

EFFECT OF RAMADHAN FASTING ON NICOTINE DEPENDENCE AMONG SMOKERS

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ABSTRACT

Smoking is widespread among Malaysians. It has become one of the negative health behaviour that brought in health and social problems into the community. Smoking also increased the burden of national economy, particularly an increase in funding to provide public health services. The effects of smoking can be decreased by promoting smoking cessation. One of the approaches that provide opportunity for smoking cessation intervention is focusing on supportive environment that can be naturally found during the month of Ramadan where every Muslim is obligated to fast which includes abstaining from smoking. This study used a one group pretest-posttest study design to evaluate the effect of Ramadan environment on nicotine dependence using Fagestrom Test for Nicotine Dependency (FTND) and saliva cotinine among a group of smokers working in Selangor. It aims to identify the changes in the smoker's nicotine dependency score by using FTND and saliva cotinine level from before Ramadan to during Ramadan and after Ramadan. A total of 61 male and current smokers were recruited. Their mean age was 32 (\pm 6.6) years old. By using paired sample t-test, the results of the study revealed a significant positive change of FTND score from before Ramadan to during Ramadan and from before Ramadan to after Ramadan ($p = 0.001$, $p = 0.002$). Similarly, there was a significant positive change in the saliva cotinine level from before Ramadan to during Ramadan ($p = 0.001$). The findings suggest that there are significant effects of fasting in reducing smoker's nicotine dependency. Results of this study clearly show that fasting gave various positive effects on the mind and body of the smokers. Thus, smokers should take these advantages of fasting during Ramadan to quit smoking.

Keywords: Nicotine Dependence, Fasting, Ramadan environment, male, smokers

BACKGROUND

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, 2014). The impact of smoking has become one of the greatest burdens economically, physically and socially to the country. 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). Smoking cessation is a dynamic process and the successful rate of smoking cessation is determined by the interplay of multiple factor. One of 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). 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).

Another factors that determined a successful rate in smoking cessation 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.

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.

OBJECTIVES

This study was conducted to gather information on changes in nicotine dependence in the month of Ramadan environments among a group of Muslim male smokers.

METHODOLOGY

This research was conducted among a group of male smokers at a local authority in Selangor. The respondents were selected by using the systematic sampling method from a list name of current smokers at the local authority. The research design that was used in this study is one of the quasi experimental which is the one-group pretest-posttest study design. The one-group pretest-posttest study design was chosen as the same respondents are needed to be observed in different type of environment so that the study emphasize on the environmental influence on the behavioural changes of the respondents. In this study design, the pre-test observation (O_1) are recorded on a single group of person that later receive an intervention (X), and the post-test observation (O_2) are made after they received the intervention (Cook & Campbell, 1979). For this study, the changes in the environment that the respondents experienced naturally which is the month of Ramadan are the intervention. Post-test observations were taken in each of the changes of environment that occurs.

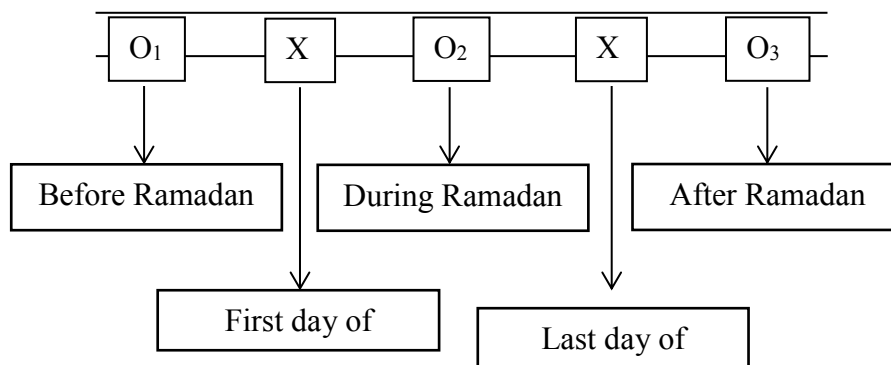


Figure 1: One-group pretest-posttest study design for effect of Ramadan environment on nicotine dependence

The first data collection was taken at one week before Ramadan. The second data collection was taken at 21 days of Ramadan and the last data collection; the third data collection was taken at 21 days after Ramadan. In each time of data collection, the data measurement was taken from the morning until afternoon of the day of the data collection. There were methods of measurement of the smoker's nicotine dependence which are by using self-reported measurement and biochemical measurement. The self-reported measurement was measured by using the Fagerstrom Test for Nicotine Dependence (FTND) and the biochemical measurement were measured by using saliva cotinine level. The saliva cotinine biomarker used in this study is the SalivaBio oral swab (SOS) and cotinine biomarker research salivary assay kits with protocols from Salimetrics with the sensitivity of 0.15ng/ml.

RESULT

A total of 61 male, Malay, Muslim and current smokers were recruited to participate in this study. The mean age of the respondents is 32 ± 6.6 years old and the mean income is $RM 2713.8 \pm 1473.5$. Majority of the respondents work in clerical position and their work required them to do field work more than three days per week. Most of the respondents also married and have secondary school as their highest level of education. The results obtained from the study are presented based on Fagerstrom Test for Nicotine Dependence (FTND) and saliva cotinine level score and changes from baseline (before Ramadan), during Ramadan, and after Ramadan.

The Fagerstrom Test for Nicotine Dependence (FTND) 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. During Ramadan, the mean score of the FTND is lower compared to before Ramadan with the mean (SD) of 3.74 (2.07). 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 maintain as during Ramadan.

At the first data collection, which is before Ramadan, all the recruited respondents were current smokers. According to their FTND score, 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 respondents fall in the low category of nicotine dependence and 9.8 % were highly dependence.

In the second data collection, which is during Ramadan, the FTND score indicated that 4.9 % of the respondent has quit smoking. Pleasingly, the percentage of the respondent that fall in the moderate (21.3%) and high (6.6%) category of nicotine dependence decrease 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 at after Ramadan compare to during Ramadan. It is also found that the respondents that have moderate (24.6%) level of nicotine dependence are higher compare 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 1: FTND score and categories of the respondents (N=61)

FTND score	Mean SD	±	Categories, n (%)				
			Non smoker	Low	Low to moderate	Moderate	High
Baseline (Before Ramadan)	4.54 1.90	±	0 (0.0)	10 (16.4)	24 (39.3)	21 (34.4)	6 (9.8)
During Ramadan	3.74 2.07	±	3 (4.9)	13 (21.3)	28 (45.9)	13 (21.3)	4 (6.6)
After Ramadan	3.84 2.08	±	5 (8.2)	10 (16.4)	27 (44.3)	15 (24.6)	4 (6.6)

The respondents were then categorized as having positive changes in the FTND scores when their scores are lower during and after Ramadan when compared to before Ramadan. As shown in Table 2, 41.0% of the respondents have positive changes in their FTND score during Ramadan and it is increased to 44.3% at after Ramadan. However, when comparing during and after Ramadan, only 19.7% of the respondents have positive changes in their FTND score.

A One-Way ANOVA with repeated measures was then 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 ANOVA with repeated measures 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.

Table 2: The changes of FTND score of the respondents (N=61)

Variable	Categories	n (%)	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	Positive changes	25 (41.0)	3.47 (60)			0.001 ^b
	Negative changes	36 (59.0)				
Before Ramadan-After Ramadan^b	Positive changes	27 (44.3)	3.25 (60)			0.002 ^b
	Negative changes	34 (55.7)				
During Ramadan-After Ramadan^b	Positive changes	12 (19.7)	-0.64 (60)			0.522 ^b
	Negative changes	49 (80.3)				

^aOne-Way ANOVA with repeated measures test ^bPaired sample t-test
*significant at p value <0.05

The saliva cotinine of the respondents

The mean of the saliva cotinine level among respondents before Ramadan is 81.99 (21.07) with the minimum level of 8.4 and maximum level of 100.6. During Ramadan, the mean level of the saliva cotinine is lower compared to before Ramadan. However, the mean saliva cotinine level showed slight increase after Ramadan but still lower compared to before Ramadan.

Table 3 summarize the distribution of the saliva cotinine category of the respondents. During the first data collection, most of the smokers were on the heavy smoker category (95.1%). During Ramadan, there is slight decrease in the percentage of smoker in the heavy category (86.9%) as there is an increase in the percentage of respondents in the non-smoker (4.9%) and light smoker (8.2%) category. However, after Ramadan, the percentage of smoker in the heavy smoker (86.9%) category remained the same as during Ramadan and there is an increased in the percentage of non-smoker (8.2%) category.

Table 3: Saliva cotinine level and categories of the respondents (N=61)

Saliva cotinine level	Mean ± SD	Categories		
		Non smoker	Light smoker	Heavy smoker
Baseline (Before Ramadan)	81.99 ± 21.07	0 (0.0)	3 (4.9)	58 (95.1)
During Ramadan	73.59 ± 29.90	3 (4.9)	5 (8.2)	53 (86.9)
After Ramadan	77.15 ± 32.13	5 (8.2)	3 (4.9)	53 (86.9)

The respondents are categorized as having positive changes in the saliva cotinine level when their level is lower during and after Ramadan when compared to before Ramadan. As shown in Table 4, 59.0% of the respondents have positive changes in their saliva cotinine level during Ramadan when comparing to before Ramadan. However, when comparing before to after Ramadan, only 32.9% of the respondents have positive changes in their saliva cotinine level.

A One-Way ANOVA with repeated measures was then conducted to compare the saliva cotinine level at before, during and after Ramadan environment condition. Based on the One-Way ANOVA with repeated measures test, there was a significant changes in the saliva cotinine level, Wilks' Lambda = 0.814, $F(2, 59) = 6.753$, $p = 0.002$. A paired sample t-test was conducted as the post hoc test to compare the saliva cotinine level of the respondents at three different period of time. There was a significant difference in the saliva cotinine level for baseline (before Ramadan) (82.00±21.07) and during Ramadan (73.59±29.90) conditions; $t(60) = 3.66$, p value = 0.001.

Table 4: The changes of saliva cotinine level of the respondents (N=61)

Variable	Categories	n (%)	t-value (df)	Wilks' Lambda value	F value (df)	p value
Saliva cotinine level changes^a				0.814	6.753 (2, 59)	0.002 ^a
Before Ramadan- During Ramadan^b	Positive changes	36 (59.0)	3.66 (60)			0.001 ^b
	Negative changes	25 (41.0)				
Before Ramadan- After Ramadan^b	Positive changes	20 (32.9)	1.63 (60)			0.109 ^b
	Negative changes	41 (67.2)				
During Ramadan- After Ramadan^b	Positive changes	7 (12.1)	-1.41 (60)			0.165 ^b
	Negative changes	54 (88.5)				

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

DISCUSSION

In a Muslim country such as Malaysia, there is a month in the year that could help to reduce the environmental temptation of smoking and provide a supportive environment for the smoker to quit smoking, which is during the month of Ramadan. During

this month, Muslims is obligated to fast from dawn until dusk which includes abstaining from smoking. From the finding of this study, it is found that the environment during Ramadan does help to reduce the nicotine dependence of the respondents as there are significant changes of the FTND score and saliva cotinine level from before, during and after Ramadan.

Social norms on perceptions of smoking and environmental temptations from other smokers are some of the factors that causing the environment to become unsupportive environment for smoking cessation (Carter-Pokras et al., 2011; Caponnetto & Polosa, 2008; Stillman et al., 2007). During the fasting month of Ramadan, it is out of social norms in Malaysia for a Muslim to eat or smoking openly. This environment helps to reduce the environmental temptation of other smokers and help to change the pattern of smoking of the respondents. The changes of the environment to supportive environment do influence the behaviour of the respondents as there is a positive change in their nicotine dependency. At the first data collection, which is before Ramadan, all the recruited respondents were current smokers. According to their FTND score, in the environment it is normal smokers to smoke freely outside, most of the respondents were on the low to moderate and moderate level of nicotine dependence.

During Ramadan, where there are changes in the environment norm of smoking, the mean score of the FTND is lower compare to before Ramadan. It is found that during Ramadan, from the result of the FTND score, there is 4.9% of the respondent has quit smoking and the finding was confirmed with the finding of the saliva cotinine level. According to Hughes (2008) the enforcement of smoking abstinence during Ramadan will enhance withdrawal for many regular smokers. 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). The respondents is using the opportunity of the month of Ramadan to quit smoking and studies have found that smoker that stop smoking abruptly are more likely to succeed (Cheong, Yong & Borland, 2007). Pleasingly, it is also found that the percentage of the respondent that fall in the moderate and high category of nicotine dependence decrease from before Ramadan data collection as the percentage of the respondents that fall in the low and low to moderate category increasing. The findings from this study are similar to finding from study done in different environment that promote smoking prohibition in public areas which is in a smoke free environment. A study done by Hahn et al. (2008) has found that there was a significant effect of smoke free legislation on adult smoking rates as there was a 31.9% decline in adult smoking. The study also estimated about 16,500 fewer smokers after the smoke free law have been legalise (Hahn et al., 2008).

Similarly, the finding of the saliva cotinine level showed that the percentage of the respondents that fall into the light smoker category from before to during Ramadan is increasing and the percentage of the respondents in the heavy smoker category is decreasing. The changes of the nicotine dependence of the respondents from before to during Ramadan are found to be significant in both the FTND and saliva cotinine level. Majority of the respondents have positive changes in their FTND and saliva cotinine level from before to during Ramadan. As the respondents could not smoke during the day of Ramadan due to fasting, the percentage of the respondents that smoke 10 or fewer cigarettes is increasing from before Ramadan to during Ramadan. Previous studies has found that one of the factors that causing the smokers to unable to quit smoking is due to unsupportive environment (Carter-Pokras et al., 2011; Caponnetto & Polosa, 2008; Stillman et al., 2007). Prohibition from smoking during the day of Ramadan and the absence of other smoker influence could assist in smoking cessation attempt (Chandola, Head, & Bartley, 2004). These changes of positive attitude and practice should be used as an opportunity for the smokers to quit smoking. 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).

Although the nicotine dependency of the respondents does reduce during Ramadan, the positive result does not sustain until after Ramadan. There is a slight increase in the mean of the FTND score and saliva cotinine level of the respondents. Nonetheless, it is found that the percentage of respondents that quit smoking increases from during to after Ramadan and the mean of FTND and saliva cotinine level are still lower in after Ramadan when comparing to before Ramadan. As most of the smokers are obligated or abstaining from smoking during Ramadan, studies have found that force abstinence of smoking does not lead to permanent cessation in most of people (Aveyard, Begh, Sheikh, & Amos, 2011; Lincoln et al., 2009). 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).

The positive environment during Ramadan were able to help the smokers to reduce the nicotine dependence, however due to lack of support on the environment after Ramadan, most of the smokers will end up relapse or only able to maintain the same dependence level as during Ramadan. Smoking cessation is a difficult process and many smokers have tried to quit repeatedly before succeeded and some will experience relapse after a lengthy period of abstinence (Gilpin, Pierce, Farkas, & Farkas, 1997). As the environment after Ramadan where Muslim is no longer obligated to fast, the environment become the same environment as normal days where it is a social norm to smoke and presence of temptation from the other smokers caused smoking cessation become more difficult.

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), however, only minority of them perceived Ramadan as a motivator in smoking cessation (Suriani, Zulkefli, Chung, & Mohamad Sulaiman, 2015; Yong, Hamann, Borland, Fong & Omar, 2009). The fasting environment during Ramadan that gives advantage of the annual daytime smoking abstinence can provide unique opportunity for smoking cessation (Ramahi, Seidenberg, Kennedy, & Rees, 2012). If the smokers were given support through the smoking cessation programmes, they might be able to maintain reduction of number of cigarette intake like they perceived during Ramadan. Thus, support through smoking cessation programmes after Ramadan that were able to promote the useful

environment of Ramadan is needed in order to help the smokers to keep reducing their level of nicotine dependence until reaching a successful smoking cessation.

CONCLUSION

This study was conducted in order to identify the effect Ramadan environment on the nicotine dependence of the smokers. The nicotine dependence of the smokers was measured by using the Fagerstrom Test for Nicotine Dependence (FTND) and saliva cotinine level. From the finding of the study, it is found that the environment where smoking abstinence is required among the Muslim smokers during daylight could help to improve the nicotine dependence of the smokers. Most of the smokers will have positive changes in their FTND score and saliva cotinine level during the supportive environment of Ramadan. The reduction of the nicotine dependence will help the smokers to have higher chances in successful smoking cessation as the lower the nicotine dependence, the easier the smoking cessation.

However, it is also found that the FTND score and saliva cotinine level of the smoker is increasing at after Ramadan compared to during Ramadan. Though that, the FTND score and saliva cotinine is still found to be much lower in after Ramadan compared to before Ramadan. This finding suggest that, if the smokers received support through the more frequently and aggressively smoking cessation programmes that promoting the smoking cessation during Ramadan, the successful rate of smoking cessation will increased. The effect of smoking abstinence during Ramadan still influences the smokers after Ramadan. If the nicotine dependence of the respondents keeps reducing after Ramadan, they might be able to quit smoking for real. Therefore, the environment during the month of Ramadan does provide the golden opportunity for the smokers in smoking cessation.

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