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EFFECT OF RAMADAN ENVIRONMENT ON FAGERSTROM TEST FOR NICOTINE DEPENDENCE (FTND) AMONG SMOKERS

Nuraisyah Hani Z., Suriani I.*, Rosliza A.M., Ahmad Farhan A.F.

Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

**Corresponding author: Dr Suriani Ismail, Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, MALAYSIA Email: si_suriani@upm.edu.my*

ABSTRACT

Background: Measurement of the nicotine dependence of the smokers can become valuable information in understanding the smoker's level of addiction. One of the methods in measuring the nicotine dependence is by using the Fagerstrom Test for Nicotine Dependence (FTND). Understanding the accurate level of addiction level can help in the process of developing approach for smoking cessation. Approaches for smoking cessation intervention can be found during Ramadan where every Muslim is obligated to fast. Ramadan environment can provide a supportive environment for the smokers in smoking cessation.

Materials and Methods: A total of 61 male smokers who currently smoke cigarette on daily basis were recruited. The study used the time-series experimental study design to evaluate the effect of Ramadan environment on FTND among a group of smokers who work at a local authority in Selangor. The data were collected three times which were one week before Ramadan, 21st 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. Data analysis was conducted by using repeated measure One-way ANOVA and paired t-test.

Result: The study showed a significant difference in the FTND score from before, during and after Ramadan (p = 0.003). From the post-hoc test, there is a significant decrease in the FTND score from before Ramadan to during Ramadan and also from before Ramadan to one month after Ramadan (p = 0.001, p = 0.002).

Conclusion: The positive environment during Ramadan has helped to reduce the FTND score of the smokers. Health care professional should use this opportunity to help the smoker to quit smoking.

Keywords: smoking cessation, Ramadan environment, Fagerstrom Test for Nicotine Dependence (FTND), nicotine dependence

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1.0 Introduction

Over the years, smoking has become one of the major problems in every country in this world. Smoking caused numerous numbers of diseases. Every single day around the world there are children taking up smoking for the first time for various reasons. The prevalence of smoking amongst men started to increase rapidly in most of the countries and followed by substantial increase in women smoking prevalence after a few decades since the beginning of the 19th century (Islami, Torre, & Jemal, 2015; Thun, Peto, Boreham, & Lopez, 2012). Globally, it is estimated that over 1.1 billion people smoked tobacco in 2015 (WHO, 2016). It is also found that the prevalence of smoking keep on increasing in most of the Asian countries (Shafey, Dolwick & Guindon, 2003). Malaysia is one of those Asian countries that have a high prevalence of smoker as 43% of the Malaysian population are current smoker (WHO, 2016).

Smoking has become one of the negative health behaviour that has brought ill health and social problems into the community. It is known worldwide that smoking is bad for a person's health as it can harm most of the human organs and it is one of the main risks in health that can cause death (Centre for Disease Control and Prevention, 2014). The impact of smoking has become one of the greatest burdens economically, physically and socially to the country. According to the WHO (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).

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). In Malaysia, a comprehensive tobacco control programme began in 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). The Malaysian government has also taken 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 Malaysian smoker (Lim et al., 2013).

With various smoking cessation program being established, reliable indicators of the current smoking related behaviour or exposure are needed to accurately assess the efficacy of the programs (Tennekoon & Rosenman, 2013). One of the methods of measurement to indicates smoking behaviour is by using self-reported measurement. Depending on the use of information, self-reported is useful when trying to measure the smoking exposure (Tennekoon & Rosenman, 2013). The most common tools that have been used to measure the self-reported smoking exposure or smoking related behaviour is Fagerstrom Test for Nicotine Dependence (FTND). FTND is the most widely used tools to measure the cigarette dependence as the items in the FTND have been found to be of particular value and have been combined in a brief dependence measure (Fidler, Shahab, & West, 2010).

If the smokers are given the opportunity and have the support in quitting, it is possible for them to quit smoking for real. While smoking cessation is difficult, it is also possible to be done if assistance is provided (Morris & Blackmon, 2011). 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 is available during Ramadan where every Muslim is obligated to fast, which included abstaining from smoking. The Ramadan environment may provide a new approach for smoking cessation intervention programmes that can help smokers to quit smoking. This article reports the effect of Ramadan environment on FTND among the smokers.

2.0 Materials and Methods

2.1 Study Design and population

The research was conducted by using the time-series experimental design to identify the changes of the smoker's FTND score from before Ramadan to during Ramadan and after Ramadan. The data from this study were collected three times which were at one week before Ramadan, 21st of Ramadan and 21 days after Ramadan. A total of 61 smokers who work at a local authority in Selangor were recruited by using simple random sampling method. The human resource officers at the local authority identified the list of the male worker who currently smoking during the first data collection which is before Ramadan. The respondents for this research were then screened based on the inclusion and exclusion criteria. All male, who smoke cigarette on daily basis or some days, aged 18 and above were eligible to participate in this study. However, smokers who smoke only e-cigarette were excluded from this study as the FTND is not suitable to measure nicotine dependency of the e-cigarette smokers.

2.2 Instruments

The instruments that were used in conducting this research were divided into two sections. The first section is the self-administered questionnaire, and the second one is the Fagerstrom Test for Nicotine Dependence (FTND). The language of the self-administered questionnaire and adapted Fagerstrom Test for Nicotine Dependence is Bahasa Malaysia. The self-administered questionnaire was based on the demographic data that included age, marriage status, ethnic, religion, educational level, income, work position, and frequency of fieldwork. The adapted Fagerstrom Test for Nicotine Dependence (FTND) used in this study were translated from English language to Bahasa Malaysia version in a study done among the groups of male staff smokers in Universiti of Malaya Medical Centre (Anne Yee, Ng & Rusdi, 2011). A pilot study was conducted before the actual data collection among the smokers who work at other government institute and the Croncbach's alpha is 0.85.

2.3 Statistical analyses

The analysis was conducted by using Statistical Product and Services Solution (SPSS) Version 22.0 software for Windows to analyses the data including descriptive and inferential statistical tests. Test for normality was done and it was found that the data for the Fagerstrom Test for Nicotine Dependence (FTND) score for before, during and after Ramadan were normally distributed. The normality testing was visually confirmed by using histogram, box plot and p-p plot. Test for normality by using the Shapiro-Wilk test showed that *p* value is greater than 0.05, which indicated normally distributed data. The confidence interval was set at 95%, and the null hypothesis was rejected if the p value less than 0.05.

2.4 Ethical issue

The ethical approval for this research was obtained from the '*Jawatankuasa Etika Universiti Untuk Penyelidikan Melibatkan Manusia*' (JKEUPM), Universiti Putra Malaysia. The permission to conduct research from the head of local authorities was also obtained.

3.0 Result

3.1 Socio-demographic of the respondents

Majority of the respondents were between 21 to 40 years old as 47.5% of the respondent's age between 21 to 30 years old and another 47.5% of the respondent's age between 31 to 40 years old. The youngest respondent in this study was 21 years old and the oldest respondent was 56 years old. Most of the respondents in this study were married, which accounted for 73.8% of the total respondents. Majority of the respondents had secondary school (67.2%) as the highest level of the education. For the family income, most of the respondents earned RM 1,000 to RM 1,999 (29.5%), RM 2,000 to RM 2,999 (24.6%) and RM 3,000 to RM 3,999 (21.3%). The mean income of the respondents is RM 2713.77 with the minimum income of RM 800 and the highest income was RM 8,000. Seventy seven per cent of the respondents work in the clerical position. Out of all the respondents, 55.7% of the respondent have requirement of having to go for field work more than three days per week.

3.2 The Fagerstrom Test for Nicotine Dependence (FTND) from baseline (before Ramadan), during and after Ramadan of the respondents

The mean and standard deviation (SD) of the FTND score among respondents before Ramadan is 4.54 (1.90) with the minimum score of two and maximum score of nine (Table 1). During Ramadan, the mean score of the FTND is lower compared to before Ramadan with the mean (SD) of 3.74 (2.07) and the minimum score is zero and the maximum score is nine. The mean FTND score showed slight increase after Ramadan which is 3.84 (2.08) and the minimum and maximum score maintained as during Ramadan.

Table 1: Mean and Standard Deviation of FTND score of the respondents (N=61)

FTND score	Mean (SD)	Scoring	
		Minimum	Maximum
Baseline (Before Ramadan)	4.54 (1.90)	2	9
During Ramadan	3.74 (2.07)	0	9
After Ramadan	3.84 (2.08)	0	9

At the first data collection, which was before Ramadan, all the recruited respondents were current smokers. According to their FTND score, as shown in Table 2, most of the respondents were on the low to moderate (39.3%) and moderate (34.4%) level of nicotine dependence. Another 16.4% of the respondent fall in the low category of nicotine dependence and 9.8% were highly dependence.

In the second data collection, which was during Ramadan, the FTND score indicated that 4.9% of the respondent had quit smoking. Pleasingly, the percentage of the respondent that fall in the moderate (21.3%) and high (6.6%) category of nicotine dependence decreased from before Ramadan data collection. The percentage of the respondents that fall in the low (21.3%) and low to moderate (45.9%) category is much higher compare to from before Ramadan.

The percentage of the respondents that is in the low (16.4%) and low to moderate (44.3%) level of nicotine dependence is decreasing after Ramadan compare to during Ramadan. It is also found that the respondents that have moderate (24.6%) level of nicotine dependence were higher compared to during Ramadan. The percentage of respondents that fall in the high (6.6%) level category of nicotine dependence after Ramadan remained the same as during Ramadan. Despite that, surprisingly, the percentage of the respondents that quit smoking (8.2%) is higher compare to during Ramadan.

Table 2: Distribution of respondents FTND category according to time of data collection (N=61)

Categories	n (%)		
	Before Ramadan	During Ramadan	After Ramadan
Non smoker	0 (0.0)	3 (4.9)	5 (8.2)
Low	10 (16.4)	13 (21.3)	10 (16.4)
Low to moderate	24 (39.3)	28 (45.9)	27 (44.3)
Moderate	21 (34.4)	13 (21.3)	15 (24.6)
High	6 (9.8)	4 (6.6)	4 (6.6)

3.2 Distribution of responses to FTND items of the respondent

The findings show that there is improvement of the smoking practice of the respondent from before Ramadan to during Ramadan and most of the practices were maintained until after Ramadan. As shown in Table 3, the percentage of respondents that took longer time to smoke in the morning increased at during Ramadan compare to before Ramadan. The percentage of the respondents that found difficulty in smoking at the non-smoking gazetted area has decreased from before Ramadan (49.2%) to during (37.9%) and after (33.9%) Ramadan. Moreover, the result also shown that the percentage of the respondents that have more frequently smoked in the morning also decreased from before (65.6%) Ramadan to during (65.1%) Ramadan. The percentage of respondents that smoke 10 or less cigarette per day also increased during and after Ramadan compare to before Ramadan. A total of 43.1% of the respondent reported that they will not smoking if they are sick during Ramadan compared to only 27.9% at before Ramadan.

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Table 3: Distribution of responses to FTND items of the respondent (N=61)

Item	n (%)		
	Before Ramadan (n=61)	During Ramadan (n=58)*	After Ramadan (n=56)*
How soon after waking do you smoke your first cigarette			
≤ 5 minutes	8 (13.1)	4 (6.9)	8 (14.3)
5 – 30 minutes	26 (42.6)	26 (44.8)	23 (41.1)
31 – 60 minutes	27 (44.3)	28 (48.3)	25 (44.6)
Do you find it difficult to refrain from smoking in places where it is forbidden			
Yes	30 (49.2)	22 (37.9)	19 (33.9)
No	31 (50.8)	36 (62.1)	37 (66.1)
Which cigarette would you hate to give up			
The first in morning	31 (50.8)	31 (53.5)	30 (53.6)
Any other	30 (49.2)	27 (46.5)	26 (46.4)
How many cigarettes a day do you smoke			
10 or less	20 (32.8)	33 (56.9)	27 (48.2)
11 – 20	33 (54.1)	20 (34.9)	19 (33.9)
21 – 30	8 (13.1)	4 (6.9)	9 (16.1)
31 or more	0 (0.0)	1 (1.3)	1 (1.8)
Do you smoke more frequently in the morning			
Yes	21 (34.4)	20 (34.9)	18 (32.1)
No	40 (65.6)	38 (65.1)	38 (67.9)
Do you smoke even if you are sick in bed most of the day			
Yes	44 (72.1)	33 (56.9)	33 (58.9)
No	17 (27.9)	25 (43.1)	23 (41.1)

*During Ramadan = 3 respondents quit smoking
*After Ramadan = 5 respondent quit smoking

3.3 The changes of Fagerstrom Test for Nicotine Dependence (FTND) score from baseline (before Ramadan), during and after Ramadan of the respondents

The respondents are categorized as having positive changes in the FTND scores when their scores are lower in during and after Ramadan when compared to before Ramadan. As shown in Table 4, 41% of the respondents have positive changes in their FTND score during Ramadan and it is increased to 44.3% after Ramadan.

Table 4: Frequency and percentage of changes in the FTND score of the respondents (N=61)

	Categories	n (%)
Before Ramadan – During Ramadan	Positive changes	25 (41.0)
	Negative changes	36 (59.0)
Before Ramadan – After Ramadan	Positive changes	27 (44.3)
	Negative changes	34 (55.7)

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A One-Way repeated measures ANOVA was conducted to compare the Fagerstrom Test for Nicotine Dependence (FTND) score at before, during and after Ramadan environment condition. There was a significant change of the FTND score from the One-Way repeated measures ANOVA test; Wilks' Lambda = 0.823, F (2, 59) = 6.329, p = 0.003. A paired sample t-test was conducted as the post hoc test to compare the FTND score of the respondents at three period of time. There was a significant difference in the mean FTND score for baseline (before Ramadan) (4.54±1.90) and during Ramadan (3.74±2.07) conditions; t (60) = 3.47, p value = 0.001. There was also a significant difference in the mean FTND score for baseline (before Ramadan) (4.54±1.90) and after Ramadan (3.84±2.08) conditions; t (60) = 3.25, p value = 0.002. These findings suggest that the Ramadan environment could have positive effect on the FTND scores of the respondents.

Table 5: The changes of FTND score of the respondents (N=61)

Variable	t-value (df)	Wilks' Lambda value	F value (df)	*p* value
FTND score changes [a]		0.823	6.329 (2, 59)	0.003[a]
Before Ramadan-During Ramadan [b]	3.47 (60)			0.001[b]
Before Ramadan-After Ramadan [b]	3.25 (60)			0.002[b]

[a] One-Way repeated measures ANOVA test [b] Paired sample t-test
*significant at p value <0.05

4.0 Discussion

Nicotine dependence is one of the major factors causing failure in smoking cessation. Addictions are caused by the alteration of the brain systems that control the emotional and motivational behaviour which are fundamental for adaptive survival (Gray & Critchley, 2007). Nicotine is highly addictive as it is the main responsible substances for the maintenance of smoking and the cigarette would be much less addictive when nicotine level gets very low (Benowitz & Henningfield, 2013). A good measurement of the severity in nicotine dependence can be helpful in providing valuable information on cigarette dependence and ways to overcome or prevent it (Fidler, Shahab, & West, 2010). The most widely used tool to measure the nicotine dependence is the Fagerstrom Test of Nicotine Dependence (FTND).

From the distribution of the FTND items, the result of the finding shown that there is improvement of the smoking practice of the respondent from before Ramadan to during Ramadan and most of the practices were maintained until after Ramadan. The percentage of the respondents that found difficulty in smoking at the non-smoking gazetted area is decreasing from before Ramadan (49.2%) to during (37.9%) and after (33.9%) Ramadan. This is similar with the findings of other study by Suriani, Zulkefli, Chung and Mohamad Sulaiman (2015) which showed that the percentage of smokers that find it difficult to restrain smoking in place that is forbidden is decreasing from before to during Ramadan. The finding suggests that the Ramadan environment where most Muslim are abstaining from smoking has helped in enhancing the enforcement of the smoke-free law.

The percentage of the respondents that smoke 10 or fewer cigarettes is also increasing from before Ramadan to during Ramadan. Moreover, the result also showed that the percentage of the respondents that will not smoke if they are sick is increasing from before Ramadan (27.9%) to during (43.1%) and after (41.1%) Ramadan. Mahroof, Syed, El-Sharkawy, Hasan and Ahmed (2007) stated that Ramadan can be used as a spur to encourage smoking cessation among smokers. The fasting environment during Ramadan provides an opportunistic setting for smoking cessation intervention where most smokers find it easy to cease smoking during Ramadan due to the religious, cultural and environmental influences (Suriani, Zulkefli, Chung & Mohamad Sulaiman, 2015).

The findings of this study also shown that there is significant changes of the FTND score from before, during and after Ramadan. These findings suggest that the changes of the environment of the respondent, has significantly influenced the behaviour of the nicotine dependence of the respondent.The enforcement of smoking abstinence during Ramadan will enhanced withdrawal for many regular smokers (Hughes, 2007). Many Muslim smokers in Malaysia feel that they are able to quit smoking during Ramadan (Suriani, Zulkefli, Chung, & Mohamad Sulaiman, 2015; Abu Bakar et al., 2010).

From before to during Ramadan, there is a significant change of the FTND score of the respondents. According to Chandola, Head and Bartley (2004) the prohibition period against smoking during the day and the absence of smoking influence in the Ramadan environment can assist in smoking cessation attempt. It can be seen that about 41% of the respondents experienced a positive changes in their FTND score from before to during Ramadan. These findings suggest that the environment during Ramadan does help the smoker's feels like their nicotine addiction reducing compare to the environment before Ramadan where there is lack of smoking abstinence and strong environmental influence for the smokers.

The result of this study also revealed that there is a significant change on the FTND score of the respondents from before Ramadan to after Ramadan. From the total respondents, it is found that 44.3% of them have positive changes in their FTND score and it is increasing compare to from before to during Ramadan. These findings show that the positive sensation that the smokers experience during the month of Ramadan where the environment is much more suitable in smoking cessation does help to decrease the nicotine addiction of the smokers and they are able to keep it maintain until one month after that. Abstinence from smoking that the respondents experience in Ramadan result in robust changes of mood, craving, and cognition that arise shortly after the last smoke and it may persist for as long as one month after quitting (McClernon et al., 2007).

5.0 Conclusion and recommendation

The Ramadan environment where smoking abstinence during daytime is required among the Muslim smokers could help to improve the smoking behaviour of the smokers. Most of the smokers had positive changes in their FTND score during and after Ramadan. Based on these study findings, if the smokers received support through the smoking cessation programmes that promoting the smoking cessation during Ramadan, the success rate of smoking cessation will increase. The health care professional should use this opportunity found during Ramadan to help smokers to quit smoking. If the smokers are given social and moral support through a

good smoking cessation programmes during Ramadan, it would be able to increase the success rate for initiation of smoking cessation during the normal environment.

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Declaration

The authors declare that the manuscript is our original work and the manuscript has not received prior publication and is not under consideration for publication elsewhere. We also confirm that all authors listed have contributed significantly to the work, have read and agree to submission of the manuscript.

Author's contribution

Author 1: Data collection, analysis and preparation of manuscript
Author 2: Research idea, supervising data collection and analysis, and editing of manuscript
Author 3: Supervising analysis and editing of manuscript
Author 4: Data collection

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