

# THE ASSOCIATION BETWEEN NICOTINE DEPENDENCE AND SMOKING PRACTICES AMONG MALAY MALE SMOKERS WORKING IN SELANGOR MUNICIPALITIES

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## ABSTRACT

**Introduction:** Nicotine dependence develops over time. It radically contributes to adverse health effects and influences smoking cessation. Globally the prevalence of current nicotine dependence has been reported as being between 46 to 53 percent. Nicotine dependence is associated with many factors, one of which is smoking practices.

**Methods:** This cross sectional study was conducted among 112 Malay male smokers working in two selected municipal council. Smokers were identified and then randomly selected. Nicotine dependence was assessed using Fagerstrom Test for Nicotine Dependence (FTND). Smoking practices and data on respondents' characteristics were collected using a validated self-administered questionnaire.

**Results:** The percentage of high nicotine dependence among this study population is 37.56%. Nicotine dependence is significantly associated with current smoking practices (number of cigarette and frequency smoke per day,  $P=0.001$ ), smoking cues (such as feeling sad and lonely,  $P=0.017$  &  $0.013$ ); waking up in the morning and while driving, ( $P=0.01$  &  $0.018$ ); smoking rewards (feeling accepted,  $P=0.026$ ); smoking environment at workplace (smoking in the toilet,  $P=0.05$ ) and at home (not smoking neither inside nor outside the house,  $P=0.013$ ).

**Conclusion:** Nicotine dependence is associated with smoking practices, smoking cues, smoking rewards and smoking environment. Understanding the associations could help in establishing better smoking cessation programs. The smoking cessation program should focus not only on individual smokers but also their smoking environments at the workplace (such as making sure sufficient no smoking signage are present to remind smokers) and as well as at home (such as empowering family members to encourage smokers not to smoke at home).

**Key Words:** nicotine dependence, Malay male smoker, smoking practices, smoking environment

## 1.0 Introduction:

Nicotine dependence develops over time as a person continues to use tobacco products such as smoking cigarettes. Nicotine is highly addictive and radically contributes to adverse health effects. A systematic review on the prevalence of nicotine dependence among current smokers shows a range of between 38 and 55 % for lifetime nicotine dependence and between 46 and 53% for current nicotine dependence. These rates were higher in United States of America and Germany compared to Asia (Hughes et al., 2006). In Singapore it was reported that the prevalence of nicotine dependence was 4.5% (Picco et al., 2012) while in Malaysia, moderate to high nicotine dependence among smokers were reported to range between 3.1 and 28.6 % depending on the study population (Lim et al, 2010, Chua et al, 2013).

One of the factors associated with nicotine dependence is smoking behavior. For instance, current smoking practices such as number of cigarette smoked per day and frequency of smoking are the main predictors of nicotine dependence (Broms, 2008, Doubeni et al., 2015). Nicotine dependence is also associated with smoking cues (such as feeling stress, feeling sad, after waking up, after meal and also while driving) and smoking environment (such as smoking restriction at workplace and at home) (Lamin et al. 2014, Azagba & Asbridge, 2013). Nicotine dependence is also associated with sociodemographic characteristics of the smoker such as gender, age, level of education and income (Picco et al., 2012, Breslau et al., 2001, Huijie et al., 2015).

One of the main problems of nicotine dependence is that it causes difficulty in smoking cessation efforts and thus the vicious cycle of smoking is amplified. Those who are not nicotine dependent are 4 times more likely to quit smoking compared to those who are (Buckner et al, 2014, Breslau et al, 2001). Nicotine dependence modifies the risk of smoking persistence and it varies along with its associations with other factors. Understanding the factors associated with nicotine dependence would allow the formulation of more effective smoking cessation intervention programs as these programs will include interventions tailored to specific groups. This study chose to study nicotine dependence and its associated factors among Malay male smokers. Malay males make up the group with highest smoking prevalence in Malaysia. The findings of the study could assist in developing more effective smoking cessation intervention programs in Malaysia, mainly for Malay male smokers.

## 2.0 Methodology

### 2.1 Study sample

This cross sectional study was conducted among 112 Malay male smokers working in the two selected municipal councils in Selangor (one of the states in Malaysia). The scope of work and jurisdictions of both councils were similar. The inclusion criteria were Malay male current smoker and working as permanent staff, while the exclusion criteria was the use of other kinds of tobacco products other than cigarette. The smokers were identified and then randomly selected.

## 2.2 Data collection

Nicotine dependence was assessed using Fagerstrom Test for Nicotine Dependence (FTND) which has been validated both in English and also Bahasa Malaysia version in Malaysia (Anne Yee et al., 2011). It consisted of 6 items and for each item a score was given and then summed to determine the nicotine dependence level. Based on this summed score, the nicotine dependence was further classified into low and high dependence.

The saliva cotinine level was also measured as an attempt to validate the self-reported smoking behavior. The 'Salimetrics Saliva Cotinine Test Kit' was used and the saliva samples were collected according to the protocols. The sample was then analyzed in the pathology laboratory in the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

The respondents' characteristics (age, marital status, formal education level, monthly income, job position and job description) and smoking practices were collected using a self-administered questionnaire which has been developed and validated for the study. Smoking practice questions were subdivided into current smoking practices, cues to smoke, perceived reward from smoking, smoking environment at workplace and at home.

## 2.3 Data analysis

Data was analyzed using IBM SPSS version 21.0. Chi squared test was used to test for associations. Significant levels were set at a standard value of  $P < 0.05$ .

## 3.0 Results

A total of 112 respondents participated in the study which meant a response rate of 93.3%. The non-response was mainly because some respondents decided not to give their saliva samples. Most respondents were between 30-39 years of age (55.4%), married (75.9%), had secondary education (58.9%), earned between RM 2000-3999 per month (43.8%), non-officer (94.5%) and work in the office (52.7%). Majority of the respondents were in the low nicotine dependence group (62.5%), although assessment by saliva cotinine showed that majority (82.1%) were heavy smokers.

Table 1 shows that respondent's education level was significantly associated with nicotine dependence. Table 2 shows that nicotine dependence among this study population was significantly associated with current smoking practices (number of cigarette and frequency smoke per day), smoking cues (such as feeling sad and lonely, waking up in the morning and while driving) and smoking rewards such as feeling accepted. Table 3 shows the association between nicotine dependence and smoking environment at the workplace (smoking in the toilet) and at home (not smoking neither inside nor outside the house).

**Table 1:** association between respondent's characteristics (sociodemographic, socioeconomic, job position and nature of work) and nicotine dependence (N=112)

Variables	Fagerstrom Nicotine Dependence		$\chi^2$	df	P
	High n(%)	Low n(%)			
<b>Age group (year)</b>					
20-29	13(35.1)	24(64.9)	4.589	2	0.204
30-39	27(43.5)	35(56.5)			
≥40	2(25.0)	11(75.0)			
<b>Marital status</b>					
Single	8(33.3)	16(66.7)	0.264	2	0.877
Married	33(38.8)	52(61.2)			
Divorcee	1(33.3)	2(66.7)			
<b>Education level</b>					
Primary	1(50.0)	1(50.0)	14.528	2	0.006*
Secondary	34(51.5)	32(48.5)			
Tertiary	7(16.1)	37(83.9)			
<b>Household income</b>					
RM ≤ 1999	17(48.6)	18(51.4)	7.709	2	0.052
RM 2000-RM 3,999	20(40.8)	29(59.2)			
RM ≥ 4,000	5(22.7)	23(77.3)			
<b>Job position</b>					
Officer	0(0.0)	6(100.0)	3.804	1	0.082
Non officer	42(39.6)	64(60.4)			
<b>Nature of work</b>					
Field work	22(37.3)	37(62.7)	0.002	1	1.000
Office work	20(37.7)	33(62.3)			

\*Significant at  $P < 0.05$

**Table 2:** association between current smoking practices, smoking cues and smoking rewards, and nicotine dependence (N=112)

Variables	Fagerstrom Nicotine Dependence		$\chi^2$	df	P
	High n(%)	Low n(%)			
Current smoking practices					
Cigarettes per day					
≤ 10	10(23.8)	48(68.6)	22.73	1	0.001*
≥11	32(59.3)	22(40.7)			
Frequency per day					
≤ 10	12 (18.8)	52 (81.3)	23.13	1	0.001*
≥11	30 (62.5)	18 (37.5)			
Smoking cues					
Feeling stress					
Yes	24 (34.3)	46(65.7)	0.823	1	0.364
No	18(42.9)	24(57.1)			
Feeling sad					
Yes	14 (58.3)	10 (41.7)	5.657	1	0.017*
No	28 (31.8)	60 (68.2)			
Feeling lonely					
Yes	19 (54.3)	16(45.7)	6.120	1	0.013*
No	23 (29.9)	54 (70.1)			
Feeling frustrated					
Yes	16 (48.5)	17 (51.5)	2.409	1	0.121
No	26 (32.9)	53 (67.1)			
Feeling sleepy					
Yes	29 (41.4)	41 (58.6)	1.229	1	0.268
No	13 (31.0)	29 (69.0)			
After waking up in the morning					
Yes	18 (66.7)	9 (33.3)	12.913	1	0.001*
No	24 (28.2)	61 (71.8)			
After a meal					
Yes	40 (40.0)	60 (60.0)	2.489	1	0.115
No	2 (16.7)	10 (83.3)			
While watching television					
Yes	15 (50.0)	15 (50.0)	2.732	1	0.098
No	27 (32.9)	55 (67.1)			
While driving					
Yes	24 (50.0)	24 (50.0)	5.600	1	0.018*
No	18 (28.1)	46 (71.9)			
Smoking rewards					
Calm					
Yes	27 (42.9)	36 (57.1)	1.763	1	0.184
No	15 (50.9)	34 (69.4)			
Feel accepted					
Yes	7 (70.0)	3 (30.0)	4.948	1	0.026*
No	35 (34.3)	67 (65.7)			
Reduce stress					
Yes	25 (38.5)	40 (61.5)	0.061	1	0.805
No	17 (36.2)	30 (63.8)			
Feel macho					
Yes	5 (33.3)	10 (66.7)	0.128	1	0.720
No	37 38.1)	60 (61.9)			

\*Significant at  $P < 0.05$

**Table 3:** association between smoking environment (at workplace and at home) and nicotine dependence (N=112)

Variables	Fagestrom Nicotine Dependence		$\chi^2$	df	P
	High n(%)	Low n(%)			
<b>Aware workplace is non-smoking area</b>					
Yes	37(37.0)	63(63.0)	0.1	1	0.761
No	5 (41.7)	7(58.3)			
<b>Smoke at workplace</b>					
Yes	35(37.6)	58(62.4)	0.004	1	0.948
No	7(36.8)	12(63.2)			
<b>Places for smoking at workplace</b>					
<b>Emergency staircase</b>					
Yes	16(45.7)	19(54.3)	1.446	1	0.226
No	26(33.8)	51(66.2)			
<b>Toilet</b>					
Yes	21(48.8)	22(51.2)	3.828	1	*0.05
No	21(30.4)	48(69.6)			
<b>Inside office room</b>					
Yes	1(50.0)	1(50.0)	0.136	1	1
No	41(37.3)	69(62.7)			
<b>Parking lot</b>					
Yes	26(44.1)	33(55.9)	2.295	1	0.13
No	16(30.2)	37(69.8)			
<b>Places for smoking at home</b>					
<b>Inside the house</b>					
Yes	4(30.8)	9(69.2)	0.284	1	0.764
No	38(38.4)	61(61.6)			
<b>Outside the house</b>					
Yes	22(32.8)	45(67.2)	1.548	1	0.213
No	20(44.4)	25(55.6)			
<b>Not at all</b>					
Yes	3(20.0)	12(80.0)	2.263	1	*0.013
No	39(40.2)	58(59.8)			
<b>Other family members who smokes</b>					
<b>Father</b>					
Yes	20(55.6)	16(44.4)	7.379	1	*0.012
No	22(28.9)	54(77.1)			
<b>Siblings</b>					
Yes	26(45.6)	31(54.4)	3.261	1	0.082
No	16(29.1)	39(70.9)			
<b>None</b>					
Yes	9(22.5)	31(77.5)	5.973	1	*0.016
No	33(45.8)	39(54.2)			

\*Significant at  $P < 0.05$

## 4.0 Discussion

The percentage of high nicotine dependence in this study (37.5%) is higher than a study done among smokers in selected villagers in Sabah (28.6 %) (Chua et al, 2013). The variation could be due to different study locations. Although the percentage of high nicotine dependence among the respondents was 37.5% but heavy smokers (according to the assessment using saliva cotinine level) was 82.1%. The discrepancies between these findings are somewhat expected, and may be due to several contributing factors. The inconsistency between nicotine dependence (which was derived from self-reported smoking behavior) and type of smoker (which was assessed using saliva cotinine concentration level) may be due to information bias from the respondent as different person may define smoking practices differently. Information bias was avoided when saliva cotinine was used as a biomarkers tool for validation of self-reported smoking behavior. It could also be due to exposure to secondary smoking itself (Hu et al, 2006) which was not evaluated in this study. And lastly, it could be due to biological variation. A study in Switzerland showed that there were considerable variations in the saliva cotinine concentration for similar number of cigarettes smoked which could be due biological differences in nicotine metabolism (Etter et al. 2000, Hu et al, 2006, Huang et al, 2008).

Current smoking practices of smoking  $\geq 11$  cigarettes per day (57.1%) was similar to the current smoking practices among Malaysian adult smokers aged 25-64 years old where the mean of number of cigarette consumed per day was 14.2 (Lim et al., 2012). The highest reasons for smoking were stress (62.5%) and smoking after meal (89.3%). These reasons for smoking were similar to the findings of other studies which showed that stress (43.9%), feeling pressure (47.4%) and smoking after meal (43.9%) were cues to smoke (Lamin et al., 2014, Jamal et al., 2012). Most (56.3%) respondents perceived that they felt calmer and less stressed after smoking. These smoking rewards were similar to the findings of other studies which showed positive correlation with emotions such as feeling pleasure and relaxed after smoking (Moon & Lee, 2011). Majority (89.3%) of the respondents declared that they were aware that their workplaces were gazetted as non-smoking areas, but 38.4% still smoke at the workplace. The most common place to smoke at the workplace is the parking lot. This is similar to the findings of a study which showed that people would generally agree not to smoke in the working environment, provided they were allowed to smoke outside the premises (Ratschen et al., 2010). Although 86.6% smokers smokes at home but only 11.6 % of them smoke in the house.

The only sociodemographic characteristic that was found to be significantly associated with nicotine dependence in this study was education level. This is in line with the findings that those with lower education level were most addicted to nicotine and least aware of the harm of smoking (Picco et al., 2012, Siahpash et al, 2015). The association of nicotine dependence with marital status was established in a few other studies (Pennanen et al, 2014, Broms, 2008), however the association was not observed in this study and this could be due to the difference in the culture of the study populations.

In this study, nicotine dependence was shown to be associated with number of cigarettes and frequency of smoking per day. The association between nicotine dependence and smoking practices (numbers of cigarette and frequency of smoking per day) is well established (Broms, 2008, Donny et al., 2007, Hu et al., 2014, O'Loughlin et al., 2003, Doubeni et al., 2010). This could be plausibly explained by the fact that both (increase number of cigarette (CPD) and



frequency of smoking per day) could contribute directly to the increase of nicotine consumption in smokers.

Although stress was not shown to be associated with nicotine dependence in this study, it was demonstrated in many other studies (Balk et al., 2009, Pietras et al, 2011). In a recent study among employed patients, occupational stress was found to be associated with lower nicotine dependence (Schmidt et al., 2010). In this study, feeling sad and lonely was found to be associated with nicotine dependence,. This is similar to other studies which showed that those who were depressed have more severe nicotine dependence (Jamal et al., 2012, Unsal & Tozun, 2014, Buckner et al., 2014). Waking up in the morning and driving was found to be associated with nicotine dependence, in this study. This was also established in other study in Malaysia (Lamin et al., 2014).

Although, this study was conducted among adult smokers, there was a significant association between wanting to be accepted by peers and nicotine dependence. This could be because smoking makes socializing easier (Piasecki et al., 2007). However, there were no association shown between nicotine dependence and perceived smoking reward assessed in this study (i.e. feeling calm, reduce stress and feeling macho). These finding are different than the findings in other studies which showed significant positive correlation between the positive emotional experiences such as feeling pleasure and relaxed (Moon & Lee., 2011). The smoking reward in this study population could be mainly to reduce the nicotine craving since most respondents were nicotine dependent.

There is a significant association between those who smoke in the toilet and nicotine dependence in this study. The study location is at municipal councils' offices. In line with the Control of Tobacco Product (Amendment) Regulations 2013, they are gazetted as non-smoking areas and stern action will be taken on smokers caught smoking in gazetted non-smoking area (e.g. they shall be compounded up to RM 5,000). Therefore it is not surprising that, in this study, smokers who are of high nicotine dependence would resort to smoke in the toilet. Thus there was failure in the enforcement of the prohibition against smoking at the workplace. Studies had shown that enforcement of the prohibition of smoking at the workplace had no significant association with nicotine dependence (Azagba & Asbridge, 2013).

Encouragingly, in this study, there is significant association between nicotine dependence and smoking restriction at home (not smoking at home at all). This is in line with the study in Canada which showed home smoking restriction showed better association with nicotine dependence compared to workplace restriction (Azagba & Asbridge, 2013). In this study also, it was noted that there are significant association between nicotine dependence and father who smokes and also no other family member who smokes. This is similar to the findings of a study in USA where significant association with parents and siblings who smoke with nicotine dependence level (Scherrer et al., 2012, Selya et al., 2012). This finding could be related to the fact that parents' practices were followed by their off springs as they are normally portrayed as role models.

The limitation of this study is that it was a cross sectional study which could not infer causal relationships and it was carried out only at municipal councils offices, therefore the findings cannot be generalized to other government offices. The strength of this study is its attempt to validate self-reported smoking behavior using saliva cotinine.



## 5.0 Conclusion and recommendation

In conclusion, the factors that were significantly associated with nicotine dependence were education level, current smoking practices (number of cigarette and frequency of smoking per day), smoking cues (such as feeling sad and lonely and waking up in the morning and driving), smoking rewards (i.e. being accepted), smoking environment at workplace (i.e. the habits of smoking in the toilet) and at home (i.e. not smoking at home at all). Smoking cessation program should take into account the factors identified to be associated with nicotine dependence. For example, the program should focus on smokers from low education levels, improving their skills to control smoking cues and reward. To complement the program, effort to control the smoking environment at workplace and at home should also be emphasized. Ample no-smoking signages should be placed at all identified places where smokers would normally smoke including the toilets and family member of smoker should be equipped with the knowledge and skill to help smokers to not smoke at home. Lastly, further studies should be carried out to determine factor associated with nicotine dependence using better study instruments which could measure variables such as stress more accurately.

## Ethical

Ethical approval (reference number UPM/TNCPI/RMC/ JKEUPM/1.4.18.1/F1) was obtained from the Ethical Committee of Universiti Putra Malaysia.

## Declaration of conflict of interest

The authors declare that there is no conflict of interest regarding publication of this article.

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