

# Evaluation of Nicotine Dependence in Adult Population of Eastern Nepal

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## ABSTRACT

### Background

Tobacco consumption is a leading cause of premature death in the world. Tobacco-related deaths are associated with cardiovascular diseases, pulmonary diseases, oral potentially malignant disorders, cancer, others. Moreover there is also associated nicotine dependence which might result to numerous tobacco-associated diseases.

### Objective

This study was conducted to analyze the degree of nicotine dependence considering its potential health risk, in the Eastern region of Nepal.

### Method

A descriptive questionnaire based study was conducted among current tobacco users of six districts of Eastern Nepal. Fagerstrom Test for Nicotine Dependence (FTND) and Fagerstrom Test for Nicotine Dependency for Smokeless Tobacco (FTND-ST) questionnaire were used for tobacco smokers and chewers, respectively.

### Result

Of the total participants, 836 were males and 359 females, among whom 736 were active tobacco smokers and 432 chewers, 34.8% had tried to stop consuming tobacco and 306 (25.6%) had oral lesions in white or red forms. Very low nicotine dependence was found among 244 (31.47%) tobacco smokers and 37 (8.56%) chewers whereas 36 (4.71%) smokers and 103 (23.84%) chewers had very high nicotine dependence. The mean score for FTND was  $3.73 \pm 2.37$  and  $5.74 \pm 2.12$  for FTND-ST. A significant difference in duration and age group with FTND score was observed, however not with FTND-ST.

### Conclusion

The information regarding degree of nicotine dependence can be used as baseline information for planning of preventive strategies and implementation of tobacco cessation and control programs.

## KEY WORDS

*Fagerstrom, Nicotine dependence, Tobacco*

## INTRODUCTION

Tobacco abuse is one of the global leading preventable causes of early mortality.<sup>1</sup> The STEPwise approach conducted in Nepal by the World Health Organization (WHO) to survey non-communicable disease risk factors unveiled 37.3% active smokers, of which, 31.7% smoked daily.<sup>2</sup> As scientifically proven, the reason for the daily consumption of tobacco and its products (TIPs) can be eminently associated with nicotine dependence.<sup>3,4</sup>

Abuse of TIPs is not only associated with dependence but also recognized for its deleterious oral and systemic health outcomes.<sup>5</sup> As per the WHO predictions, these TIPs related illnesses would dramatically hike the global mortality from 4.9 million to ten million by the end of 2020. The prediction also had indicated developing nations, to be severely affected.<sup>6</sup> Considering the potential risk of nicotine dependence and the need to ultimately develop preventive strategies in Nepal, this study was conducted to unfold the degree of nicotine dependence in the population of Eastern region of Nepal.

## METHODS

The data for this questionnaire-based cross-sectional study obtained from BP Koirala Institute of Health Sciences and its peripheral teaching centers, covering six districts (Sunsari, Illam, Dhankuta, Morang, Jhapa, and Saptari) of Eastern Nepal, collected within a span of one year. The data was collected by trained interns and registered dental surgeons of the Institute.

The study population comprised of current tobacco smokers or tobacco chewers of age between 20 to 60 years. A semi-structured questionnaire was provided to the participants after obtaining written consent and the information was collected through in-person interviews or was self-reported. Individuals who refused to comply with the study protocols, incomplete information or unwilling to provide consent were excluded from the analysis. The questionnaire survey tool collected: social demographic information (age, gender, address, and occupation); tobacco habits [Types of tobacco consumed (smoke or smokeless), duration of the habit, willingness to stop the habit, and presence of any oral lesion]; nicotine dependence scoring [Fagerström Test for Nicotine Dependence (FTND) and Fagerström Test for Nicotine Dependence-Smokeless Tobacco (FTND-ST)].

FTND and FTND-ST are standardized, non-invasive quantitative tools to measure nicotine dependence for tobacco smoker and smokeless tobacco users, respectively. The scoring for this tool ranged from 0 to 10, wherein the dependency was scaled from very low to very high; marking (0-2) for very low dependence, (3-4) low dependence, (5) medium dependence, (6-7) high dependence and (8-10) very high dependence.<sup>7,8</sup>

All the respondents were divided into two groups: Group I (only tobacco smokers) and Group II (only tobacco chewers) and tabulated for further statistical analysis. The study was approved by the Institutional Ethical Review Board of BP Koirala Institute of Health Sciences, Nepal.

A descriptive statistic was employed to analyze the data. All the continuous variables were expressed as mean and all categorical variables were expressed as counts and percentage. For inferential statistics, Chi-square and ANOVA test were applied to find out the significant difference between nicotine dependence and other related variables at 95% confidence interval with marking a p-value of 0.05.

**Table 1. Socio demographic characteristics of participants**

Demographic variables		Total n=1195 (100%)	Smoking n=763 (63.8%)	Smokeless n=432 (36.2%)
Gender	Male	836(70.0)	529(44.3)	307(25.7)
	Female	359(30.0)	234(19.6)	125(10.5)
Mean age (years)	Male	40.23±11.8	40.07±12.0	40.5±11.6
	Female	42.44±10.7	43.13±10.6	41.15±10.8
Location of study partici- pants (Districts)	Sunsari	154(12.9)	84(7.0)	70(5.9)
	Illam	241(20.2)	149(12.5)	92(7.7)
	Dhan- kuta	261(21.8)	203(17.0)	58(4.9)
	Morang	239(20.0)	137(11.5)	102(8.5)
	Jhapa	154(12.9)	99(8.3)	55(4.6)
	Saptari	146(12.2)	91(7.6)	55(4.6)
Occupation	Farmers	350(29.3)	228(19.1)	122(10.2)
	Business- man	287(24.0)	166(13.9)	121(10.1)
	Student	168(14.1)	114(9.5)	54(4.5)
	House- wife	170(14.2)	112(9.4)	58(4.9)
	Government em- ployee	116(9.7)	73(6.1)	43(3.6)
	Teacher	104(8.7)	70(5.9)	34(2.8)
Marital Status	Married	964(81.4)	603(50.5)	361(30.2)
	Unmar- ried	231(18.6)	160(13.4)	71(5.9)
Tried to stop habit	Yes	416(34.8)	272(22.8)	144(12.1)
	No	779(65.2)	491(41.4)	288(24.1)
Presence of Oral Lesion	Male	211(69.0)	67(67.0)	144(69.9)
	Female	95(31.0)	33(33.0)	62(30.1)

## RESULTS

### Demographics of the population (Table 1)

Total of 1195 responses were collected over a period of one year. Of the total participants from six different districts of Eastern Nepal [Sunsari (n=154, 12.9%), Illam (n=241, 20.2%), Dhankuta (n=261, 21.8%), Morang (n=239, 20.0%), Jhapa (n=154, 12.9%) and Saptari (n=146, 12.2%)]. Seventy

percent (n=836) were males (mean age: 40.23±11.8 years) and 30.0% (n=359) (mean age: 42.44±10.7 years) were females. Majority of the participants were farmers (29.3%, n=350), followed by businessmen (24.0%, n=287), housewives (14.2%, n=170), students (14.1%, n=168), government employee (9.7%, n=116) and teachers (8.7%, n=104). Based on the tobacco habits, 63.8% (n=763) reported as 'only smokers (Group I)', and 36.2% (n=432) as 'only tobacco chewers (Group II)'. Intra-oral lesions in the form of white, red, red and white lesions, ulcer and growth were observed in 25.6% (n=306) among all which 69.0% (n=211) were males and 31.0% (n=95) were females. Out of all, 34.8% (n=416) said that they had tried to stop consuming tobacco at some point of time in their life; among them, 287 were males and 129 females, with majority being in second decade for males (29.9%) and fourth decade (31.7%) for females.

**Table 2.** Mean dependence score with respect to age group

Age group (years)	Total	FTND	p value	Total	FTND-ST	p value
21-30	215	3.36±2.2	0.05	118	5.81±2.3	0.77
31-40	140	3.80±1.4		96	5.54±1.9	
41-50	207	3.97±2.4		107	5.74±2.1	
51-60	201	3.85±2.3		111	5.82±2.0	

**Table 3.** Mean dependence score with duration of tobacco consumption

Duration of tobacco consumption (in years)	Total	FTND	p value	Total	FTND-ST	p value
≤ 5	136	3.05±2.3	0.002	49	5.53±2.5	0.12
6-10	112	3.89±2.2		95	5.49±2.2	
11-15	100	3.69±2.2		71	5.51±2.0	
16-20	116	4.25±2.2		83	5.69±2.1	
>20	299	3.80±2.4		134	6.13±1.8	

**Mean dependence score with respect to gender, age group and duration of tobacco consumption (Table 2 and table 3)**

The mean FTND score in males were 3.70±2.3 and 3.81±2.4 in females; and mean FTND-ST scores were 5.71±2.1 and 5.80±2.0 in males and females, respectively. Significant difference among age group (p=0.05) and duration of tobacco smoking (p=0.002), with mean FTND scores were observed. However, similar comparison with FTND-ST values did not yield significant results.

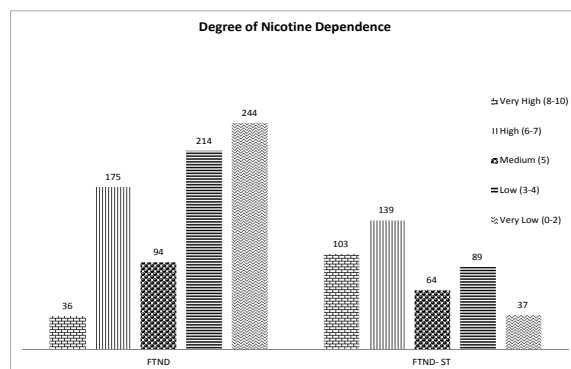
**Percentage of overall and gender-wise responses to FTND and FTND-ST categories (Table 4 and Table 5)**

Of the total smokers, 274 (35.9%) started smoking within 6 to 30 minutes after they woke up, whereas, 223(29.2%)

**Table 4.** Percentage of males and females and their responses to FTND categories

Items for FTND	Total (n=763) n (%)	Males n (%)	Females n (%)	p value
<b>Time of first cigarette</b>				
Within 5 minutes	223 (29.2)	152 (19.9)	71 (9.3)	0.32
Within 6-30 minutes	274 (35.9)	203 (26.6)	71 (9.3)	
Within 31-60 minutes	103 (13.5)	67 (8.8)	36 (4.7)	
After 60 minutes	163 (21.4)	107 (14)	56 (7.4)	
<b>Difficult to refrain from smoking in places where it is forbidden</b>				
Yes	340 (44.6)	234 (30.7)	106(13.9)	0.78
No	423 (55.4)	295 (38.6)	128(16.7)	
<b>Which cigarette you hate the most to give up</b>				
First in the morning	429 (56.2)	297 (38.9)	132(17.3)	0.94
Any Other	334 (43.8)	232 (30.4)	102(13.4)	
<b>Number of cigarette smoking per day</b>				
10 or less	559 (73.3)	392 (51.4)	167(21.9)	0.37
11-20	194 (25.4)	131 (17.1)	63 (8.3)	
21-30	10 (1.31)	6 (0.8)	4 (0.5)	
31 or more	-	-	-	
<b>Smoking during the first hours after waking</b>				
Yes	256 (33.6)	169 (22.2)	87 (11.4)	0.15
No	507 (66.4)	360 (47.1)	147(19.3)	
<b>Smoking when ill enough to be in bed</b>				
Yes	290 (38)	185 (24.2)	105(13.8)	0.009
No	473 (62)	344 (45.1)	129(16.9)	

within five minutes. A total of 290 (38.0%) participants stated that they smoked even when ill enough to be in bed, with the majority of respondents being males (Table 4). Similarly, 35.4% of those with habit of tobacco chewing took the first dip of smokeless tobacco within 6 to 30 minutes and 71.5% consumed more than three pouches per week (Table 5). Among Group I, 244 (31.9%) had very low dependence and 36 (4.71%) had very high dependence. Among Group II, 37(8.5%) had very low dependence to nicotine, whereas 103 (23.84%) had very high dependence to nicotine (fig. 1).



**Figure 1.** Frequency distribution of degree of dependence between tobacco smoking and chewing groups.

**Table 5.** Percentage of males and females and their responses to FTND-ST categories

Items for FTND-ST	Total (n=432) n (%)	Males n (%)	Females n (%)	p value
<b>Time of first dip of smokeless tobacco</b>				
Within 5 minutes	106 (24.5)	77 (17.8)	29 (6.7)	0.86
Within 6-30 minutes	153 (35.4)	107 (24.8)	46 (10.6)	
Within 31-60 minutes	75 (17.4)	50 (11.6)	25 (5.8)	
After 60 minutes	98 (22.7)	73 (16.9)	25 (5.8)	
<b>Intentionally swallow tobacco juice</b>				
Always	110 (25.5)	81 (18.8)	29 (6.7)	0.73
Sometimes	267 (61.8)	186 (43.1)	81 (18.7)	
Never	55 (12.7)	40 (9.2)	15 (3.5)	
<b>Which chew you hate the most to give up</b>				
First one in the morning	256 (59.3)	179 (41.5)	77 (17.8)	0.52
Any other	176 (40.7)	128 (29.6)	48 (11.1)	
<b>Number of can/pouches used per week</b>				
More than 3	309 (71.5)	220 (50.9)	89 (20.6)	0.80
2-3	112 (25.9)	80 (18.5)	32 (7.4)	
1	11 (2.5)	7 (1.6)	4 (0.9)	
<b>Chewing during the first hours after waking</b>				
Yes	117 (27.1)	85 (19.7)	32 (7.4)	0.65
No	315 (72.9)	222 (51.4)	93 (21.5)	
<b>Chewing when ill enough to be in bed</b>				
Yes	189 (43.8)	126 (29.2)	63 (14.6)	0.07
No	243 (56.3)	181 (41.9)	62 (14.4)	

Geographically, Illam and Dhankuta are the hill districts and Sunsari, Morang, Jhapa and Saptari are districts based in the plains. In terms of tobacco smoking, low dependency levels were observed in Dhankuta district (n=91; 11.9%), whereas overall high dependency levels were observed in Morang district (n=56; 7.3%). In terms of smokeless tobacco, low dependency levels were observed among participants of Illam district and high dependency among those of Morang district (n=68; 15.7%). Significant differences {FTND ( $p < 0.001$ ) and FTND-ST ( $p=0.027$ )} were observed among dependency in different districts of the study population.

## DISCUSSION

Fagerström Test for Nicotine Dependence and Fagerström Test for Nicotine Dependence-Smokeless Tobacco are one of the commonly used tool to measure nicotine dependence.<sup>9</sup> The scores obtained are successful in predicting the outcome of attempts to stop the habit and also provide direction for treatment approaches. The physical dependence is characterized by need to smoke early in the morning to alleviate the overnight withdrawal and number of cigarettes smoked per day. The level of dependence signifies the urgency of counseling and

treatment for specific individuals. Also, the ability of a person with tobacco consumption in successfully stopping the habit totally depends on the balance between the individual's motivation to stop smoking and the degree of dependence on cigarettes.<sup>10</sup>

The result of our study revealed no association between age, gender and marital status with nicotine dependence which was inconsistent with other studies.<sup>11-13</sup> Females were more dependent than males, though not statically significant. It might be suggested due to high dependence symptoms such as lost autonomy, cravings and withdrawal and shorter transition times in females.<sup>14,15</sup> Farmers were commonly found to have high dependence of nicotine compared to others, which highlights the urgent need of educating the vulnerable population in an agricultural-based nation like Nepal. A study conducted by Laaksonen et al. suggested a direct association between socio-economic status and smoking habits, with increased prevalence observed in people with low socio-economic status.<sup>16</sup> Study conducted in Sri Lanka has also established a correlation between education and tobacco habits.<sup>17</sup>

One fourth of the participants (25.6%) had intraoral lesions, commonly in the form of white, red or mixture of red and white lesions. Suspected lesions are considered as the clinical sign of oral potentially malignant disorders or oral cancer.<sup>18</sup> Higher frequency of oral lesions in this study could be due to the fact that the data were collected from participants visiting health centers and observed by dentists. However, tobacco being the only cause for oral lesions cannot be ruled out. It is also suggested that dentists have unique opportunity in linking a person's oral conditions to tobacco use, and hence can have a significant impact in prescribing tobacco cessation measures.<sup>19</sup> More than one third (34.8%) of the participants said they had tried to stop consuming tobacco at any point in time. Among them, most (n=287) were males and belonged to fourth to fifth decade. Similar result (n=765; 26.0%) was observed in a STEPwise study done in Nepal.<sup>2</sup> The reason given by most of the respondents to quit tobacco was presence of oral lesion which had induced fear and concern. Nonetheless, this data can be used to highlight the importance of oral changes due to tobacco consumption. However, most of the participants (65.2%) had never tried to stop consuming tobacco, which is an alarming situation.

Among tobacco chewers, 61.8% intentionally swallowed tobacco juice sometimes and 25.5% always. Swallowing tobacco juice could add up to the harmful effect of chewing tobacco. It results in local exposure of oral mucosa to tobacco-specific nitrosamines (TSNA). Chewing also releases high amount of reactive oxygen species (ROS), especially when betel quid is present. Both TSNA and ROS are major genotoxic agents involved in chewing tobacco-associated oral cancer.<sup>20</sup> With the increase in the duration of consumption of smoked tobacco, a significant difference

in mean dependence score was noted though it was not significant among smokeless tobacco users. Around 40% consumed tobacco even when ill enough in bed, which could be attributed to the increasing dependence on tobacco, 17.82% of the smokers had started smoking less than or equal to five years back which indicates the chances of high dependence; as dependence in adolescents is also associated with the intensity of recent cigarette consumption.<sup>21</sup>

The level of nicotine dependence though associated with the age or gender of the study population was not significant and this was consistent with another study from Nepal.<sup>11</sup> However the findings were inconsistent with the study from India and Singapore, which might be due to limited sample size and selection of sample.<sup>12,13</sup> FTND score was found to increase with age indicating the duration of tobacco consumption having a direct effect on dependence which was consistent with the study by Jayakrishnan et al.<sup>13</sup> It could be attributed to the increased difficulty in coping with stressful condition with increasing age as compared to the young.<sup>22</sup> Also the FTND score increasing with age could be an indication that duration of smoking has a linear effect on smoking dependence.<sup>13</sup>

Overall the FTND scores can be categorized as low dependence and FTND-ST as medium dependence. The mean FTND score was comparatively lower compared to the study conducted in the Indian population,<sup>13</sup> but it was higher compared to studies on the European population.<sup>23,24</sup> The mean FTND-ST score was found to be more as compared to the study conducted on Oklahoma by Mushtaq et al.<sup>25</sup> Majority of Group I had low dependence (31.97%), which was in contrast to the Group II who had most high nicotine dependence (32.9%). It could be due to the high content of tobacco in chewing forms and the cumulative effect of tobacco, though it is also dependent upon the duration and forms of tobacco consumed.<sup>13</sup>

Present study has highlighted the nicotine dependence of current tobacco smokers and chewers in six districts of Eastern Nepal. Significant differences were found in terms of level of dependency for both smoked ( $p < 0.001$ ) and smokeless tobacco ( $p = 0.027$ ) users. The results are not in consistence with other researches which might be attributed to the type and nature of tobacco and heterogeneity in the population within the society and culture. Dhankuta and Illam are in the hill area and Morang is in the low land, terai belt.

Nepal is a landlocked country with diverse cultural and ethnic values and practices. The prevalence of tobacco smoking and chewing is on a rise.<sup>26</sup> On the top of increasing dependence there is high percentage of tobacco related cancers and other pathologies in the country. Nearly half of all cancers among males and a quarter among females

are tobacco related.<sup>27</sup> Control in tobacco use and nicotine dependence has been identified as a key strategy in reducing the significant long-term health effects and associated economic costs. It is very important to understand the nature of nicotine dependence among tobacco users to implicate proper smoking cessation program. Behavioral modification and frequent motivational workshops encouraging the young generation of the nation would be one of the best approaches. Pharmacotherapy of such individuals having high nicotine dependency is also possible along with the cognitive behavioral therapy.<sup>27</sup>

Implementation of this simple yet effective method of analyzing the dependence could be a feasible step. This self-reported questionnaire can guide interventions, such as counseling for cessation, detection of relapse, or the need to reduce environmental tobacco exposure. A multi-level model based on the social cognitive theory and the socio-ecological model of health behavior has been proposed in India. This model termed as 'IMPACT' aims to target the adolescents from starting the tobacco habit and also the elder individuals at an individual, community and policy level to promote tobacco cessation.<sup>28</sup>

Nepal being a developing country faces a number of challenges in curbing the negatives associated with dependence on tobacco. It is a difficult task but not an impossible one as we can draw inspiration from one of the SAARC countries, Sri Lanka which has achieved tremendous success in the fight against tobacco.<sup>29</sup> Nepal being one of the signatories of Framework Convention on Tobacco Control (WHO-FCTC) can adopt different models and make significant impact in the fight against tobacco. In the developing countries, measures such as increasing taxes on tobacco have been effective in reducing the tobacco consumption. However, other proven measures such as establishment of 'quit lines', mass media campaigns and insurance coverage are lacking due to its economic burden.<sup>30</sup>

Baseline information related to tobacco consumption and nicotine dependence representing the regional area of the country is crucial for implementing any tobacco cessation policies and disease management strategies. Categorizing the tobacco users and implementing directives based on the level of nicotine dependence, their willingness to stop the habit, presence of oral lesions or other symptoms will be a strategic beginning in country like Nepal wherein awareness regarding harmful effect of tobacco and strict legislation against use of tobacco products is still in a beginning phase. Also early tobacco withdrawal would go a long way in decreasing the overall incidence of oral cancer in our country.<sup>11</sup>

Despite the representation of participants from different region of Eastern Nepal, geographical and cultural variables,

second hand smoking, bias in relieving information and more importantly lack of biochemical verification of the nicotine dependence were the limitations of the study.

## CONCLUSION

Tobacco use in Nepal is increasing every year. There has been an associated increase in the tobacco-associated diseases, along with potentially malignant oral diseases and oral cancer. For many tobacco users, the situation

is complicated by a strong dependence on it. Economic status of the country, poor health indicators and increasing burden of tobacco associated disease highlight the need for early intervention in tobacco cessation programs and dissemination of information regarding tobacco use and its potentially harmful effects.

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