


Interrelations of Level of Urinary Cotinine and Score for Fagerstrom Test for Nicotine Dependence among Beedi Smokers, and Smokeless Tobacco Users in India

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ABSTRACT

Background: Tobacco related diseases is largely preventable and can stop pre-mature death. According to World Health Organization (WHO), the prevalence rate of smoking is 28.6% (40% among males and 18.2% among females).^[1] Beedismoking and tobacco chewing are the commonest forms of tobacco habits in India, and strongly associated with oral cancer in India.^[2] There are methods to estimation of severity of tobacco dependency, of them FTND is identified. The score for FTND is used for cigarette smoking, but we do not know the FTND score of ST users and Beedi smokers in India. Therefore, keeping the study in plan, we aim a systemic review with the following objective. **Objectives:** 1. To pursue a review of published researches on interrelations between Beedi smoking and FTND score. 2. To pursue a review of published researches on interrelations between consumption of ST and FTND score. **Materials and Methods:** A systematic search of published papers were examined from three different electronic databases namely Pubmed, Cochrane library, and ProQuest. The inclusion criteria and exclusion criteria was set based on commonality of the studies which was looked through the objectives. Total of four papers of its category were found, and those met the criteria for inclusion factors. **Results:** Seventy-one articles were screened initially and forty-three articles were excluded and twenty-eight articles were screened, out of which twenty articles were excluded based on inclusion criteria. The abstracts of remaining eight articles were reviewed and four were removed because of duplication of the data. Finally, four articles were included for review after three stages of screening. Review results revealed that out of four selected reviews, one research study finding was interrelated with FTND score and Beedi and ST users. This study results also revealed that there is not a set of research carried out on FTND score for Beedi smokers and ST users.

Key words: *Beedi smokers, Fagerstrom Test for Nicotine Dependence, smokeless form of tobacco users*

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INTRODUCTION

Smoking and smokeless form of tobacco (ST) consumption is common in India. Most tobacco users begin the habit at a young age. Smoking forms include cigarette, beedi, hooka, and chutta. Tobacco consumption can cause various cancers and cardiovascular disease.^[1] ST users are in high numbers in India. Cotinine is a major metabolite of nicotine in body fluids. Its concentration is high in urine than in blood because of its pH. Self-reported questionnaires likely to underestimate the prevalence of tobacco users.^[2] Research studies have found that urinary cotinine level may be positively correlated with smokers who claimed to be nonsmokers. Assessing nicotine level among tobacco users is a challenging task to the tobacco researchers. Fagerstrom Test for Nicotine Dependence (FTND), heaviness of smoking index (HSI) score and urinary cotinine level can be used as a reliable method to assess nicotine dependent level among tobacco users.^[3] The review evidence may help the researcher to identify the exact concurrence between the score of FTND and HSI among beedi smokers and ST users which may be different from others.

MATERIALS AND METHODS

The method for this review was according to PRISMA guidelines (<http://www.equator-network.org/reporting-guidelines/prisma/>). The inclusion and exclusion criteria are highlighted in the Table 1.

The authors performed a review of existing literature published till date using keywords as, FTND, HSI, urinary cotinine, Fagerstrom Test for Nicotine Dependence, Heaviness of Smoking Index, FTND and urinary cotinine, HSI and urinary cotinine, FTND and beedi, FTND and gutka, HSI and beedi, FTND and snuff, FTND and pan, HSI and tobacco users, HSI and urine Cotinine level, urinary cotinine and Fagerstrom Test for Nicotine Dependence or FTND and Heavy of Smoking Index or HSI, Urinary Cotinine and Fagerstrom Test for Nicotine Dependence or FTND and Heavy of Smoking Index or HSI India, smokers or smoker and Tobacco or smokers. Three data base were used to search review article by using above mentioned key words. The quantitative studies were included in order to improve study sensitivity.

The Flowchart 1: shows that processes which has been followed during the review.

Initially 71 articles [Flowchart 1 and Table 1] were screened, out of which 43 articles were excluded based on inclusion and exclusion criteria. Twenty-five articles from Pubmed, 3 articles from Cochrane library. Total 28 article abstracts were screened out of which 7 articles

from Pubmed, 1 article from Cochrane library were fully reviewed. Four articles were removed because of duplication of the data; ambiguity of the content and inadequate information. Finally, 4 articles were included for systematic review.

Table 2 shows that details of the twenty five articles abstract which were reviewed during review process.

There were limited studies on score of FTND and HSI among Beedi, and ST users. Therefore the author included all the studies that measured FTND and HSI score as main outcome measures [Table 3].

Data extraction and quality assessment

The authors adopted qualitative systematic review approach to find FTND and HSI score of beedi and ST users. Data were extracted from the original authors. The quality of the data was checked by predesigned criteria checklist developed by the authors. A formal review was done by the authors. We adopted qualitative systematic review approach to find FTND and HSI score of beedi and ST users. Data were extracted from

Table 1: Summary of the Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
The primary sources	Outcomes were not reported clearly
Studies related to beedi smokers and ST users	Review articles
Quantitative studies	
Studies conducted in the community and in hospital settings	
Studies reported in English language	
Only research articles	
Studies conducted by healthcare professionals	
Studies conducted on all the age groups, gender, and demographic variables	

Table 2: Summary of the search strategy carried out in database

FTND and beedi	1
FTND and snuff	1
FTND and pan	3
FTND and gutka	0
HSI and tobacco users	13
HSI and Urine cotinine level	0
Urine cotinine level and HSI	1
Urinary cotinine and Fagerstrom Test for Nicotine Dependence	8
Urinary cotinine and Fagerstrom Test or FTND and Heavy Smoking Index or Heavy Smoking Index or HSI	1
Smokers or smoker and tobacco or smokeless tobacco and Fagerstrom Test) or FTND and nicotine or nicotine dependence and India	6
Fagerstrom Test OR FTND AND ((nicotine) OR nicotine dependence) AND India	14
Heavy Smoking Index OR heavy smoking index OR HIS AND nicotine OR nicotine dependence	7

the original authors. The quality of the selected articles data were checked by predesigned criteria checklist developed by the authors [Table 4].

RESULTS

Characteristics of included studies

Table 5 shows the all selected four studies used FTND and HSI score to evaluate various outcomes like validating the amount of tobacco used by the individual, effectiveness of tobacco cessation programme, correlate FTND score with urinary cotinine level, and identifying intended to quit tobacco smoking behaviour. The selected study population comprised psychiatric patients, patients attending outpatient department of pulmonary medicine, and other two study population comprised healthy volunteers with personal habits.

DISCUSSION

Beedi and ST users are common among low socioeconomic population in India. Using ST users are an accepted cultural behavior India. However, its ill effects on health

are ignored. Tobacco consumption in the form of smoking or chewing leads to cancer and other chronic diseases.^[4] FTND and HSI are universally accepted addiction index tools for cigarette smoking and ST. However, its relation with beedi and ST users are not well-established. This systematic review has focused research on cotinine level and score of FTND, HSI among smokers and ST users.

The study by Balhara *et al.*, with year suggested that urinary cotinine and nicotine dependence level were interrelated; it was also revealed that there was a significant correlation between the socioeconomic status of smokers and smoking-related factors with respect of urinary cotinine levels and the FTND scores. The study also mentioned that FTND tool helps to assess physical dependence of tobacco use rather than assessing persistence of tobacco use. This finding was not directly supported by previous studies conducted in the field of tobacco research. Major limitation of this study was retrospective in nature and gender distribution among study subjects was not equal (women 7.6%). Self-administered questionnaire

Table 3: Articles included for abstract reviewing^[1-25]

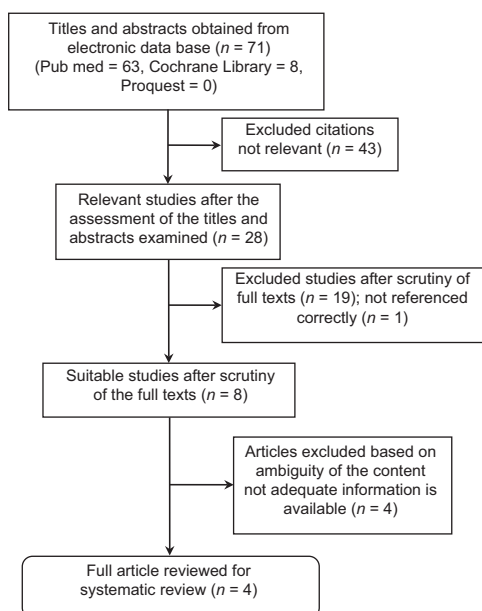
Title	Author	Year
Can urinary cotinine predict nicotine dependence level in smokers	Jung HS <i>et al</i>	2012
Use of cotinine urinalysis to verify self-reported tobacco use among male psychiatric out-patients	Balhara YP <i>et al</i>	2012
Assessing tobacco dependence among cannabis users smoking cigarettes	Flatz A <i>et al</i>	2013
Concordance between urinary cotinine levels and self-reported tobacco use among drug-dependent persons: a pilot study	Jain R <i>et al</i>	2012
A comparative study of reliability of self report of tobacco use among patients with bipolar and somatoform disorders	Balhara YP <i>et al</i>	2011
Tobacco use and measuring nicotine dependence among urban indigenous pregnant women	Panaretto KS <i>et al</i>	2009
A preliminary investigation of early smoking initiation and nicotine dependence in Korean adults	Park SM <i>et al</i>	2004
A group intervention to reduce smoking in individuals with psychiatric disorder: brief report of a pilot study	Kisely SR <i>et al</i>	2003
Assessment of nicotine dependence among smokers in a selected rural population in Kerala, India	Jayakrishnan R <i>et al</i>	2012
Genetics of the association between intelligence and nicotine dependence: a study of male Swedish twins	Modig K <i>et al</i>	2011
Mediation of smoking abstinence self-efficacy on the association of nicotine dependence with smoking cessation	Li S <i>et al</i>	2015
Cognitive behavioural therapy versus basic health education for tobacco cessation among tobacco users: a randomized clinical trial	Raja M <i>et al</i>	2014
Smoking in eating disorders	Anzengruber D <i>et al</i>	2006
Predictors of quitting behaviour with special reference to nicotine dependence among adult tobacco-users in a slum of Burdwan district West Bengal	Kamirul I <i>et al.</i>	2014
Use of cotinine urinalysis to verify self-reported tobacco use among male psychiatric out-patients	Balhara YP <i>et al</i>	2012
Assessing tobacco dependence among cannabis users smoking cigarettes	Flatz A <i>et al</i>	2013
Concordance between urinary cotinine levels and self-reported tobacco use among drug-dependent persons: a pilot study	Jain R <i>et al</i>	2012
A comparative study of reliability of self-report of tobacco use among patients with bipolar and somatoform disorders	Balhara YP <i>et al</i>	2011
Tobacco use and measuring nicotine dependence among urban Indigenous pregnant women	Panaretto KS <i>et al</i>	2009
A preliminary investigation of early smoking initiation and nicotine dependence in Korean adults	Park SM <i>et al</i>	2004
A group intervention to reduce smoking in individuals with psychiatric disorder: brief report of a pilot study	Kisely SR <i>et al</i>	2003
Tobacco cessation outcomes in a cohort of patients attending a chest medicine outpatient clinic in Bangalore city, southern India	Mony PK <i>et al</i>	2014
Smoking, nicotine dependence and nicotine intake by socio-economic status and marital status	Pennanen M <i>et al</i>	2014
The relationship between the nicotine metabolite ratio and three self-report measures of nicotine dependence across sex and race.	Schnoll RA <i>et al</i>	2014
The prevalence, predictors and associated health outcomes of high nicotine dependence using three measures among US smokers	Schnoll RA <i>et al</i>	2014

Table 4: Summary of included articles for Systematic Review

Author	Title of the study	Research Design	Study population	Findings
Hyun-Suk Jung ¹ , Yeol Kim, Jungsik Son, Young-Jee Jeon, Hong-GwanSeo ² , So-Hee Park, Bong Ryul Huh-2012	Can urinary cotinine predict nicotine dependence level in smokers?	Correlation research design	381 Healthy individuals with personal habits	The results of this study supported that interrelating the score of FTND with using urinary cotinine levels for assessment of nicotine dependence in active smokers
Mony PK, Rose DP, Sreedaran P, D'Souza G, Srinivasan K-2014	Tobacco cessation outcomes in a cohort of patients attending a chest medicine outpatient clinic in Bangalore city, southern India	Cohort study	106 patients attending outpatient department of pulmonary medicine	They were mild differences in the FTND and HSI score for beedi smokers
Kamirul Islam, Indranil Saha, Rajib Saha, Sufi Abdul Samim Khan, Rupali Thakur & Swapnil Shivam	Predictors of quitting behaviour with special reference to nicotine dependence among adult tobacco-users in a slum of Burdwan district, West Bengal	Cross sectional research design	128 Adult tobacco users	Tobacco users having high FTND score and who started tobacco use early in life and they were more unintended to quit, respectively
Yatan Pal Singh Balhara, Raka Jain, A. Shyam Sundar, Rajesh Sagar -2012	Use of cotinine urinalysis to verify self-reported tobacco use among male psychiatric out-patients	Correlation research Design	175 psychiatric patients using tobacco	No significant concordance between the self-reported recent tobacco use and urinary cotinine levels for both smoking and smokeless tobacco forms. The discordance between the FTND scores and urinary cotinine levels.

Table 5: Risk of bias for every study

Author	Adequate Sequence Generation Yes/no/Unclear	Allocation concealment Yes/no/unclear	Blinding of outcome assessors Yes/no/unclear	Incomplete outcome data addressed Yes/no/unclear	Selective outcome reporting Yes/No/unclear	Free of other bias Y/N/Un	Level of risk of bias High/Medium/Low
Jung HS <i>et al</i>	Yes	No	No	No	No	Yes	Low
Mony PK <i>et al</i>	Yes	No	No	No	No	Yes	Low
Kamir <i>et al</i>	Yes	No	No	No	No	Yes	Low
Balhara YP <i>et al</i>	Yes	No	No	No	No	Yes	Low



Flow Chart 1: Schematic representation of research article selection process

was used to collect data from subject, therefore information obtained from the study subjects were biased. The study recommended that future study

should focus on broad utilization of urinary cotinine measurement.^[5]

The study by Panaretto *et al.*, with year focused on long-term patients who had been enrolled for tobacco cessation in a clinical setting. There was a correlation between HSI score and absence of vascular or other chronic diseases but no correlation between FTND score and history of alcohol consumption, previous quit attempt, and duration of tobacco use. This discrepancy between FTND and HSI score was unexpected. The study failed to correlate self-reported cessation assessment with biochemical validation. Therefore, there are chances for information bias. The study recommended that further studies need to be conducted to identify the predictors for quitting.^[6] This study finding was supported by a study conducted by Park *et al.* which revealed that FTND score was more reliable in assessing low nicotine dependence. Perhaps HSI can be used as a good screening tool to assess high dependence level.^[7]

Study by Kisely *et al.*, with year results revealed that FTND score alone was significant with age and habit of use. The study recommended that multicenter

Table 6: Main characteristics of selected studies for systematic review

Ref.	Variables	No%	FTND Score	P*	Main outcomes measured
1.	Age	45.4±7.8			FTND score and urinary cotinine level was concordance with higher level of Nicotine dependence.
	Gender				
	Male	352 (92.4)	3.5±2.4	0.44	
	Female	29 (7.6)	3.1±2.2		
	Marital Status				
	Married	368 (96.6)	3.4±2.4	0.21	
	Not married, divorced, separated	13 (3.4)	4.3±2.9		
	Education				
	≤12	116 (30.4)	3.8±2.4	0.06	
	13-16	201 (52.8)	3.5±2.5		
	≥16	64 (16.8)	2.9±2.2		
	Average monthly income (million)				
	≤2	18 (4.7)	3.8±2.1	0.18	
	2-4	92 (24.1)	3.2±2.5		
	4-7	135 (35.4)	3.8±0.2.4		
	≥7	136 (35.7)	3.3±0.2.4		
	Smoking status				
	Cigarette per day	19.4±9.7			
	Total smoking period (years)	24.9±8.1			
	Total lifetime cigarette (pack year)	24.8±16.3			
	Age at smoking initiation (years)	20.8±4.4			
History of smoking cessation					
Yes	4 (1.0)	1.3±1.5	0.07		
No	377 (99)	3.5±2.4			
Intention to quit smoking					
Begin with near 6 months	141 (37.0)	3.0±2.4	0.01		
Some day, but after 6 months	213 (55.9)	3.7±2.4			
None	27 (7.1)	4.2±2.4			
Partner's smoking					
Yes	44 (11.5)	3.6±2.2	0.69		
No	337 (88.5)	3.5±2.5			
2.	FTND score of beedi smokers				FTND and HSI score for Bidi smokers are mild differences when compare with P value
		Respondents	Non-respondents		
	≥6	53	55	0.26	
	≤6	31	22		
3.	HSI Score of beedi smokers				FTND standard mean deviation for ST users will vary based on their motivational level.
	≥4	47	37	0.49	
	≤4	44	42		
4.	FTND score of Smokeless form of Tobacco users				No significant concordance between the self-reported recent tobacco use and urinary Cotinine levels for both smoking and smokeless tobacco forms. The discordance between the FTND scores and urinary Cotinine levels.
	Intention to quit		Non intention to quit		
	4.65±2.41		7.76±1.90		
4.	Self reported use of ST users-13 (9.8%)	Mean FTND score: 2.59 (SD ± 1.72)			
	Tobacco powder-8 (6.1%)				
	Khaini-2 (1.5%)				

studies need to be undertaken to identify other predictors of quitting behavior.^[8] This study finding was contradictory to a study conducted by Bernstein *et al.* which revealed that people with low FTND score were found to be more interested to quit.^[9]

A study by Modig *et al.*, with year finding was contradictory with above-mentioned studies. This study found that FTND score was not directly correlated with urine cotinine level.^[10] Falsification of data could have occurred due to self-report.

The data presented in the Table 6 shows that main characteristic of selected studies for review process. The main outcome of the selected studies emphasized on relation between FTND and HSI score for bidi smokers, ST users and other nicotine dependence.

These systematic review findings reviewed that FTND and HSI indices were not widely used to assess nicotine level among beedi and ST users. They were widely used among cigarette smokers. Beedi and ST smokers are high in number in India compared to cigarette smokers. The above-mentioned study results have revealed that there was a significant difference in score of FTND and HSI among beedi and ST users. In this review, findings also indicated that HSI can be used as a reasonably good screening tool to identify daily smokers with high level of nicotine dependence than the subpopulation having low nicotine dependence. FTND score is more reliable when supported with the validity of using urinary cotinine levels for assessment of nicotine dependence in active smokers. There were no studies with randomized control trial included for review, hence we cannot use specific statistical test.

Limitations

- The articles included for systematic review were different in its population size, outcome measures, type of tobacco
- The authors have used only three databases and selected key words in the review process
- The quality of the selected articles was screened by predesigned form prepared by the author.

CONCLUSION

The outcome of this systematic review suggests that the FTND score is not available for ST users and beedi users which need quantification with further study; because not a single study has been carried out to find FTND for ST and beedi consumers. As India and regional countries are heavily loaded with those addictions, the possibility and pattern of tobacco-related disorder would be different. Therefore, the determination of urinary cotinine will be biomarker to establish FTND values for beedi smokers and ST users, and the score may be different from cigarette smokers. This helps to establishing awareness among the ST/beedi addicts in India.

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Conflicts of interest

There are no conflicts of interest.

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