan Melibatkan Manusia
MPSJ	Majlis Perbandaran Subang Jaya
nAChR	nicotine cholinergic receptors
NHS	National Health Service
NRT	Nicotine Replacement Therapy
OR	Odds Ratio
SCT	Social Cognitive Theory
SD	Standard Deviation
TSNAs	Carcinogenic Tobacco Specific Nitrosamines
UPM	Universiti Putra Malaysia
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

Over the years, smoking has become one of the major health problems in most countries in the world. Smoking caused numerous diseases and health problems but sadly, every single day around the world there are people taking up smoking for the first time for various reasons. Further discussion and understanding of the factors that promote smoking and smoking cessation are needed. This chapter presents the background, problem statements, significance of the study, research questions, research objectives, research hypotheses and definition of terms related to the study.

1.1 Background

Since the beginning of the 19th century, the prevalence of smoking amongst men started to increase rapidly in most of the countries followed by substantial increase amongst women after a few decades (Islami, Torre, & Jemal, 2015; Thun, Peto, Boreham, & Lopez, 2012). Globally, it is estimated that over 1.1 billion of people smoked tobacco in 2015 (WHO, 2016). In the United States of America alone, it is estimated that 40 million adults which is 17 out of every 100 populations are current smokers (Centers for Disease Control and Prevention, 2015). It is also found that the prevalence of smoking keep on increasing in most Asian countries (Shafey, Dolwick & Guindon, 2003). In 2015, out of all Asian countries, smoking prevalence among male adult population is found to be the highest in Indonesia which is about 76.2%, followed by South Korea, 49.8% and China, 47.6% (WHO, 2016). Malaysia is one of those Asian countries that have a high prevalence of smoker as 43.0% of the Malaysian adult, male population are current smoker (WHO, 2016).

Smoking has become one of the health hazards that had caused many health and social problems in the community. It is well known worldwide that smoking is bad for a person health as it can harm most of the human organs, and it is one of the main risks in human health that can cause death (Centers for Disease Control and Prevention, 2014a). The impact of smoking has become one of the greatest burdens economically, physically and socially to the country. Smoking give a great impact in the health setting as it causes many smoking related diseases that is preventable. According to WHO data (2014), smoking related diseases globally cause around 6 million of mortalities each year. By the year 2030, smoking related mortalities are expected to increase to more than 8 million per year (WHO, 2014). According to National Cancer Institute (2015), globally cigarette smoking has caused 90% of lung cancer deaths in men and 80% in women. Smokers are six times more likely to suffer a heart attack and the risks increase with the number of cigarettes smoked each day (National Cancer Institute, 2015).

The impact or effect of smoking does not only involve the smokers as it will also affect the second-hand smokers; whom are the public, family members, or friends which are non-smokers, but being near a smoker. Second-hand smokers will inhale the smoke that is the combination of smoke from the burning end of the cigarette and the smoke breathed out by the smokers (Centers for Disease Control and Prevention, 2014). Second-hand smoke contains more than 7000 chemical compounds in which more than 250 of these chemicals are known to be harmful and at least 69 of these are known to be cancer causing chemicals (Bahl, Jacob, Havel, Schick & Talbot, 2014). It have been stated that globally, 2.5 million smoking related mortalities were among non-smokers who died from the exposure to second-hand smoke and 100,000 babies died due to parental smoking that include smoking during pregnancy (Surgeon General's Report, 2014).

In Malaysia, it has been estimated that 20,000 of the Malaysian population die annually due to smoking related diseases (Randhawa, 2015). Smoking has caused a great economic burden as the Malaysian Government are forced to spend more than RM 3 billion annually on treating smoking related disease (Tan, Yen & Nayga, 2009). Thus, these prove that smoking causes the country a great burden from health and economic stand point. This can be avoided as smoking related disease can be prevented with smoking cessation and prevention of smoking initiation. Smoking cessation has become the key strategy to decrease the impact of the smoking related disease and disability in the community (Zwar & Richmond, 2006).

Malaysian government has instituted many anti-smoking measures in order to reduce the consumption of the tobacco product among the Malaysian populations (Lim et al., 2013). A comprehensive tobacco control programme has existed since 1993 that includes programmes such as Control of Tobacco Product Regulations and its enforcement, the tobacco duty, the national anti-tobacco campaign and the quit-smoking clinics (Hizlinda et al., 2012). In 2004, the Malaysian government had conducted a largest national anti-tobacco media campaign known as '*Tak Nak*' or 'Say No'. The purpose of the campaign was to educate the publics on the health hazards of smoking thus prevent publics from smoking and encourage smokers to quit smoking. The Malaysian government also taking measures by designating smoke free areas in 2004 and restructuring the tobacco taxes to increase the cost of cigarette in 2007 to change the smoking pattern of the Malaysian smoker (Lim et al., 2013).

Smoking cessation is a difficult process and there are many factors that influence the success of smoking cessation. One of the factors that are known to be the barrier in the smoking cessation is nicotine dependence. Nicotine dependence is one of the major factors that causes the smoker unable to quit smoking as smoking is acknowledge to be addictive (Kleinjan et al., 2012). Nicotine dependence is an addiction to tobacco product caused by nicotine (Centers for Disease Control and Prevention, 2010). As many smoking cessation program established, reliable indicators of the nicotine dependence are needed to accurately assess the efficacy of the programs (Tennekoon & Rosenman, 2013). There are many method can be used to measures the nicotine

dependence of the smokers and one of it is by using the Fagerstrom Test for Nicotine Dependence (FTND) and saliva cotinine.

Although smoking cessation is difficult, it is possible and easier to do if assistance is provided (Morris & Blackmon, 2011). If the smokers are given the opportunity and have support in quitting, it is possible for them to quit smoking for real. Environments that help to reduce the urge of the smokers to smoke can be one of the excellent opportunities for the smokers to quit smoking. In a Muslim country such as Malaysia, this supportive environment can be found during Ramadan where every Muslim is obligated to fast, which included abstaining from smoking. The Ramadan environment could probably provide opportunity for an easier smoking cessation initiation that can help the smokers to eventually quit smoking. Therefore, studying the effect of Ramadan environment in nicotine dependence and factors associated with the changes of nicotine dependence could highlight the initiation of smoking cessation through smoking abstinence during Ramadan; thus facilitate the Muslim Malaysian smokers to quit smoking.

1.2 Problem Statement

Smoking has given many negative impacts to health and social aspects towards the community and country. Although it is known that smoking is bad for health, in Malaysia, the prevalence of smoking remains high. Based on a survey by Global Adult Tobacco Survey (2011) in Malaysian adult population, 43.9% of men and 1% of women are smokers. The survey also indicates that an overall of 23.1% or 4.7 million of the Malaysian adult populations are smokers (Global Adult Tobacco Survey, 2011). According to the Malaysia Institute for Public Health (2015) the prevalence of smokers still remains high among the Malaysian population in 2015; as 22.8% are current smokers, 20.5% are daily smokers and 2.3% are occasional smokers. The prevalence of smokers among men had shown a slight decrease from 2011 to 2015, which is from 43.9% to 43.0%. However, the prevalence of smokers among female had increased in 2015 compare to 2011 as study shown that in 2015, 1.4% among the Malaysian female population are a current smoker compare to only 1% in 2011(Malaysia Institute for Public Health, 2015).

The largest ethnic group in Malaysia is Malay as it is accounted for 50.1% of the total population and the official religion is Islam as 61.3% of the total population is Muslim (CIA World Fact book, 2014). Study have also shown that the smoking prevalence is the highest among the Malays compared to the other two largest ethnic groups in Malaysia, which is Chinese and Indian as 55.9% of smokers in Malaysia are from the Malays ethnic group (Lim et al, 2013). Moreover, Global Adult Tobacco Survey (2011) stated that in Malaysia, Muslim smokers had a higher prevalence compare to the non-Muslim counterparts in all comparison. Muslim is obligated to obey Islamic rules and smoking is prescribed as forbidden by the Islamic rules. Malaysian Islamic Council in 1995 had also stated that smoking is considered as '*haram*' as it caused harm to the

human bodies (Portal Rasmi Fatwa Malaysia, 2015). A study done by Yong, Hamann, Borland, Fong and Omar (2009) had shown that there is a great proportion of the Muslim Malaysian smokers which is 78.0% of them reported they perceived that Islam discourages smoking. Ironically, despite the prohibition of smoking in Islamic law, the prevalence of smoking among Muslim in Malaysia is highest compare to others religious group.

Many health problems related to smoking give a great burden in mortality and morbidity. Globally, cancer and cardiovascular disease which is some of the smoking related diseases are the main cause of premature death (Lim et al., 2013; Beaglehole et al., 2011). Smoking related diseases have also become the primary cause of mortality in Malaysia as smoking have accounted for one out of every five death (Ministry of Health Malaysia, 2003). Cardiovascular and pulmonary diseases are the top principle causes of deaths in the Malaysian hospital in 2007 (National Cancer Registry Malaysia, 2007). According to the National Cancer Registry Malaysia (2007) lung cancer which is one of the most common smoking related diseases is one of the top five cancers affecting the Malaysian population and the incidence rate is found to be high among the Chinese and Malay ethnicity. The incidence of lung cancer is also found to be higher in males compared to females.

In order to reduce the effect and burden of smoking related diseases, the Malaysian government have provided many intervention programmes for smoking cessation and one of it is the Malaysian Smoking Cessation Programme by the Malaysian Ministry of Health. Some of the strategies that have been used in the smoking cessation programme are health promotion and public advocacy, tobacco tax policy and smoking cessation services (Zarihah, 2007). Unfortunately, despite of all the effort done by the Ministry of Health for smoking cessation programmes, only 48.6% of smokers in Malaysia attempted to quit smoking (Global Adult Tobacco Survey, 2011). Studies have also found that the smoking cessation programmes in Malaysia is seen to be ineffective in promoting smoking cessation thus attribute to the small percentage of Malaysian smokers that successfully quit smoking. The ineffectiveness of the smoking cessation programmes in Malaysia are due to the inadequacy of message content, lack of exposure impact and poor law enforcement (Hizlinda et al., 2012).

One of the factors that contribute to the failure in smoking cessation is the influence of environment. Smoking cessation is a dynamic process and the successful rate of smoking cessation is determined by the interplay of multiple factor and one of the factors that determined a successful rate is a supportive environment (West, 2006). A supportive environment in smoking cessation can help the smokers in taking the initiative to quit. Wee (2011) stated that a complexity in the environment that interacts with the smokers may lead to realization and resulted in an urgency to act as they realise the negative effect of smoking. The supportive environment can be found naturally during the month of Ramadan. The Malaysian government has launched a campaign known as 'Nafas Baru Ramadan' that promotes the smoker to quit smoking during the fasting month of Ramadan (Bernama, 2005). However, there is only a

handful of research that has been conducted to identify the true effect of smoking behaviour among smokers during Ramadan. Lack of research in this area provides only a handful information and minimal data that can be utilized to form a new intervention approach which use Ramadan as an opportunity for the smokers to quit smoking.

Another factor that contributes to failure of smoking cessation is due to nicotine dependence. Nicotine that is found naturally in tobacco is a highly addictive substance (American Heart Association, 2015). Nicotine mainly affects the chemicals that are known as dopamine and noradrenaline by altering the balance of these chemicals inside the brain (NHS, 2013). Nicotine is getting rapidly into the body system as the route of administration for nicotine is through lungs by smoking practices (Nordqvist, 2015). The measurement of the nicotine dependence is important, as it can be helpful when deciding type of support needed by the smokers to quit smoking and provide valuable measures in studies that seek to gain a better understanding of cigarette dependence and best way to overcome or prevent it (Fidler, Shahab, & West, 2010).

Fasting during Ramadan is associated with significant disruption in normal regular activities (Berbari, Daouk, Mallat & Jurjus, 2012). It is also found that, during fasting, several factors may influence health-related biomarkers and outcomes such as smoking exposure (Leiper & Molla, 2003). Spirituality and religiousness play an important protective role against smoking in the general population (Borras et al., 2008). While Muslims life style did not change greatly during Ramadan, it can be an opportunity for them to contemplate and enhances their spiritual activities (Jasem, Maughan, Roky, Abdul, & Umid, 2012). Thus, the naturally found environment during Ramadan could be used as the golden opportunity for the smokers to quit smoking initiation and smoking cessation.

1.3 Significance of Study

This study was conducted to gather information on changes in nicotine dependence and identify factors associated with the changes in the month of Ramadan environments among Muslim smokers. The nicotine dependence of the smokers is valuables information that can be used in order to identify the smoker's level of addiction to smoking. By understanding, the changes in addiction level of the smokers; it could help the process of devising a new approach for smoking cessation.

From this study, both measurements which were self-reported measurement and biomarker measurement was taken to identify the effect of Ramadan environment in nicotine dependence. The nicotine dependence of the smokers was measured by using the Fagerstrom Test for Nicotine Dependence (FTND) as self-reported measurement and saliva cotinine as the biomarker measurement. The saliva cotinine biomarker

provides a more accurate and reliable measurement of nicotine dependence compared to self-reported measurement.

By using both of the measurements methods, the finding of this study could provide information and understanding on how smokers really feel towards their nicotine addiction during Ramadan. Biomarker measurement is more accurate and reliable measurement to support the smoker's self-reported measurement. The measurements could provide strong, accurate and valuable information for the health care professional in inventing new smoking cessation programmes.

The information on the effect of Ramadan environment on FTND and saliva cotinine of the smokers could be used in developing new intervention by using the opportunity provided during the month of Ramadan itself. The information from this study can be used to build an intervention plan that is not expensive; in fact, it can be provided by using the natural way, which, by using a faith based intervention program. These could reduce the government spending on conventional smoking cessation program as most of the programs for smoking cessation are costly thus, the economic burden of the country could be reduces.

1.4 Research Questions

1) What are the characteristic of smokers who work at Majlis Perbandaran Subang Jaya (MPSJ)
    a. socio-demographic characteristics,
    b. knowledge on environmental related smoking,
    c. attitude on environmental related smoking,
    d. practice on environmental related smoking behaviour and
    e. barrier of previous smoking cessation attempt.
2) What is the nicotine dependence (Fagerstrom Test for Nicotine Dependence (FTND) and saliva cotinine) score and category at before, during and after Ramadan among smokers who work at MPSJ?
3) Is there a significant change on nicotine dependence (FTND and saliva cotinine) from before Ramadan to during and after Ramadan among smokers who work at MPSJ?
4) What are the factors associated with the nicotine dependence (FTND and saliva cotinine) changes from before to during and after Ramadan among the smokers who work at MPSJ?

5) What are the predictors of nicotine dependence (FTND and saliva cotinine) changes from before to during and after Ramadan among the smokers who work at MPSJ?

6) Is there a significant correlation between the FTND and saliva cotinine at before, during and after Ramadan among the smokers who work at MPSJ?

1.5 Research Objectives

1.5.1 General Objective

To identify the effect of Ramadan environment on nicotine dependence among smokers who work at Majlis Perbandaran Subang Jaya (MPSJ), Selangor.

1.5.2 Specific Objectives

1) To describe the characteristics of the smokers who work at MPSJ
    a. socio-demographic characteristics,
    b. knowledge on environmental related smoking,
    c. Attitude on environmental related smoking,
    d. practice on environmental related smoking behaviour and
    e. barrier of previous smoking cessation attempt.
2) To identify the nicotine dependence (FTND and saliva cotinine) score and category at before, during and after Ramadan among smokers who work at MPSJ.
3) To identify the changes of nicotine dependence (FTND and saliva cotinine) from before Ramadan to during and after Ramadan among the smokers who work at MPSJ.
4) To determine the factors associated with the nicotine dependence (FTND and saliva cotinine) changes from before to during and after Ramadan among the smokers who work at MPSJ.
5) To determine the predictors of nicotine dependence (FTND and saliva cotinine) changes from before to during and after Ramadan among the smokers who work at MPSJ.
6) To explore the correlation between the FTND and the saliva cotinine at before, during and after Ramadan among the smokers who work at MPSJ.

1.6 Research Hypothesis

1) Alternate Hypothesis $_1$: There is a significant change on the nicotine dependence (FTND and saliva cotinine) from before Ramadan to during and after Ramadan of the smokers who work at MPSJ.

2) Alternate Hypothesis $_2$: There is a significant factor associated with the changes in the nicotine dependence (FTND and saliva cotinine) from before to during and after Ramadan of the smokers who work at MPSJ.

3) Alternate Hypothesis $_3$: There is a significant predictor associated with the changes in the nicotine dependence (FTND and saliva cotinine) from before to during and after Ramadan of the smokers who work at MPSJ.

4) Alternate Hypothesis $_4$: There is a significant correlation between the FTND and the saliva cotinine at before, during and after Ramadan of the smokers who work at MPSJ.

1.7 Definition of Terms

1) Smoker

According to the Oxford Dictionaries (2015a) smoker is defined as someone who smokes tobacco regularly. There are different types of smokers which are current smoker, never smoker, former smoker, occasional smoker, and every day smoker (Centers for Disease Control and Prevention, 2017).

a. Current Smoker

Centers for Disease Control and Prevention (2014) stated that current smokers are define as adults, who smoked 100 cigarettes in their lifetime and currently smoked cigarette on daily basis or some days.

b. Never Smoker

Never smoker is an adult who smoked less than 100 cigarettes or never smoked in their lifetime (Centers for Disease Control and Prevention, 2017).

c. Former Smoker

According to Centers for Disease Control and Prevention (2017) former smoker is define as adult who had quit smoking at the presence time but has smoked at least 100 cigarettes in their lifetime.

d. Occasional Smoker

Occasional smoker or also known as some day's smoker is define as adult who smoked at least 100 cigarettes in their lifetime and currently smokes, but does

not smoke on a daily basis (Centers for Disease Control and Prevention, 2017).

e. Every day Smoker

Centers for Disease Control and Prevention (2017) define every day smoker or also known as regular smoker as adults who smoked at least 100 cigarettes in their lifetime and currently smoked on a daily basis.

2) The Month of Ramadan

Ramadan is the ninth lunar month in the Islamic calendar and the month where the Muslims will be performing one of the pillars in Islam, which is fasting. The Muslim will fast which will require abstaining from food, drink, or consumption of any oral intake, marital relation and ill conduct from early dawn until sunset everyday throughout the month Ramadan (Islamicfoundation, 2015).

3) Nicotine Dependence

Nicotine dependence is an addiction to tobacco products that is caused by the ingredients inside the tobacco; which is nicotine (Nordqvist, 2015). Nicotine is an addictive drug that causes mood-altering changes in the brain that are temporary pleasing, making the users want to keep on using it more and causing unpleasant withdrawal symptoms (Nordqvist, 2015).

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