

Nicotine dependence and its correlates among the adult tobacco users in a slum of Burdwan district, West Bengal, India

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ABSTRACT

Background: Tobacco kills half of its users, with smoking and smokeless tobacco killing nearly 6 million people worldwide - one death every 6 s in each year. Use of tobacco over time causes a physical and psychological addiction due to the presence of nicotine. To find out the level of nicotine dependence among adult (18 years and above) tobacco users and the factors responsible for it. **Materials and Methods:** A cross-sectional community-based study was conducted among 128 current tobacco users in an urban slum of Burdwan District, West Bengal, India. Study tools comprised of predesigned, pretested, semi-structured schedule, containing Fagerström test for nicotine dependence (FTND) questionnaire. Data were collected by interview after getting consent from the participants. Chi-square test, unpaired student *t*-test, ANOVA, correlation coefficient, and linear regression was calculated. SPSS software (Statistical Package for the Social Sciences Inc, Chicago, IL, USA) was used for analysis. **Results:** High level of nicotine dependence was maximally seen among increased in age group, prolonged duration of use and daily users. Age, duration of tobacco use and habit of tobacco use had a significant positive correlation with FTND score while starting age of tobacco had a significant negative correlation. Then in multivariable linear regression, starting age of tobacco use, habit of tobacco use and duration of tobacco use emerged as a significant predictor of FTND score and could explain 27.3% of total variation in FTND score. **Conclusions:** Suitable plan for quitting may be developed based on the FTND score of an individual, the most important determinant of quitting.

Keywords: Correlates, Fagerström test, Fagerström test for nicotine dependence score, nicotine dependence, tobacco users

Introduction

Tobacco use both in the form of smoke or smokeless is a silent threat to the people and is one of the most widely abused substances in the world. Excessive use of tobacco, called by some “the brown plague” is an example of modern epidemic.^[1] Tobacco use causes dependence to nicotine, the prevalence of which is much higher in the developing country like India due to poor literacy, decreased awareness, and less developed medical services.

Nicotine, the main addictive chemical in tobacco, produces temporarily pleasing physical and mood-altering effects in the brain which alter the mesolimbic pathway.^[2] Like any other drug, use of tobacco over time can cause a physical and psychological addiction. This is also true for smokeless forms of tobacco such as snuff and chewing tobacco.

Cotinine is a metabolite of nicotine is measured in serum or saliva to find the level of nicotine dependence in an individual. But as the test is cumbersome, different questionnaires were developed to find nicotine dependence. One such questionnaire is Fagerström test for nicotine dependence (FTND).^[3,4] This

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degree of dependence will further help to determine the suitable plan of tobacco cessation (counseling or both counseling and pharmacotherapy) for an individual, who wants to quit tobacco.^[2]

The burden of tobacco epidemic in South-East Asian Region countries is one of the highest among the WHO regions, and tobacco use becomes a public health problem in this zone.^[5] According to global adult tobacco survey 2010, 35% of Indians use tobacco either smoke (9%) or use smokeless tobacco (21%) or both (5%).^[6]

Many studies had been carried out in our country regarding the prevalence of tobacco use and its different correlates. However, detailed information on the level of nicotine dependence among the tobacco users and its correlates in the Indian context is relatively scarce. In this background, this cross-sectional study was conducted to find out the level of nicotine dependence among adult (18 years and above) tobacco users and the factors responsible for it, if any, in an urban slum of Burdwan District, West Bengal, India.

Materials and Methods

Study setting, population, and design

A community-based, observational, cross-sectional study was conducted in an urban slum— Alamganj from January to October 2012. This area is an urban field practice area of the Department of Community Medicine, Burdwan Medical College and Hospital. Out of the total 572 population of the study area, 315 were adults (≥ 18 years). The total current adult tobacco (both smokers and smokeless) users of the slum were comprised of our study population. Thus, complete enumeration method was employed and the number came out to be 132. Four tobacco users were excluded from the study (two were absent, one was unwilling, one had stage IV bronchogenic carcinoma). Finally, 128 current tobacco users were studied. Study tools comprised of predesigned, pretested, semi-structured schedule, and containing FTND questionnaire. This questionnaire has been extensively used in various countries, and its reliability has also been confirmed in different settings and populations.^[3,4]

Ethics, consent, and approval

The study was initiated after obtaining necessary clearance from Ethics Review Board, Burdwan Medical College. Data were collected by interview after getting written consent from the participants. The study was approved by the Indian Council of Medical Research.

Operational definition

Participants who were smoking at the time of study and had smoked >100 cigarettes in their lifetime were defined as current smokers.^[7] Cigarettes, smoking pipes, and cigars were considered as smoked products. Individuals either chewing tobacco or snuff at the time of study and had chewed tobacco 20 or more times in their lifetime were defined as current smokeless tobacco users.^[8] Smokeless tobacco products consist of chewing tobacco, moist

snuff, and dry snuff. FTND score <4 , 4–6, and >6 in FTND questionnaire was identified as low, medium, and high level of nicotine dependence, respectively.^[3,4]

Data management and statistical analysis

Data were entered into Microsoft Excel worksheet (Microsoft, Redwoods, WA, USA). Categorical and continuous data were expressed in proportions and mean values respectively. In contingency tables, significance of association between the two attributes was analyzed by Pearson's Chi-square (χ^2) test. Difference between two mean values was tested by Student's independent *t*-test (unpaired), while one-way ANOVA was used for comparing >2 mean values. Degree and direction of relationship between two variables were computed by Pearson's correlation coefficient (*r*). Significant correlated variables from Pearson's *r* coefficient were further considered in multivariable linear regression (stepwise approach) models to identify the predictors by taking FTND score as the dependent variable. $P \leq 0.05$ was considered as statistically significant. All the statistical analysis was done in SPSS software, version 19.0 (Statistical Package for the Social Sciences Inc, Chicago, IL, USA).

Results

The highest proportion (35.94%) of the study individuals were from ≤ 30 years age group and least (10.93%) from the geriatric population. Out of 128 study individuals, 90% were male and 10% were female. Majority, i.e., 44% (57) of adult tobacco users used exclusively smokeless tobacco, 22% (28) were exclusively smokers and 34% (43) used both, i.e., smokers and smokeless tobacco users. About 46.87% of the adult tobacco users were found to be highly dependent to nicotine; and only 24.22% were in the low dependence group. About 57.75% of smokers and 41% of smokeless tobacco users were in the high nicotine dependence group; while 9.86% smokers and 31% smokeless tobacco users were in the low nicotine dependence group.

High level of nicotine dependence was maximally seen among geriatric age group (64.28%), males (47.83%), nuclear family, illiterate (54.9%), unskilled workers (55.82%), lower socioeconomic status (70%), and married individuals (52.08%). Mean FTND score increased gradually and significantly with increase in age (positive correlation coefficient $r = 0.240$) and highest score was found among the tobacco users belonged to geriatric age group (6.79 ± 2.29). The scores are also significantly different among the different groups. Mean score was higher among males (5.82 ± 2.72) compared to the females (5.62 ± 2.47), without any statistically significance ($P < 0.05$) difference. Mean FTND score was also higher among the tobacco users from nuclear family (6.28 ± 2.52 vs. 5.61 ± 2.74), without any significance difference ($P > 0.05$). Mean FTND score was also found to be highest among unskilled worker (6.26 ± 2.46), lower socioeconomic status (7.30 ± 1.42), and married individuals (5.97 ± 2.84) [Table 1].

Majority (70.73%) of adult tobacco users who started to use tobacco at 11–15 years of their age were highly dependent

Table 1: Distribution of study subjects according to nicotine dependence and different sociodemographic variables (n=128)

Variables	Low, n (%)	Medium, n (%)	High, n (%)	FTND score (mean±SD)	Statistical significance
Age (years)					
≤30	15 (32.61)	16 (34.78)	15 (32.61)	4.89±2.55	$\chi^2=7.909$
31-40	6 (27.27)	6 (27.27)	10 (45.46)	5.77±3.15	$P=0.4424$
41-50	3 (14.29)	6 (28.57)	12 (57.14)	6.33±2.54	$r=0.240^*$
51-60	5 (20.00)	6 (24.00)	14 (56.00)	6.48±2.52	$F=2.505$
>60	2 (14.29)	3 (21.43)	9 (64.28)	6.79±2.29	$P=0.046^*$
Sex					
Male	28 (24.35)	32 (27.82)	55 (47.83)	5.82±2.72	$\chi^2=0.683$
Female	3 (23.08)	5 (38.46)	5 (38.46)	5.62±2.47	$t=0.25$
Type of family					
Nuclear	5 (13.89)	11 (30.55)	20 (55.56)	6.28±2.52	$\chi^2=3.059$
Joint	26 (28.26)	26 (28.26)	40 (43.48)	5.61±2.74	$t=1.27$
Level of education					
Illiterate	12 (23.53)	11 (21.57)	28 (54.90)	6.16±2.58	$\chi^2=3.973$
Primary school	8 (25.81)	10 (32.26)	13 (41.93)	5.48±2.85	$P=0.6803$
Middle school	10 (27.03)	12 (32.43)	15 (40.54)	5.43±2.70	$F=0.797$
High school	1 (11.11)	4 (44.44)	4 (44.44)	6.33±2.78	$P=0.498$
Occupation					
Unemployed	9 (29.03)	9 (29.03)	13 (41.94)	5.65±2.65	$\chi^2=4.107$
Unskilled	6 (13.95)	13 (30.23)	24 (55.82)	6.26±2.46	$P=0.6621$
Semi-Skilled	12 (28.57)	12 (28.57)	18 (42.86)	5.62±2.94	$F=0.729$
Others	4 (33.33)	3 (25.00)	5 (41.67)	5.17±2.76	$P>0.05$
Socioeconomic status					
Upper middle	0	1 (100.00)	0	4.00±0.00	$\chi^2=6.530$
Lower middle	3 (25.00)	4 (33.33)	5 (41.67)	5.83±2.75	$P=0.3665$
Upper lower	28 (26.67)	29 (27.62)	48 (45.71)	5.70±2.76	$F=1.236$
Lower	0	3 (30.00)	7 (70.00)	7.30±1.42	$P>0.05$
Marital status					
Married	23 (23.96)	23 (23.96)	50 (52.08)	5.97±2.84	$\chi^2=5.485$
Not married	8 (25.00)	14 (43.75)	10 (31.25)	5.28±2.14	$t=1.2591$

*Statistically significant. FTND: Fagerström test for nicotine dependence; SD: Standard deviation

to tobacco; on the other hand, only 26.67% of tobacco users who started tobacco use after their 20 years of age were highly dependent to tobacco. This association was significant statistically by Chi-square test. Mean FTND score gradually decreased with increase in the starting age of tobacco use and this difference was statistically significant in different age group as evident from ANOVA, and there was a significant negative correlation ($r = -0.453$). About 73.91% of tobacco users who used tobacco for 40 years or more were highly dependent to tobacco. The difference in the mean FTND score was significant ($P < 0.05$) across the different groups. Highest score (7.17 ± 1.99) was found among those who used tobacco for 40 years or more and there was significant positive correlation ($r = 0.353$). Majority (55.92%) of daily tobacco users were highly dependent to nicotine. Mean FTND score was significantly ($P < 0.05$) higher among the daily tobacco users (6.39 ± 2.57) compared to the occasional tobacco users (4.23 ± 2.39) and there was a significant positive correlation ($r = 0.359$). About 53.85% of adult tobacco users who were not aware of injurious effect of tobacco to health were highly dependent to tobacco. Although mean FTND score was also lower among those who

were aware (5.70 ± 2.61) of the injurious effect of tobacco than who were not (6.00 ± 2.88), this difference was not significant ($P > 0.05$) [Table 2].

Three independent variables i.e., age ($r = 0.240$), duration of tobacco use ($r = 0.353$) and habit of tobacco use ($r = 0.359$) had significant ($P < 0.01$) positive correlation with score of FTND scale, with the exception of starting age of tobacco use, which had significant negative correlation ($r = -0.453$). Hence, these variables were further considered for multivariable linear regression. On linear regression by step-wise method, starting age of tobacco use, habit of tobacco use, and duration of tobacco use were found to be statistically significant and could explain 27.3% of variations of FTND score and remaining 72.7% of variations remained unexplained probably signifying the role of many factors which were either unknown or not considered for regression. Out of the total variation starting age of tobacco use alone contributed 20.5%, starting age of tobacco and habit of tobacco use combined contributed 24.6%. Remaining 3.1% of variations were due to duration of tobacco use alone. The role of age for the variation of score was insignificant. Using step-wise approach, the following equations were obtained [Table 3].

Table 2: Distribution of study subjects according to nicotine dependence and different variables (n=128)

Variables	Nicotine dependence			FTND score (mean±SD)	Statistical test (Chi-square, ANOVA test)
	Low, n (%)	Medium, n (%)	High, n (%)		
Starting age of tobacco use (years)					
11-15	1 (2.44)	11 (26.83)	29 (70.73)	7.32±1.78	$\chi^2=24.679, P=0.0001^*$ $F=15.508$ $P<0.05, r=-0.453^*$
16-20	10 (23.81)	13 (30.95)	19 (45.24)	5.81±2.58	
>20	20 (44.44)	13 (28.89)	12 (26.67)	4.40±2.77	
Duration of tobacco use (years)					
≤10	16 (35.56)	16 (35.56)	13 (28.88)	4.67±2.48	$\chi^2=16.074$ $P=0.0413^*$ $r=0.353^*$ $F=5.179$ $P=0.001^*$
11-20	7 (31.82)	5 (27.73)	10 (45.45)	5.42±3.23	
21-30	2 (10.53)	6 (31.58)	11 (57.89)	7.00±2.26	
31-40	4 (21.05)	6 (31.58)	9 (47.37)	6.05±2.55	
>40	2 (8.70)	4 (17.39)	17 (73.91)	7.17±1.99	
Habit of using tobacco					
Daily	16 (17.20)	25 (26.88)	52 (55.92)	6.39±2.57 [#]	$\chi^2=13.320$ $P=0.0013^*, r=0.359^*$
Occasional	15 (42.86)	12 (34.29)	8 (22.85)	4.23±2.39	
Awareness					
Aware	21 (23.60)	29 (32.58)	39 (43.82)	5.70±2.61 [^]	$\chi^2=1.995$ $P=0.3687$
Not aware	10 (25.64)	8 (20.51)	21 (53.85)	6.00±2.88	

[#]Student's unpaired $t=4.3178, P<0.0001$, [^]Student's unpaired $t=0.5798, P>0.05$, *Statistically significant. FTND: Fagerström test for nicotine dependence; SD: Standard deviation

Table 3: Regression coefficients and their significance in multivariable linear regression (step wise method) for Fagerström test for nicotine dependence score among the study subjects (n=128)

a. Model summary					
R	R ²	F	Significance		
0.453 ^a	0.205	32.491	0.000		
0.496 ^b	0.246	20.351	0.000		
0.522 ^c	0.273	15.484	0.000		
b. Regression coefficients and their significance					
Model	Unstandardized coefficients		Standardized coefficients	t	Significant
	B	SE			
Model 1					
Constant	10.323	0.822		12.557	0.000
Starting age	-0.244	0.043	-0.453	-5.700	0.000
Model 2					
Constant	8.539	1.058		8.071	0.000
Starting age	-0.199	0.045	-0.370	-4.397	0.000
Habit	1.311	0.505	0.218	2.595	0.011
Model 3					
Constant	7.331	1.186		6.181	0.000
Starting age	-0.164	0.048	-0.304	-3.447	0.001
Habit	1.189	0.501	0.198	2.373	0.019
Duration	0.028	0.013	0.180	2.141	0.034

^aPredictors: Constant, starting age of tobacco use; ^bPredictors: Constant, starting age of tobacco use, habit of tobacco use; ^cPredictors: Constant, starting age of tobacco use, habit of tobacco use, duration of tobacco use. SE: Standard error

Model 1:

$$Y_{\text{FTND Score}} = 10.323 - 0.244X_{\text{starting age of tobacco use}}$$

Model 2:

$$Y_{\text{FTND Score}} = 8.539 - 0.199X_{\text{starting age of tobacco use}} + 1.311X_{\text{habit of tobacco use}}$$

Model 3:

$$Y_{\text{FTND Score}} = 7.331 - 0.164X_{\text{starting age of tobacco use}} + 1.189X_{\text{habit of tobacco use}} + 0.028X_{\text{duration of tobacco use}}$$

Discussion

Tobacco use is a social problem, and it causes many diseases irrespective of age group and sex; >1 in 3 adults use some form of tobacco in India. The present study was conducted to find out the level of nicotine dependence among the users, its correlates. The present study found that 42.2% of smokers were in low and medium dependence group and 57.8% were highly dependent to nicotine, which is contradictory to the findings of Clemente Jiménez *et al.*^[9] who found that 86.6% of smokers were low to moderately dependent to nicotine and only 3.3% of smokers were highly dependent to tobacco. This is probably due to, the inclusion of only teenage smokers in their study and the present study revealed that increase in age was significantly and positively correlated with FTND score. In our study, mean FTND score was found to be 6.47 ± 2.38. In contrast, Fagerström and Furberg *et al.*^[10] found somehow lower score than our study; FTND score ranged from 2.8 to 4.6. However, this score is more or less similar to the observation of Jayakrishnan *et al.* (5.04 ± 5.05).^[11]

Mean FTND score gradually increased with increase in age in the present study, and also noted by Wu *et al.*^[12] and Jayakrishnan *et al.*^[11] However, mean score is slightly lesser in the study of Wu *et al.*^[12] probably because they used a Mandarin Chinese version of FTND questionnaire. Among all the educational groups, the FTND score was more or less similar as compared to Jayakrishnan *et al.*,^[11] but there was a huge difference in the score among those who were educated up to secondary level or above it. However, Wu *et al.*^[12] also noted a similar increase in the CFTND score among the college students. Similar to this

finding, Schmidt *et al.*^[13] found that lower education is a risk factor of a higher level of nicotine dependence. It may be due to the fact that those who are educated are more concerned about the injurious effect of tobacco to health. Among the entire occupational group, the scores are a bit higher than that found by Jayakrishnan *et al.*^[11] Ota *et al.*^[14] noted the similar observation. The findings are also similar to the observation of Schmidt *et al.*^[13] who found that occupational stress causes a decrease in nicotine dependence, as it can be assumed that unskilled worker are less sufferer of occupational stress than semi-skilled worker. The present study noticed gradual decrease in mean FTND score with higher socioeconomic status. Similarly, Roberts *et al.*^[15] also found that bad household economic situation was associated with higher level of nicotine dependence. Higher mean FTND score among the married was probably due to more stress associated with married life, and also obtained by Wu *et al.*^[12] In contrast, Schmidt *et al.*^[13] found higher level of nicotine dependence among “never being married.”

Maximum proportion (70.73%) high nicotine dependence was seen among the people who smoking at 11–15 years. Similar to present finding, Breslau *et al.*,^[16] Roberts *et al.*^[15] and Taioli and Wynder *et al.*^[17] found that tobacco dependence was highest among those who started smoking at 14–16 years of age, i.e., at an early age. Lowest FTND score was found among the people who were using tobacco for <10 years; and highest among those who was using tobacco for >40 years. Maximum (73.91%) proportion of tobacco users, who were highly dependent to nicotine, also belonged to the group of study population using tobacco for >40 years. Mean FTND score was significantly higher among daily tobacco users compared to the occasional tobacco users. Again, mean FTND score was insignificantly higher among those who were not aware (6.00 ± 2.88) of injurious effect of tobacco on health, than those who were aware (5.70 ± 2.61) of it. Age, duration of tobacco use, and habit of tobacco use had a significant positive correlation with FTND score while starting age of tobacco use had a significant negative correlation. Then in multivariable linear regression, starting age of tobacco use, habit of tobacco use and duration of tobacco use emerged as a significant predictor of FTND score and could explain 27.3% of total variation in FTND score.

Conclusions

Tobacco use has its early origin in the childhood and adolescent period. Hence, school children should be targeted and made aware of injurious effect of tobacco with the involvement of their parents. Advertisements against the use of tobacco should be done in mass media such as television and newspaper to target daily and prolonged users. The slogan of World No Tobacco Day of 2016: “Get ready for plain packaging” is an important demand reduction measure that will reduce the attractiveness of tobacco products, and increase the effectiveness of health warnings. Level of nicotine dependence will further help to determine the suitable plan of tobacco cessation (counseling or both

counseling and pharmacotherapy) for an individual, who wants to quit tobacco.

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Conflicts of interest

There are no conflicts of interest.

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