RESEARCH COMMUNICATION

Assessment of Nicotine Dependence among Smokers in a Selected Rural Population in Kerala, India

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Abstract

Objectives: An attempt was made to understand the nicotine dependence of smokers selected for an ongoing smoking cessation intervention programme in rural Kerala, India. **Methods**: Data were collected from resident males in the age group of 18 to 60 years from 4 randomly allocated community development blocks of rural Thiruvananthapuram district (2 intervention and 2 control groups). Trained accredited social health activist workers were utilised to collect data from all groups through face to face interview. Nicotine dependence among participants was assessed by means of the six-item Fagerström Test for Nicotine Dependence (FTND) translated into the local language. The internal consistency of FTND was computed using Cronbach's alpha coefficient. Criterion validity (concurrent) was assessed by correlations of nicotine dependence scores with age at initiation of smoking and cumulative smoking volume in pack-years. **Results**: Among the 928 smokers identified, 474 subjects were in the intervention area (mean age =44.6 years, SD =9.66 years) and 454 in the control area (mean age= 44.5 years, SD =10.30 years). The overall FTND score among current daily smokers was 5.04 (SD: 5.05). FTND scores in the control and intervention areas were 4.75 (SD: 2.57) and 4.92 (SD: 2.51) respectively. The FTND scores increased with age and decreased with higher literacy and socioeconomic status. The average FTND score was high among smokers using both bidi and cigarettes (mean 6.10, SD 2.17). Internal consistency analysis yielded a Cronbach's alpha coefficient of 0.70 in a subsample of 150 subjects, a moderate result. The association of the scale was strongest, with the number of pack-years smoked (rho = 0.677, p < 0.001). **Conclusion**: A moderate level of nicotine dependence was observed among smokers in the current study. Tobacco cessation strategies could be made more cost effective and productive if a baseline assessment of nicotine dependence is completed before any intervention.

Keywords: Smoking - rural India - Fagerstrom test for nicotine dependence - tobacco cessation strategies

Introduction

The public health impact of tobacco use is enormous, given its effect in the bio-physical, psychological and social spheres of life. The World Health Organisation estimated that more than 5 million deaths occur every year worldwide due to tobacco use (MPOWER package, 2008). While the prevalence of smoking has come down in developed countries, the focus of attention has shifted to low and moderate income countries, where the increase in population and rapid rise in smoking constitutes a major public health problem (Abdullah and Husten, 2004). India being the second largest consumer and the third largest producer of tobacco products in the world, it is estimated that nearly 900,000 people die annually in India due to tobacco attributable diseases (Reddy and Gupta 2004). Smoking is the predominant habit among males in India constituting more than 50% of the tobacco users. The addictive property of the alkaloid 'nicotine' found in tobacco makes addicts out of tobacco users and this property of nicotine is considered similar to those

of cocaine (Banegal, 2005). Dependency on nicotine is the major obstacle that smokers have to overcome while in the process of quitting the habit. Though tobacco consumption, in general, is considered as a major public health problem in India, nicotine dependency is one area which has not been given much importance. Assessment of nicotine dependence has emerged as an important area of research while studying the tobacco use patterns, behaviour and addiction in various populations.

Measurement of nicotine dependency in smoking research has gained significant importance since 1978 when the Fagerstrom Tolerance Questionnaire was developed (Fagerstrom,1978). To compensate for inaccuracies in the psychometric properties of the older scale, the Fagerstrom Test for Nicotine Dependence (FTND), a 6 item questionnaire, was introduced and has gained wide popularity since 1991. The FTND is considered as easy to obtain self-reporting tool that conceptualise dependence through physiological and behavioural symptoms (Pérez-Ríos et al.,2009). Studies conducted in different contexts had shown high test-retest

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reliability and moderate internal consistency for the FTND scale (Weinberger et al., 2007; Wu et al.,2011).

The state of Kerala located in the south west corner of India has been recognised for its high literacy rate and good level of health indicators. However, tobacco control is one area where the state is only on par with many other states in India. In Kerala, the prevalence of "current tobacco users" among males above 15 years of age was reported to be 35.4% and the prevalence of "current smokers alone" is estimated to be 22.4% (GATS: India, 2010).

There is paucity of information on the effectiveness of community based smoking cessation intervention in rural India. In this backdrop, a smoking cessation intervention programme is being implemented in rural Thiruvananthapuram district of Kerala, India (Jayakrishnan et al., 2011). One of the key domains which we intended to look upon is the nicotine dependency of smokers in the study areas. In the present article, the internal consistency, validity, test-retest reliability of the FTND and the overall FTND scores of subjects in the study area are assessed.

Materials and Methods

The study design is a community based randomised intervention trial in 4 Community Development Blocks (CDB's) in Thiruvananthapuram district. Ward is the lowest level of administrative system of CDBs. A total of 11 wards (5 from intervention and 6 from control area) were selected from the above 4 selected CDBs using random sampling method. Each ward represents a cluster and thus 11 cluster units were identified for the study. Men in the age group 18-60 years who is a smoker, i.e., reports using at least one cigarette/bidi (locally made by wrapping coarse tobacco in dried temburni leaf) daily were included for the study.

Nicotine dependency status information of study subjects were collected by trained Accredited Social Health Activists (ASHA). An ASHA is a female community health activist working under the National Rural Health Mission programme (NRHM), a programme of the Government of India primarily to improve the health standards of people residing in the rural areas. They were trained to interview eligible subjects to collect and record information on socioeconomic characteristics, tobacco and alcohol habits and nicotine dependency status of smokers. One day training was given by a dentist and a psychologist from the Regional Cancer Centre, Thiruvananthapuram. The training programme gave emphasis on awareness of tobacco hazards, assessment of nicotine dependency and conduct of household survey using lectures, slide presentations and mock interviews.

Nicotine dependency was assessed using the Fagerstrom Test for Nicotine Dependency scale (FTND). The FTND scale consists of 6 items and has a total score of 10. Other than cigarette smoking, the FTND was also utilised to assess the nicotine dependency of bidi smokers in the current study. The 6 items include, (1) time to take up the first cigarette/bidi after awakening in the morning (2) difficulty in refraining from smoking in places where it

is forbidden (3) unwillingness to give up the first cigarette in the morning (4) number of cigarettes/bidis smoked per day (5) intensity of smoking during the morning hours and (6) smoking even when bedridden due to illness. A score of 5 or more indicates a significant dependence while a score of 4 or less presents a low to moderate dependence (Heatherton et al., 1991).

The items under FTND were first translated into Malayalam (the local language) and then back before using them. Two investigators (a dentist and a psychologist) independently translated the English version into the local language. The investigators came into a consensus on the translation of questionnaire which was again back translated to the original version for comparison. Since no major discrepancy was noted, the translated version was used for the study. ASHA volunteers were trained on the use of local version of the FTND conducting mock surveys and further the queries aroused were clarified by the investigators. The volunteers later completed the questionnaire through house to house survey and were checked by the investigators for its completeness. Retest was assessed after two months of completing the initial FTND questionnaire among a subsample of 91 subjects. The internal consistency of the FTND was computed using Cronbach's alpha coefficient. Internal consistency measures the extent of inter-correlation amongst a set of measurement items with the same ability or trait in the scale (Kaplan and Saccuzzo, 2005). Criterion (concurrent) validity was assessed by correlations of nicotine dependence scores with age at initiation of smoking and cumulative smoking volume in pack-years. The age at start of smoking was calculated by subtracting the current age in years from the duration of smoking in years. To measure the amount smoked by a person over a period of time, pack years was calculated as number of cigarettes/ bidis per day * number of years smoked/10. A finding of higher correlations would support criterion validity. Since the measures were scored on ordinal scales, we used Spearman's rank correlations in the analysis. Wilcoxon signed- rank test was used to assess whether mean ranks differ when the FTND scale was repeated.

Test–retest reliability of item specific and aggregate scale were determined by intra-class correlation coefficient, using a two-way mixed effect model with absolute agreement definition and weighted kappa statistic using linear weighting respectively.

Results

The overall prevalence of current daily smokers in the 18-60 year age group was 28.1% (mean age: 44.4 years, SD: 9.2 years). Among the 3304 males in the intervention and control arm, a total of 928 'current daily smokers' were identified from house to house survey. Of the 928 smokers, 474 subjects were in the intervention area (mean age: 44.56 years, SD: 9.66 years) and 454 in the control area (mean age: 44.47 years, SD: 10.30 years). The average number of cigarettes and bidis consumed per day corresponds to 13.19 (SD: 8.4) in the intervention and 10.90 (SD: 6.8) in the control groups. Cigarette smoking was the most common habit among both groups representing 62.5% in

Nicotine Dependence among Smokers in a Selected Rural Population in Kerala, India

the control and 53.8% in the intervention areas. The mean duration of smoking was 15.05 years in the control area (SD: 8.28) and 15.78 years (SD: 9.09) in the intervention area (Table 1).

The overall FTND score among current daily smokers was 5.04 (SD: 5.05). FTND scores in the control and intervention areas were 4.75 (SD: 2.57) and 4.92 (SD: 2.51) respectively. The FTND scores increased with age and decreased with higher literacy and socioeconomic status. The average FTND score was found to be higher among those who had the habit of smoking both bidi and cigarette (mean 6.10, SD 2.17) followed by bidi alone (mean: 5.39, SD: 2.36) and cigarette alone (mean: 4.10, SD: 2.50) (Table 2).

Internal consistency analysis for FTND scale was conducted among 150 daily smokers in the survey. Internal consistency evaluation yielded a Cronbach's alpha coefficient of 0.70 suggesting moderate internal consistency.

Intra-class correlation coefficient (ICC) for test–retest was 0.77 (95% CI: 0.67 to 0.84, p<0.001) for the FTND scale. There was no significant difference in scores for the two administrations of the FTND with mean difference -0.10 (p=0.59) (Table 3). There was little association of the FTND score with age at start of smoking (rho = 0.187, p = 0.022). The association of the scale was strongest, with
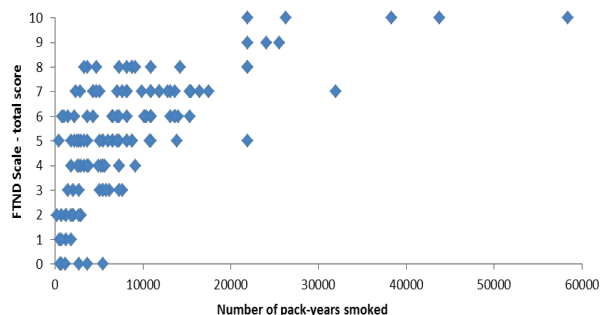
Figure 1. Correlation between FTND Scale and Number of Pack-Years Smoked

Table 1. Summary of Smoking Status

	Control group	Intervention group	Total
Number of Subjects	454	474	928
Smoking Status			
Number	454 (100%)	474 (100%)	928 (100%)
Type of Smoking			
Beedi	57 (12.56%)	73 (15.40%)	130 (14.01%)
Cigarette	284 (62.56%)	255 (53.80%)	539 (58.08%)
Both	113 (24.89%)	146 (30.80%)	259 (27.91%)
Years Since Smoking			
N	454	474	928
Mean (SD)	15.05 (8.28)	15.78 (9.09)	15.42 (8.71)
Median	15	15.00	15
(Min-Max)	(1.00 - 40.00)	(1.00 - 45.00)	(1.00 - 45.00)
Total Number of Cigarette and Beedi per Day			
N	454	474	928
Mean (SD)	10.90 (6.81)	13.19 (8.94)	12.07 (8.05)
Median	10	12.00	10
(Min-Max)	(1.00 - 40.00)	(2.00 - 52.00)	(1.00 - 52.00)
Total Dependency Score			
N	454	474	926
Mean (SD)	4.75 (2.57)	4.92 (2.51)	4.84 (2.54)
Median	5	5	5
(Min-Max)	(0.00 - 10.00)	(0.00 - 10.00)	(0.00 - 10.00)

Table 2. Distribution of FTND Total Score for Current Daily Smokers Based on the Background Characteristics

Variables		N	Mean	Std. Dev	Med	Min-Max
Group	Control group	454	4.75	2.58	5	0-10
	Intervention group	472	4.92	2.51	5	0-10
Age	<25	26	2.54	2.30	2	0-7
	26-35	177	4.34	2.49	4	0-10
	36-45	285	4.67	2.60	5	0-10
	46-55	289	5.27	2.43	6	0-10
	>55	149	5.32	2.39	5	0-10
Job						
Student		3	2.00	3.46	0	0-6
Unemployed		18	5.11	2.78	5.5	0-9
unskilled worker		408	5.11	2.52	5	0-10
semiskilled worker		162	5.41	2.38	5	0-10
skilled worker		180	4.29	2.58	4	0-10
clerical, shop owner, farmer		105	4.34	2.48	4	0-10
semi profession		47	3.77	2.28	4	0-9
Profession		3	5.67	1.53	6	4-7
Education						
Illiterate		17	6.41	1.91	6	3-9
primary school certificate		80	5.87	2.52	6	0-10
middle school certificate		247	5.36	2.40	6	0-10
high school certificate		470	4.58	2.48	5	0-10
Inter.		71	4.27	2.75	4	0-10
graduate		39	2.92	2.23	3	0-8
profession		2	4.00	2.83	4	2-6
Type of Smoking	Bidi	128	5.39	2.26	6	0-10
	Cigarette	539	4.10	2.50	4	0-10
	Both	259	6.10	2.17	6	0-10
Marriage	No	72	4.12	2.65	4	0-10
	Yes	854	4.90	2.52	5	0-0

*2 cases were excluded because of missing FTND score

Table 3. FTND scale specific test-retest reliability (n=91)

Items	Kappa statistic (SE)	P-value
Time to 1st Cigarette	0.598 (0.069)	<0.001
Forbidden cigarettes	0.593 (0.094)	<0.001
Most hate to give up	0.487 (0.098)	<0.001
Cigarettes/ day	0.604 (0.066)	<0.001
Morning smoking	0.661 (0.079)	<0.001
Smoke if ill	0.752 (0.089)	<0.001

*SE-standard error

number of pack-years smoked (rho = 0.677, p < 0.001) (Figure 1).

Discussion

The present study tried to explore the nicotine dependency status of smokers residing in rural areas of Kerala state, India. In this study, the FTND scores of intervention and control groups were 4.92 and 4.75 respectively which can be classified as low to moderate level dependence. The FTND score was found to have moderate internal consistency (Cronbach's alpha coefficient 0.70). The test-retest reliability of the scale was found to be moderate with an intra-class correlation coefficient of 0.77.

Evaluation of nicotine dependency is an important

step before planning any treatment for smoking addiction. However, a good understanding of nicotine dependency estimation is lax among physicians which are bound to failures while choosing treatment strategies. In a country like India with diverse cultural, ethnic and demographic back ground, where smoking prevalence is high, a better understanding of nicotine dependency will add-on to more possibilities in the treatment of nicotine dependence. Though a few studies were conducted in India to estimate the nicotine dependency status of selected sub-groups (Chandra et al.,2005; Jhanjee and Sethi, 2010), this study was conducted exclusively in a rural population. Though studies from rural areas have not been reported, a study conducted among 500 male students representing 5 universities in Ranchi district of India reported a FTND score of 6.7±2.22 (Sahoo and Jayant., 2010). The FTND score was comparatively lower in the present study even though the age group selected for the study ranged from 18 to 60 years. A better understanding of the attitude change in society and family towards smoking concomitant with personal awareness on its adverse effects could have influenced smokers to smoke in a much more responsible way as perceived by them. Our finding that the FTND score increased with age is an indication that duration of smoking has a linear effect on smoking dependence while higher literacy and occupation were inversely related. Wu et al., (2011), in a study conducted among migrant population in China also reported similar findings. A possible reason is that coping with stressful conditions could become difficult among smokers with age resulting in an increased smoking dependency when compared to younger age groups. Our finding also points to the fact that a strong socioeconomic gradient is associated with tobacco use which had its reflection on the nicotine dependency status. A study conducted among psychiatric patients who had attended a major hospital in South India also reported of higher dependence among older and less educated patients, whereas no association was found between nicotine dependence and the specific psychiatric diagnosis represented in the study (Chandra et al., 2005).

In our study, the FTND score was highest for both forms of tobacco. However for 'bidi alone users', it showed a high dependency score than 'cigarettes alone' which had a moderate dependence. Though 'bidi alone users' constituted nearly one fourth of the study subjects when compared to 'cigarette alone users', the fact that high dependency among 'bidi alone users' could be attributed to the high nicotine content in bidi. Studies conducted to analyse the levels of nicotine and other alkaloids in Indian tobacco products reported high nicotine content in sun cured tobacco used for making bidis (37.70 milligrams of nicotine per gram) when compared to conventional cigarettes which has 16.54 milligram per gram (Pakhele and Maru 1998; Pakhele et al., 1997). Moreover, bidi smoking is more common among the lower socioeconomic group where awareness on tobacco hazards could be reasonably low.

In our study the FTND score was found to have moderate internal consistency. A study conducted among poly drug abuse users in India reported low reliability (Jhanjee and Sethi, 2010). However, moderate internal consistency for FTND was also reported by few other studies (Vink et al., 2005; Weinberger et al.,2007; Wu et al., 2011). While translating the questionnaire, emphasis was given to translate the following items of the original questionnaire to suit the wordings in the local language for easy understanding among study subjects. Item 1 (How soon after waking do you smoke your first cigarette?) was rephrased in the following manner to match the original version in English (After you wake up, how soon you will smoke the first cigarette/bidi?). Item 2 (Do you find it difficult to refrain from smoking in public places where it is forbidden?) The term 'public place' has to be rephrased, since the authors were of the belief that it could be perceived as a vague term among public and hence could not comprehend properly. The Cigarettes and Other Tobacco Products Act, 2003 of the Government of India has defined the term 'public place' as a place where the public have access, whether as of right or not, and includes auditorium, hospital buildings, railway waiting room, amusement centers, restaurants, public offices, court buildings, educational institutions, libraries, public conveyances and the like which are visited by general public.(COTPA, 2003). With this definition as the background the item 2 was revised to "do you smoke in places where the public have access". In item 3 ("Which cigarette would you hate most to give up?) the depiction of "hate the most to give up" was modified to "you think the most difficult to avoid" which was believed to have equal meaning as in the original question in English.

The test-retest reliability of the FTND scale was found to be reasonably good in this study. Studies had reported high test-retest reliabilities of FTND among non-psychiatric patients (Pomerleau et al., 1994; Hudmon et al., 2005; Vink et al., 2005) and in patients with schizophrenia (Yang et al., 2003). The test-retest reliability was assessed after two months of completing the first version. Though it was reasonably good, higher test-retest reliability could have been achieved if the test was repeated in a short interval after completing the first one.

In conclusion, the study reported moderate level of nicotine dependence in the rural population in Thiruvananthapuram, Kerala. Tobacco cessation strategies, either clinic or community oriented, and group intervention programmes could be made more cost effective and productive if a baseline assessment of nicotine dependency could be completed before intervention.

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