European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 9, Issue 8, 2022

REVIEW ARTICLE

Age dependent addiction among smokeless tobacco users in Punjab population using fagerstorm nicotine dependence scale

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Received: 11 April, 2022 Accepted: 14 May, 2022

ABSTRACT

Background: Smokeless tobacco e including products that are chewed, snuffed, or placed between the teeth and gum rather than smoked by the user e is highly addictive and has been linked with numerous health outcomes, including cardiovascular mortality, many types of cancer. Smokeless tobacco use has been associated with a number adverse health outcomes in India and across South Asia.

Methodology: A cross-sectional study of patients at a dental hospital in Punjab who undergoing tobacco cessation counselling, was conducted between January and June 2019. Trained interviewers administered a questionnaire to all patients receiving regular dental care regarding their demographic information, data about the use of smokeless tobacco. Nicotine dependence was assessed using the six-item Fagerstrom Nicotine Dependence Scale, adapted for smokeless tobacco. At baseline, the modified dependence scale was administered to the participants and a saliva sample was collected to measure cotinine.

Results: The subjects for this study included 100 males who were recruited for a tobacco cessation intervention that involved a visit with a dentist and advice to quit smoking during the exam. High nicotine dependence was associated with a younger age of initiation of smokeless tobacco use and with frequency of use, with those who reported daily use having an excess risk of high nicotine dependence of 14% (95% CI: 2%, 27%). The correlation between the total score and salivary cotinine was moderate among the ST users (r = 0.35), Among ST users, the coefficient alpha was 0.39;

Conclusion: To reduce dependence on smokeless tobacco in India and subsequent adverse health outcomes, interventions should emphasize a combination of policy and public health interventions focused on increasing the age at which a person initially uses smokeless tobacco and decreasing the frequency of use.

Keywords: Smokeless tobacco, Nicotine, Dependence measure

INTRODUCTION

Smokeless tobacco e including products that are chewed, snuffed, or placed between the teeth and gum rather than smoked by the user e is highly addictive and has been linked with numerous health outcomes, including cardiovascular mortality, many types of cancer, reductions in birth weight and gestational age, and poorer mental health.

According to the World Health Organization (2014), the nicotine in smokeless tobacco is more easily absorbed in the body when compared to smoking, increasing the potential for addiction. In South Asia, rates of smokeless tobacco use are high and increasing rapidly, especially among young people and women. In 2009, there were approximately 274.9 million users of tobacco products in India. Of these, 59.5% used only smokeless tobacco products, 25.1% were solely tobacco smokers, and 15.4% consumed both forms[1].

To better understand the factors that contribute to use of smokeless tobacco in India, a cross-sectional study was implemented in Punjab, a planned city located on the Northern of India with a population of approximately 27.7 million residents (CENSUS 2011). The predictive validity of the Fagerstrom Test for Nicotine Dependence (FTND) has been demonstrated in numerous evaluations of nicotine dependence among tobacco smokers and as modified, been applied to assess nicotine dependence among users of smokeless tobacco.

The Fagerstrom Test for Nicotine Dependence-Smokeless Tobacco (FTND-ST) survey instrument consists of questions that measure dependence by quantifying the pattern and severity of use. The questionnaire has been used alone and in tandem with concentrations of cotinine, a primary nicotine metabolite, present in salivary or serum samples collected from the respondent.

The FTND-ST is widely used and has been applied in studies conducted to evaluate nicotine dependence in India. For example, ***Manimunda et al. (2012)*** used the FTND and the FTND-ST to assess the use of and nicotine dependency to smoking and smokeless forms of tobacco among a cross-sectional sample of residents of India's Andaman and Nicobar Islands. Although smokeless tobacco use among the 18,018 participants surveyed was significantly greater than that of tobacco smoking ($p < 0.001$), smokeless tobacco users were found to have a lower rate of nicotine dependence ($p < 0.001$). The FTND-ST has also been applied to measure the efficacy of pharmaceutical interventions in reducing nicotine dependency among smokeless tobacco users[2].

Understanding the concept of dependence is an important step in developing effective interventions. Dependence in cigarette smokers can be assessed by measuring cotinine, a major metabolite of nicotine that has become the standard marker of nicotine exposure. Heatherton and colleagues examined the relation between cotinine and questions on the Fagerström Test of Nicotine Dependence (FTND). They reported a negative relation between cotinine and time to first cigarette in the morning and a positive relation between cotinine and smoking more in the morning and smoking while severely ill [3].

The objective of the present study was to examine the properties of a modification of the FTND in a large sample of ST users. The strength of this study is that some of the ST users also smoked cigarettes, which allowed us to separate the sample into two groups based on tobacco use and examine the scale properties in each group.

METHODOLOGY

The subjects for this study were recruited from a tobacco cessation intervention that involved a visit to dental college in Punjab, and advice to quit smoking during the exam. Intervention group participants received nicotine replacement therapy and lay-led counseling sessions. The baseline questionnaire included items to measure tobacco use, demographics, and nicotine dependence. This latter scale, designed by Severson & Gordon (1997), was based on the original FTND and modified for ST users (Table 1).

Because all of the men in this study were daily users, the score on item 2 was automatically 2 (i.e. used ST 6–7 days per week); hence, the total scale score ranged from 2 to 9. Saliva samples were obtained from all men at baseline. Cotinine was extracted from saliva using a gas chromatography/mass spectrometry (GC-MS) technique.

Table 1: Dependence Questions And Response Options

S No	Questions	Response
1	How many tins/pouches of smokeless tobacco do you typically use each week?	**0 = < 1 per week 1 = 2–4 per week 2 = 5+ per week**
2	How often do you use smokeless tobacco?	**0 = ≤1 day/week 1 = 2–5 days/week 2 = 6–7 days/week**
3	Do you intentionally swallow tobacco juices?	**0 – NO 1- YES**
4	Do you use smokeless tobacco when you are sick or have mouth sores?	**0 – NO 1- YES**
5	How soon after awakening from your normal sleeping period do you use chewing tobacco or snuff?	**0 – After 30 Minutes 1- Within 30 minutes**
6	Do you smoke cigarettes?	**0 – NO 1- YES**
7	Is it difficult for you not to use smokeless tobacco where its use is restricted or not allowed?	**0 – NO 1- YES**

STATISTICAL ANALYSIS

Descriptive statistics were calculated for the entire sample and also by groups defined by tobacco use (ST only versus ST + cigarette smoking). The total score on the dependence scale and each individual item were correlated to salivary cotinine levels using Spearman's nonparametric correlation method.

Table 2: Descriptives & Level Of Conitine Among Smokeless Tobacco Users

AGE	34.9 ± 11
ST USAGE IN YEARS	14 ± 9
SALIVARY CONITINE	560 ± 369
RANGE OF CONITINE	17 - 2600

Table 3 – Mean And Standard Deviation Based On Responses To Tobacco Dependence

ITEM	N	MEAN ± SD	r†
Time/ Pouches per week			
Less than 1	13	20.8± 8.5	0.08
2 – 4	38	22.3± 7.9	
5 or more	49	23± 6	
Intentionally follow juices			
No	66	20.9± 7.1	0.05
yes	34	24.8± 6.5	
Use the ST when sick			
No	54	21± 7.4	0.20
Yes	46	23± 6.9	
Time to first use in the morning			
After 30 minutes	44	20.8± 6.4	-0.08
Within 30 minutes	56	23± 5.9	

Difficult to retrain No Yes	 60 40	 21± 5.9 23± 4.8	 0.38

RESULTS

The descriptive statistics for the entire sample and for the ST group are presented in Table 2. The cotinine distribution was highly skewed and a square-root transformation of the raw values normalized the data; therefore, all of the results are reported from analyses using the square-root cotinine. Table 3 contains the mean and standard deviation of salivary cotinine levels, as well as the Spearman rank correlation coefficient, by item on the dependence scale and the total score.

The correlation between the total score and salivary cotinine was 0.34 ($p<0.0001$) among the ST only users, The coefficients for the items ranged from −0.09 to 0.38. For three of the five items, the correlation between the response and cotinine was larger in magnitude for the ST group. however, no statistical tests were performed to determine if the coefficients differed among the subjects. Among ST users, the coefficient alpha was 0.40;

DISCUSSION

The results of this study suggest that there is a moderate correlation between the total score on the dependence questionnaire and level of salivary cotinine among the 100 study subjects who were ST only users. The correlation coefficient, 0.34, is similar in magnitude to the one reported by ***Boyle et al. (r = 0.30)*** in their examination of a 9-item variation of the FTND among 121 ST users[4]

Five of the items on their scales tapped similar behaviors as the scale in this present study (time to first use, difficulty refraining, use while ill, frequency of use, and swallowing juices). In a recent report of yet another variation of the FTND, ***Ebert and colleagues*** estimated a correlation of 0.53 between the total score and cotinine level in 42 ST users**.** This scale was comprised of six items; four of which overlapped with the scale used in the present study (time to first use, use while ill, frequency of use, and swallowing juices)[5].

The coefficient alpha for the scale used in the sample of ST only users was 0.40, which is low, but similar to what other authors have reported for nicotine dependence scales (range 0.3 to 0.52). The coefficient alpha does increase with the number of items included on a scale. Therefore, the observed alpha of 0.40 in this analysis of 5 items (from a scale that includes a total of 7 items) scale is comparable to the larger scales examined in other studies. It is possible that the samples of ST users in all of these studies are fairly homogeneous, which is a condition that will result in a low measure of reliability (internal consistency in this case)[6,7].

The results were quite different when we examined the scale in the group of men who used ST. While the correlation between the total score and salivary cotinine level was lower (r = 0.19), the coefficient alpha for the scale was higher (alpha = 0.61). It is not entirely clear why this pattern was observed. The main limitation of this study is that the ST users were male volunteers who were interested in joining a tobacco cessation study and they were all from the Punjab region in one state, which could limit the generalizability of the findings[8,9].

A second limitation relates to the number of items used in the scale. It was designed to have a total score that ranged from 0 to 9. Because the men had to be daily users to participate, one item was scored identically for all participants. Furthermore, the cigarette smoking item had to be eliminated since exclusive ST users could not respond. Thus, only five of the questions could be examined.

To conclude, the scale examined in this study was moderately correlated with salivary cotinine level in a sample of daily ST users. Future research should focus on refining scales to more precisely measure nicotine dependence in ST users. Additionally, the group of mixed

tobacco users should be further studied, as there was a low correlation between the dependence score and level of cotinine. It is possible that cotinine is not an adequate marker of dependence in these users, or that the scale needs to be modified to include questions about cigarette use.

CONCLUSION

The high prevalence of tobacco use, including smokeless tobacco, in developing counties such as India presents a major challenge for public health authorities. This clinic-based study in a Punjab identified two potential avenues for public health intervention, increasing the age of initiation of use of smokeless tobacco and reducing the frequency of use to less than daily. The use of epidemiologic measures such as predicted marginal risk differences can provide authorities with evidence-based tools to assess the effectiveness of interventions and to quantify their efficacy.

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