

Nicotine Dependence Level among Adult Male Smokers Living in North Okkalapa Township, Yangon, Myanmar

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ABSTRACT

Background and Aim: This study determined nicotine dependence level among adult male smokers living in North Okkalapa Township, Yangon, Myanmar and association between socio-demographic characteristics and smoking status. **Materials and Methods:** This cross-sectional analytical study was carried out in adult male subjects (n=450) with the age between 18 and 40 years using multistage sampling method. These recruited participants were categorized into smokers and non-smokers according to their smoking history. Each smoker was interviewed by using standardized Myanmar version of Fagerstrom Test for Nicotine Dependence (FTND) to assess nicotine dependence level. Moreover, sociodemographic information, including age, marital status, and level of education (primary school, secondary school, high school and university), and occupational information (elementary class, middle class and high class) were collected using a self-designed questionnaire. **Results:** Among 450 adult male subjects, 264 (58.7%) were non-smokers, whereas 186 (41.3%) were smokers. Mean level of FTND score of smokers was 3.80 ± 2.6 . It was shown 33.3% for very low dependence, 22.0% for low dependence, 12.9% for moderate, 25.3% for high dependence as well as 6.5% for very high dependence. It had observed that nicotine dependence was significantly associated with marital status, level of education, pack year, age at smoking initiation and occupational status. **Conclusion:** Our results revealed some sociodemographic factors affecting nicotine dependence and showed that nicotine dependence is high in Myanmar's population. These findings highlight the need for targeted interventions and public health strategies to address nicotine dependence in Myanmar.

Keywords: FTND, Nicotine dependence, Smokers.

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INTRODUCTION

The World Health Organization indicates that the smoking remains the largest international public health problem. Even health effects of light smoking have been linked to the development of non-communicable diseases, such as cardiovascular disease, cancer, chronic lung disease, and diabetes.^[1] Therefore, there is needed to quit smoking to prevent and control smoking related diseases. However, the failure rate for smoking cessation is still high. For the reason that it is likely to depend on level of nicotine dependence.

Nicotine is the key chemical compound that causes and sustains the powerful addicting effects.^[2,3] Inhalation of smoke causes that nicotine enter circulation and readily diffuses into the brain, where it binds to nicotinic acetylcholine receptors and results in the release of neurotransmitters which help mood

and behavior regulation.^[3,4] With repeated exposure to nicotine, neuroadaptation and receptor desensitization develop and it may play a role in nicotine tolerance and dependence.^[5] Since nicotine affects all areas of body, nicotine withdrawal involving physical, mental, and emotional symptoms will appear following cessation. Repeated use of nicotine trying to relieve nicotine withdrawal symptoms sustains nicotine addiction which in turn causes more devastating health problems. Therefore, severity of nicotine withdrawal symptoms is closely related to the nicotine dependence level of smokers. The World Health Organization has also stated that nicotine dependence is associated with failure to quit attempts and increases the risk of numerous health issues.

Thus, any efforts to reduce nicotine-related disease must consider the addiction potential of a tobacco product. There were several dependence scales available for the evaluation of nicotine addiction. The Fagerstrom Test for Nicotine Dependence (FTND) is a standard instrument for assessing the intensity of addiction to nicotine.^[6] In scoring the FTND, the items are summed to yield a total score of 0-10 as shown in Table 1. It is non-invasive and provides a quantitative assessment, conceptualizes addiction levels using behavioral and physiological symptoms and is



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widely used in genetic research to measure dependence levels.^[7] The higher the total Fagerstrom score, the more intense is the dependence on nicotine.

The World Health Organization, the United Nations Development Programme (UNDP), and Myanmar's Ministry of Health (MOH) conducted the Myanmar Tobacco Control Investment Case in 2018 and reported that tobacco use is responsible for approximately 64,000 deaths annually due to tobacco-related diseases, such as cancer, heart disease, and respiratory illnesses.^[8] This report highlighted the need for stronger tobacco control measures like implementing smoking bans in public places, and promoting public awareness campaigns about the dangers of smoking. FTND score is a measure of nicotine dependence that can be used to evaluate the efficacy of tobacco control measures. The most of study conducted in Myanmar has focused on the negative health effects of smoking. A few studies have been carried out to determine the prevalence of nicotine dependence in smokers by using the FTND score. Therefore, this study aimed to assess nicotine dependence level among adult male smokers living in North Okkalapa Township, Yangon, Myanmar and association between socio-demographic characteristics and smoking status.

MATERIALS AND METHODS

Study Design and Setting

This was the cross-sectional analytic study regarding nicotine dependency and its associated factors among adult male smokers living in North Okkalapa Township, Yangon. Yangon is most populous city in Myanmar and consists of 45 townships in which North Okkalapa Township is located in the eastern part of Yangon and it has a high population density. This study was carried out from 2023 to 2024 only after obtaining the approval of Academic Board of Postgraduate Studies and Ethics Review Committee.

Sample Size

The sample size for this investigation was determined using the formula provided by Rosner (2010).^[9] Based on Myanmar Demographic and Health Survey, prevalence of tobacco use was 40.9%^[10] and a minimum sample size of 432 people was required. To ensure an adequate sample, a total of 450 participants were recruited for this study.

Study Population and Sampling

The present study was carried out in adult male subjects (n=450) with the age between 18 and 40 years who lived in North Okkalapa Township using multistage sampling method. At the first stage, 9 quarters among total 19 quarters in North Okkalapa Township were selected by simple random sampling method. At the second stage, 50 adult male subjects aged between 18 and 40 years from each 9 quarters were recruited.

Inclusion and Exclusion Criteria

Non-smoker: An individual who had never smoked any form of tobacco in their lifetime.

Current smoker: An individual who had smoked at least 100 cigarettes in their lifetime and was currently smoking cigarettes.^[11]

Ex-smoker: An individual who had smoked more than 100 cigarettes in their lifetime but had not smoked in the last 28 days.^[12] Ex-smokers were excluded from the present study.

Thus, participants (n=450) were categorized into smokers and non-smokers according to their smoking history.

Ethical Considerations

All the participants were explained about detailed procedures and written informed consent was taken from each participant. The present study followed the Declaration of Helsinki's ethical standards for medical research involving human beings.

Data Collection

Each smoker was interviewed by using standardized Myanmar version of Fagerstrom Test for Nicotine Dependence to assess nicotine dependence level. The Fagerstrom Tolerance Questionnaire was developed by Karl-Olov Fagerstrom. Todd Heatherton was modified this instrument to the Fagerstrom Test for Nicotine Dependence in 1991.^[6] It composes six items that assess the quantity of cigarette consumption, compulsion and dependence. The items are summed to yield a total score of 0-10 as shown in Table 1. Moreover, sociodemographic information, including age, marital status, and level of education (primary school, secondary school, high school and university), occupational information (elementary class, middle class and high class) and smoking history were collected using a self-designed questionnaire.

Statistical Analysis of Data

Data entry and analysis was done by using SPSS software version 22. Data were interpreted as frequency and percentage, and the chi-square test was used to determine the association between the categorical variables. p-value <0.05 were considered as statistically significant.

RESULTS

A total of 450 adult male subjects were included in this study. Among them, 264 (58.7%) were non-smokers, whereas 186 (41.3%) were smokers (Figure 1). It was noted that this study did not include any ex-smokers.

Among the 186 smokers, the levels of nicotine dependence assessed using the Fagerstrom Test for Nicotine Dependence (FTND) were as follows: Very Low Nicotine Dependence (VLND) 33.3%, Low Nicotine Dependence (LND) 22.0%,

Medium Nicotine Dependence (MND) 12.9%, High Nicotine Dependence (HND) 25.3%, and Very High Nicotine Dependence (VHND) 6.5% (Figure 2).

The profile of smokers (n=186) is presented in Table 2. Most of the smokers were married (64.0%) and had high school education (55.4%). Regarding occupation, 35.5% belonged to the middle class, 33.9% to the high class, and 30.6% to the low class.

Table 3 shows the association between sociodemographic factors and smoking status. Smoking prevalence was significantly higher among married participants compared to singles (64.0% vs. 36.0%, $p=0.02$). Educational status was also significantly associated with smoking behavior ($p=0.002$). The majority of smokers had attained high school education (55.4%), whereas non-smokers were more likely to have completed secondary school or university. Occupational status, however, was not significantly associated with smoking status ($p=0.18$).

Table 1: Fagerstrom Test for Nicotine Dependence Questionnaire and Score (Heatherton, 1991).

Sl. No.	Questions		Score
1	How soon after waking up do you smoke your first cigarette?	5 min 6-30 min 31-60 min after 60 min	3 2 1 0
2	Do you find it difficult to refrain from smoking in places where it is forbidden?	yes no	1 0
3	Which cigarette would you hate most to give up?	first cigarette in the morning other	1 0
4	How many cigarettes do you smoke per day?	1-10 cigarettes 11-20 cigarettes 21-30 cigarettes 31 cigarettes or more	0 1 2 3
5	Do you smoke more frequently during the first hours after waking up than during the rest of the day?	yes no	1 0
6	Do you smoke even when you are so ill that you are in bed most of the day?	yes no	1 0
		Total	10

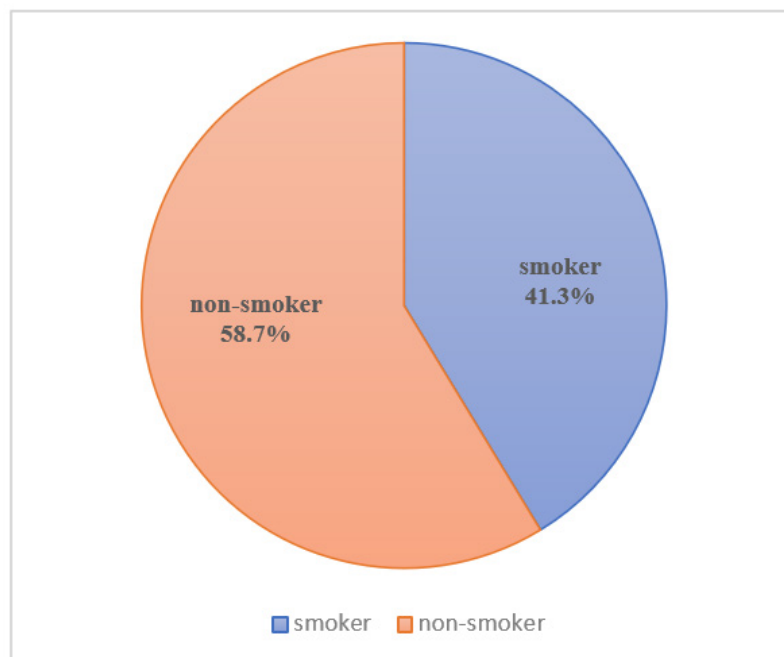


Figure 1: Smoker vs non-smoker distribution.

Further analysis of nicotine dependence and its associated factors (Table 4) revealed several significant relationships. Married participants demonstrated higher nicotine dependence compared to singles. Education also played a role, as those with high school education exhibited higher levels of dependence compared to other groups. Smoking history showed a strong influence on

dependence; individuals with more than five pack-years had significantly higher dependence levels than those with fewer pack-years. Similarly, the age at initiation of smoking was an important factor, with participants who started smoking before the age of 15 years showing higher dependence compared to those who began later. Occupational status was also linked with

Table 2: Sociodemographic characteristics of the smokers (n=186).

Variables	N (%)
Marital status	
Single	67(36.0%)
Married	119(64.0%)
Educational status	
Primary school	6(3.2%)
Secondary school	24(12.9%)
High school	103(55.4%)
University	53(28.5%)
Occupational Status	
Low	57(30.6%)
Middle	66(35.5%)
High	63(33.9%)

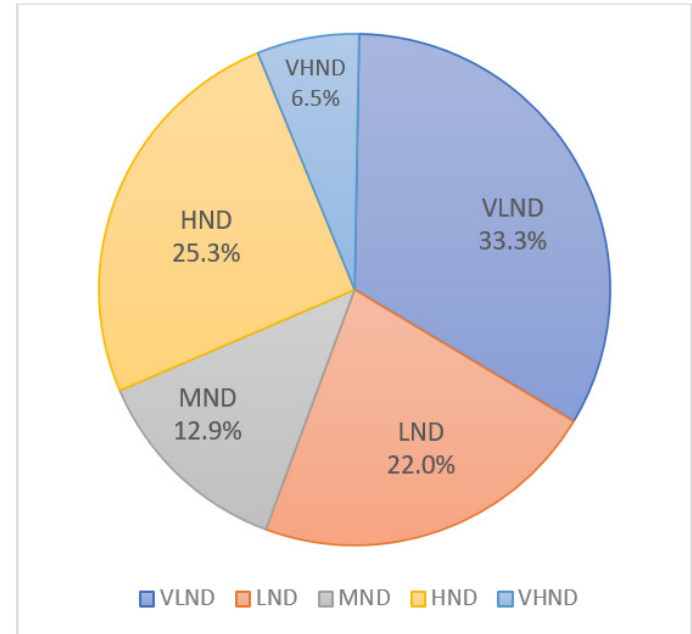


Figure 2: Level of Nicotine Dependence of the smokers (n=186). VLND: Very low nicotine dependence; LND: Low nicotine dependence; MND: Medium nicotine dependence; HND: High nicotine dependence; VHND: Very high nicotine dependence.

Table 3: Association between socio-demographic characteristics and smoking status.

Variables		Smoker	Non-smoker	X ²	p value
Marital status	Single	67 (36.0%)	124 (47.0%)	5.354	0.02
	Married	119 (64.0%)	140 (53.0%)		
Educational status	Primary School	6 (3.2%)	9 (3.4%)	14.57	0.002
	Secondary School	24 (12.9%)	63 (23.9%)		
	High School	103 (55.4%)	102 (38.7%)		
	University	53 (28.5%)	90 (34.1%)		
Occupational Status	Low Class	57 (30.6%)	90 (34.1%)	3.47	0.18
	Middle Class	66 (35.5%)	72 (27.3%)		
	High Class	63 (33.9%)	102 (38.7%)		

Table 4: Association between Socio-demographic characteristics, Smoking History and Nicotine Dependence (n=186).

Variables	All participant (n=186)	VLND (n=62) 33.3%	LND (n=41) 22.0%	MND (n=24) 12.9%	HND (n=47) 25.3%	VHND (n=12) 6.5%	X ²	p value
Single	67 36.0%	20 32.3%	16 39.0%	17 70.8%	10 21.3%	4 33.3%	17.63	0.001
Married	119 64.0%	42 67.7%	25 61.0%	7 29.2%	37 78.7%	8 66.7%		
Primary School	6 3.2%	0 0.0%	3 7.3%	3 12.5%	0 0.0%	0 0.0%	29.38	0.003
Secondary School	24 12.9%	5 8.1%	10 24.4%	2 8.3%	6 12.8%	1 8.3%		
High School	103 55.4%	35 56.5%	21 51.2%	10 41.7%	26 55.3%	11 91.7%		
University	53 28.5%	22 35.5%	7 17.1%	9 37.5%	15 31.9%	0 0.0%		
Pack year < 5	88 47.3%	45 72.6%	18 43.9%	5 20.8%	18 38.3%	2 16.7%	26.69	<0.001
Pack year > 5	98 52.7%	17 27.4%	23 56.1%	16 66.7%	29 61.7%	10 83.3%		
Age started smoking <15 years	76 40.9%	13 21.0%	13 31.7%	11 45.8%	30 63.8%	9 75.0%	27.87	<0.001
Age started smoking >15 years	110 51.1%	49 79.0%	28 68.3%	13 54.2%	17 36.2%	3 25.0%		
Low occupation class	57 30.6%	12 19.4%	9 22.0%	10 41.7%	20 42.6%	6 50.0%	16.5849	0.03
Middle occupation class	66 35.5%	20 32.3%	17 41.5%	8 33.3%	17 36.2%	4 33.3%		
High occupation class	63 33.9%	30 48.4%	15 36.6%	6 25.0%	10 21.3%	2 16.7%		

dependence, with smokers in the low occupational class showing higher levels of dependence.

DISCUSSION

In Myanmar, prevalence of smoking is still high although smoking control intervention programs are implemented. In this study, 186 out of 450 adult male participants were smokers, reporting 41.3% of study population. According to Myanmar Demographic and Health Survey, prevalence of tobacco use was 40.9%.^[10] Therefore, our finding was more or less similar to Myanmar national survey. Moreover, the present study was conducted to find out the level of nicotine dependence among smokers using FTND score in Myanmar populations. Nicotine dependence causes physical and psychological factors, that drive to smoke and make it difficult to

stop using tobacco. The sustained use of nicotine causes health problems including respiratory disease, cardiovascular disease, metabolic disease and cancer. Therefore, assessment of nicotine dependence is important for clinical trial, treatment and smoking intervention plans.

In this study, mean FTND score was 3.80 ± 2.6 which is comparable to the finding of previous study in which mean FTND score was 3.2 ± 2.1 .^[13] This difference in scores can occur due to the fact that both male and female subjects were involved in study done by John *et al* whereas our study involved only male subjects. Moreover, previous study also stated that female individuals had a lower mean FTND score in comparison to male, which indicating that previous study had a relatively lower level of nicotine dependence in the study population.^[14]

Figure 2 had showed 33.3% for very low dependence, 22.0% for low dependence, 12.9% for moderate, 25.3% for high dependence as well as 6.5% for very high dependence. Our findings were more or less similar to other previous studies.^[15,16] Moreover, previous study evaluated nicotine dependence level among industrial smokers in Mandalay, Myanmar.^[17] It had shown that FTND was very low in 31.8%, low in 43.2%, medium in 5.8% and high in 17.8% and very high in 1.4%. In our study, high and very high nicotine dependence was noted in 59 smokers, accounting for 31.7% of smokers. Compared with this previous study, nicotine dependence level was higher in our study. This may be due to characteristics of participants and the nature of industrial employment often involves time constraints, workplace smoking restrictions which may limit the frequency of tobacco use during work hours.

The present study examines sociodemographic factors, such as marital status, education, and occupation among 186 smoker subjects, as presented in Table 2. The most of smokers were married (64.0%), high school (55.4%), and middle occupational status (35.5%). These findings are in agreement with previous studies.^[18,19] In addition, our study found that smoking status was significantly associated with marital status, and educational status (Table 3). It was found that married individuals with low education are more likely to smoke.

Moreover, nicotine dependence was significantly associated with marital status ($p=0.001$), level of education ($p=0.003$), pack year ($p<0.001$), age at smoking initiation ($p<0.001$), and occupational status ($p=0.03$) (Table 4). In our study, it was observed that marital status was significantly associated with nicotine dependence. The result of our study supported previous findings which described that change in married life and increased stress lead to increased smoking rates.^[20] However, it was inconsistent with the result of previous study.^[21]

The present study observed that those who were educated to university and high occupation class were least nicotine dependence. Similar to this finding, higher education and occupation is lower risk for nicotine dependence.^[22,23] It may be due to having knowledge of health among higher education and these participants know the harmful effects of smoking. There were also some evidences of an association between occupation and nicotine dependence.^[24] It was explained that those who with lower occupational class were difficult to quit smoking or a variety of reasons, such as smoking-friendly workplaces, limited access to cessation resources, financial constraints that make quitting aids. Therefore, our study found that married individuals with low socio-economic status have high nicotine dependence.

In present study, nicotine dependence of those who started early smoking initiation was higher than that of late smoking initiation which is consistent with the findings of previous studies.^[17,25,26] In their studies, cut off point of age was slightly different from our

study. Another reason for a high rate of early smoking initiation may be a state of not having enough knowledge or information about smoking related adverse health effects and more vulnerable to influence by family, social, environmental and peer pressure. Regarding pack year, individuals who have more than 5 pack years was significantly association with nicotine dependence in our study. These findings showed that subjects began to smoke since childhood and tobacco was long used which all lead to high nicotine dependence and being difficult to quit. Thus, health education program and prohibition of tobacco sale should be implemented for children. Therefore, nicotine dependence is influenced by a complex interplay of age, economic, social, and cultural factors.

CONCLUSION

Our results revealed that nicotine dependence is high in Myanmar population and highlight some sociodemographic factors that affect nicotine dependence. This study was conducted in an area where persons live with various standards and it represents general population. Moreover, further studies are required to conduct longitudinal Assessment of nicotine dependence among smokers for providing information about the transition of smoking over time.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

FTND: Fagerstrom Test for Nicotine Dependence; **VLND:** Very Low Nicotine Dependence; **LND:** Low Nicotine Dependence; **MND:** Medium Nicotine Dependence; **HND:** High Nicotine Dependence; **VHND:** Very High Nicotine Dependence; **WHO:** World Health Organization; **UNDP:** United Nations Development Programme; **MOH:** Ministry of Health.

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