RESEARCH ARTICLE

Extending Application of the 'Hardcore' Definition to Smokeless Tobacco Use: Estimates from a Nationally Representative Population in India and its Implications

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Abstract

Background: The term 'hardcore' has been applied to use of smoking tobacco and generally referred to as the inability or unwillingness of regular smokers to quit. The component constructs of hardcore except nicotine dependence are product neutral. With the use of 'time to first chew' as a measure of nicotine dependence, hardcore definition can be extended to characterize smokeless tobacco users. Hardcore users respond less to tobacco cessation interventions, and are prone to tobacco induced diseases including cancer. Thus identifying hardcore users would help in estimate the burden of high risk population for tobacco induced diseases. Smokeless tobacco use is predominant and accounts for more than 50% of oral cancer in India. Hence, hardcore chewing information could be used for planning of tobacco and cancer control interventions. The objective of this study was to assess the prevalence and associated factors of hardcore smokeless tobacco use in India. Materials and Methods: Global Adult Tobacco Survey (GATS)-India 2010 data were analyzed to quantify hardcore smokeless tobacco use in India with following five criteria: (1) current daily smokeless tobacco use; (2) no quit attempt in the past 12 months of survey or last quit attempt of less than 24 hours duration; (3) no intention to quit in next 12 months or not interested in quitting; (4) time to first use of smokeless tobacco product within 30 minutes of waking up; and (5) knowledge of smokeless tobacco hazards. Results: The number of hardcore smokeless tobacco users among adult Indians is estimated to be 5% (39.5 million). This group comprises 23.2% of daily smokeless tobacco users. The population prevalence varied from 1.4-9.1% across different national regions of India. Logistic regression modeling indicated age, education and employment status to be the major predictors of hardcore smokeless tobacco use in India. Conclusions: The presence of a huge number (39.5 million) of hardcore smokeless tobacco users is a challenge to tobacco control and cancer prevention in India. There is an unmet need for a universal tobacco cessation programme and intensification of anti-tobacco education in communities.

Keywords: Hardcore users - smokeless tobacco - dependence - India

Asian Pacific J Cancer Prev, **13 (12)**, 5959-5963

Introduction

In general, hardcore smoking refers to a subset of daily smokers with least probability of quitting and which responds less to tobacco control interventions (Pierce et al, 1998; Emery et al, 2000; Irvin et al., 2003; Warner et al., 2003). Lichtenstein and Keutzer (1973) were the first to introduce the term 'hardcore' while suggesting 'aversion' technique of Schmahl et al. (1972) for the smokers attending smoking cessation clinic. Hardcore smokers have been identified as older male with poor education and low income (Emery et al., 2000; Jarvis et al., 2003; Augustson et al, 2004; MacIntosh et al, 2006; Ferketich et al., 2009). They are similar to pre-contemplators described in the 'Trans-theoretical Model' as they have no quit intention during the next six months (DiClemente et al., 1991; Velicer et al., 1996). However there is no standard definition of 'hardcore' smoking (Costa et al., 2010). Multiple component constructs comprising of motivational, dependence and behavioural variables have been used to define hardcore smoking (Ip et al., 2012). These are daily or regular smoking, history of long term smoking, nicotine dependence, no quit attempt in the past, no future intention to quit, smoking despite of knowledge of harmful effects and social disapprobation of smoking (Costa et al., 2010; Jena et al., 2012). These attributes makes hardcore smokers more prone to the development of tobacco-related diseases and cancers. All these component constructs of hardcore smoking were described in relation to the use of cigarette, which is the most prevalent form of tobacco in Europe and USA, where these survey/studies have been conducted (Costa et al., 2010). However the number of papers that have empirically examined this topic remains limited (Cohen et al., 2012) and also scarce in developing countries like India, where other tobacco products like smokeless tobacco use and use of bidi

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smoking are more prevalent than cigarette (GATS India, 2010; Jena et al., 2012).

India is the largest manufacturing country of smokeless tobacco in the South-East Asia (SEA) Region (Gupta et al., 2011). Smokeless use is more than twice that of smoking in India (GATS-India, 2010). Also smokeless tobacco use attributes to more than 50% of oral cancer incidences in India (Gupta et al., 1980; Boffetta et al., 2008). A recent national level survey found that tobacco related death affects more male than female. The study found that tobacco-related cancers represented 42% (84,000) of male and 18.3% (35,700) of female cancer deaths in India (Dikshit et al., 2012). By definition, the hardcore users are nicotine dependent and regularly use tobacco, thus exposing them to the carcinogens and other harmful tobacco ingredients. As the tobacco attributable cancers are dose (amount, age of initiation, duration of use, duration of quitting, etc) related (Hart et al., 2012), the different component constructs of the hardcore tobacco use suggests that, these subgroups of smokers will be affected more by cancers and other tobacco induced diseases. Thus the assessment of the 'hardcore' users will give an idea about the burden of high risk population for tobacco induced diseases including oral and other cancers.

Various measures that used to estimate hardcore smoking prevalence are product independent except nicotine dependence measure. In various studies on hardcore smoking, HSI (heaviness of smoking index) (Costa et al., 2010), Cigarette per day (Emery et al., 2000; Auguston et al., 2008; Ferketich et al., 2009) and Time to First smoke (Jena et al., 2012) have been used to measure tobacco dependence. It is to be noted that, last two measures of dependence constitute HSI. Among these two components of HSI, time to first smoke is the most stable and the best single community surveillance indicator of tobacco dependence assessment (Fagerstrom, 2003). Further, the Global Adult Tobacco Survey, India (GATS-India) has used time to first smoke or chew as an indirect measure of dependence of various tobacco products in India (GATS-India, 2010). There is an opportunity to extend the hardcore definition to the use of smokeless tobacco with the use of time to first chew as a measure of smokeless tobacco dependence in India.

In India, 21% adult use smokeless tobacco and its prevalence is more than twice that of smoking (9%) (GATS-India, 2010). The GATS-India (2010) survey has captured various component construct of hardcore tobacco use. Hardcore smoking in India has been estimated to be 24.3 million using regular smoking, quit attempt, quit intention and knowledge of smoking hazard as component constructs (Jena et al., 2012). However little is known about prevalence and correlates of hardcore smokeless tobacco and cancer control in India, which has bearing on tobacco cessation service provision in India. The objective of this study was to quantify the prevalence and associated factors of hardcore smokeless tobacco use in India.

Materials and Methods

We used data from GATS-India survey, which is a nationally representative cross-sectional household survey of adults (≥15 years) designed to produce national and sub-national estimates by residence and gender and state estimates by gender. Stratified multi-stage cluster sampling design was employed in the survey with independent sampling in each state. The survey covered about 99.92 percent of the total population of India. The objectives of the GATS India survey were to measure the impact of tobacco control efforts in India by tracking key tobacco control indicators and systematically monitor adult tobacco use. The information was collected on adult tobacco (smoking and smokeless) use, socio-demographic characteristics of tobacco users, tobacco cessation practices, exposure to second hand smoke, expenses on tobacco products, exposure to different media on tobacco related information and knowledge, attitudes and beliefs about tobacco. We estimated hardcore smokeless tobacco use prevalence by adapting population study definitions for the myriad smokeless products used in India.

For the purpose of current study we defined hardcore smokeless tobacco use as (1) current daily smokeless tobacco use, (2) no quit attempt in the past 12 months of survey or last quit attempt lasting <24 hours, (3) no intention to quit in next 12 months or not interested in quitting, (4) Time to first chew <30 minutes, and (5) Knowledge of smokeless tobacco use hazards. In the analysis daily smokeless user has been classified has hardcore and non hardcore chewer. The univariate and multivariate analysis were done to assess the factors predicting hardcore smokeless tobacco use.

Results

Prevalence of hardcore smokeless tobacco use in India

The number of hardcore smokeless tobacco users in India was estimated to be 39.52 million (23.2% of adult daily smokeless tobacco users) (Table 1). National region wise analysis indicates that East India (9.1%) had highest prevalence of hardcore smokeless tobacco use while the North India (1.5%) has the lowest prevalence. The Central and East India accounted for 68.6% of hardcore smokeless tobacco users in India. The higher proportions of daily smokeless tobacco users were identified as hardcore in East India (29.5%) and West India (26.0%). In South India (18.3%) and Central India (18.6%), lower proportions of daily smokers were identified as hardcore.

Characteristics of daily smokeless tobacco users as per component constructs of hardcore use

More than two third of daily smokeless tobacco users (67.8%) had reported nil quit at tempt in the past 12 month preceding the survey (table not given). About 62.6% of daily smokeless tobacco users were neither interested in quitting nor thinking to quit in next 12 months. More than half (54.2%) of the daily users used their first smokeless tobacco within 30 minutes of waking up. About six in seven (86.3%) daily chewers knew or believed that smokeless tobacco use is hazardous.

Distribution of hardcore smokeless tobacco use across various socio demographic characteristics

The distribution of hardcore smokeless tobacco use

Table 1. Distribution of Hardcore Smokeless Tobacco Use Across National Regions of India

National regions of India	Hardcore Chewer	Proportion of adult (≥15 yrs) population	Proportion of daily smokeless tobacco user
North	588,639	1.40%	23.40%
Central	11,896,679	4.60%	18.60%
East	15,226,932	9.10%	29.50%
North East	1,521,822	5.30%	21.80%
West	6,823,729	5.80%	26.00%
South	3,462,013	1.90%	18.30%
All regions (India)	39,519,814	5.00%	23.20%

Table 2. Prevalence of Hardcore Chewing Across Various Socio Demographic Categories

Selected socio demographic variables		Hardcore Chewer	Non Hardcore Chewer
Gender:	Male	23.00%	77.00%
	Female	23.60%	76.40%
Type of residence:	Urban	22.00%	78.00%
	Rural	23.50%	76.50%
Occupation status:	Govt. or Non Govt. Employee	23.70%	76.30%
	Student	16.10%	83.90%
	Self Employed	24.80%	75.20%
	Homemaker	20.60%	79.40%
	Retired or unemployed	22.00%	78.00%
Education Level:	No formal education	25.00%	75.00%
	primary Incomplete	22.90%	77.10%
	Primary but Secondary incomplete	23.00%	77.00%
	Secondary and above	19.00%	81.00%
Age Group: (years)	15-24	16.50%	83.50%
	25-44	22.30%	77.70%
	45-64	27.00%	73.00%
	≥ 65	28.50%	71.50%

Table 3. Multiple Logistic Regression Predicting Hardcore Smokeless Tobacco Use in India

		Adjusted Odds Ratio	95%CI Lower	95%CI Upper	P Value
Age Group (years)	15-24	**			
	25-44	1.3	1.2	1.6	0.001
	45-64	1.6	1.3	1.8	0.001
	≥65	1.5	1.2	1.8	0.001
Gender	Female	**			
	Male	1.1	1	1.2	NS
Type of residence	Rural	**			
	Urban	1.04	0.95	1.14	NS
Occupation	Retired or unemployed	**			
	Employed	1.2	1	1.4	0.027
	Self employed	1.1	1	1.3	NS
	Student	1.2	0.8	1.7	NS
	Home Maker	0.9	0.7	1.1	NS
Education	Secondary and above				
	No formal education	1.4	1.3	1.6	0.001
	Primary Incomplete	1.4	1.2	1.7	0.001
	Primary but less than Secondary	1.2	1.1	1.4	0.003

*NS=Non significant, **Reference category

across various socio demographic characteristics has been enlisted in Table 2. Prevalence of hardcore chewing was slightly higher among female and rural population than males and urban population respectively. The prevalence of hardcore chewing increased with increase in age and decreased with increasing education level. Higher prevalence of hardcore chewing was noted among self employed (24.8%) or employed (23.7%) category.

Multivariate analysis

Above socio-demographic categorical variables were included in the binary logistic regression model to predict hardcore chewing in India. Age, education and employment status were found to be significant predictors of hardcore chewing behaviour. Being older (25+ years) has 1.3-1.6 higher odds of becoming hardcore chewer than 15-24 age groups. Employed chewer had 1.2 time higher odds of becoming hardcore chewer than those were retired or unemployed. Those chewers without any formal education or not completed primary education had higher odds (1.4) of becoming hardcore chewer than those completed higher secondary or higher studies. Those completed primary but not completed secondary had 1.2 times higher odds of becoming hardcore chewer than those completed secondary or higher education.

Discussion

There is little information on hardcore smokeless tobacco use either in India or other countries. This study quantified the prevalence of hardcore smokeless tobacco use in India for the first time. About one fourth adult daily chewers are hardcore by definition using daily use, quit intention, quit attempt, nicotine dependence and knowledge component constructs. GATS-India (2010) report indicates that the number and prevalence rate of smokeless tobacco use is higher than smoking tobacco use. The number of hardcore chewers (39.5 million) is also higher than the number of hardcore smokers (24.3 million) in India (Jena et al., 2012) suggesting need for more emphasis on smokeless tobacco control under the flagship National Tobacco Control Programme.

Low socio economic position was found to be strongly associated with hardcore smoking (Schaap et al., 2008; Lund et al., 2011). In this study, we found higher odds for being a hardcore chewer with lower level of education. This may be due to fact that lower education is associated with lower quitting rate (Kotz et al, 2009; Reid et al, 2010). In contrast to other hardcore smoking studies, this study found that employed chewers have higher odds for being hardcore than unemployed or retired chewers. Repeated exposure to anti-tobacco messages may lead to desensitization of tobacco users leading to increased abstinence in this group (Hyunyi et al., 2007). Cultural acceptability of smokeless tobacco use in India may be a factor associated with its increased use (Reddy et al., 2004), but further research is required to confirm this hypothesis. Higher age has been consistently linked with hardcore smoking. Our study also confirms similar results. This may be partly due to dependence component construct of hardcore smokeless tobacco use which increases with age (Jayakrishnan et al., 2012).

Our data describe the typical hard-core chewer as a user of higher age group, employed and with no or fewer years of education. However, being male, older and not self-employed are significant independent predictors of hardcore smoking in India (Jena et al., 2012). Gender

has little role in hardcore chewing as observed in this study. By showing that the hard-core chewers represent a unique group, this research defines them as chewers who are least likely to quit. This group may represent a special population, for whom tobacco-control and cancer prevention efforts may need to be specifically tailored. Fagerstrom et al. (1996) has suggested more intensive tobacco control interventions to influence hardcore smokers. Same strategy may be applied to address the burden of hardcore chewing and oral cancer incidence in India.

The present study is first of its kind that quantified prevalence of hardcore chewing. With use of 'time to first chew' as a standalone product independent measure of nicotine dependence while defining hardcore chewing, this study represented hardcore use of myriad variety of smokeless tobacco products used in India. Due to large sample size, and use of sample weights, the study is generalizable, which can form the baseline indicators for future evaluation of tobacco control efforts in India. However self reported smoking behaviour, lack of standardized definition for hardcore use and cross sectional nature of the study are the limitations of this study.

In conclusion, a large number of adult Indians (39.5 million) are hardcore chewers who use smokeless tobacco daily just within 30 minutes of waking up, were unable to quit in the past, is still unwilling to quit even if they are aware of serious illness resulting from tobacco use. As the hardcore chewers represent a high risk population prone to tobacco induced diseases and cancers, urgent need for tobacco cessation programme expansion and cancer prevention interventions should be given due importance. As South-East Asian countries like India, where use of myriad variety of tobacco products is the norm, time to first chew should be preferred to define smokeless tobacco dependence in population surveys. The study results also emphasize for the need of standard definition of hardcore tobacco use so that different study results can be compared across the globe. Further longitudinal study is required to predict future tobacco use behaviour among the hardcore users.

References

Augustson EM, Marcus SE (2004). Use of the current population survey to characterize subpopulations of continued smokers: A national perspective on the "hardcore" smoker phenomenon. *Nicotine and Tobacco Res*, **6**, 621-9.

Augustson EM, Barzani D, Rutten LJF, Marcus S (2008). Gender differences among hardcore smokers: an analysis of the tobacco use supplement of the current population survey. *J Women Hlth*, **17**, 1167-73.

Boffetta P, Hecht S, Gray N, Gupta P, Straif K (2008). Smokeless tobacco and cancer. *Lancet Oncol*, **9**, 667-75.

Cohen EJ, McDonald PW, Selby P (2012). Debates-Softening up on the hardening hypothesis. *Tob Control*, **21**, 265-6.

Costa ML, Cohen JE, Chaiton MO, et al (2010). "Hardcore" definitions and their application to a population-based sample of smokers. *Nicotine and Tobacco Res*, **12**, 860-4.

DiClemente CC, Prochaska JO, Fairhurst SK et al (1991). The process of smoking cessation: an analysis of pre-contemplation, contemplation, and preparation stages of change. *J Consult Clin Psychol*, **59**, 295-304.

Dikshit R, Gupta PC, Ramasundarahettige C, et al (2012). Cancer mortality in India: a nationally representative survey. *The Lancet*, **379**, 1807-16.

Emery S, Gilpin EA, Ake C, Farkas AJ, Pierce JP (2000). Characterizing and identifying "hard-core" smokers: Implications for further reducing smoking prevalence. *Am J Public Hlth*, **90**, 387-94.

Fagerstrom K (2003). Time to first cigarette; the best single indicator of tobacco dependence? *Monaldi Arch Chest Dis*, **59**, 91-4.

Fagerstrom KO, Kunze M, Schoberberger R, et al (1996). Nicotine dependence versus smoking prevalence: comparisons among countries and categories of smokers. *Tob Control*, **5**, 52-6.

Ferketich AK, Gallus S, Colombo P, et al (2009). Hardcore smoking among Italian men and women. *Eur J Cancer Prev*, **18**, 100-5.

Gupta PC, Mehta FS, Daftary DK, et al (1980). Incidence rates of oral cancer and natural history of oral precancerous lesions in a 10-year follow-up study of Indian villages. *Commun Dent Oral Epidemiol*, **8**, 283-333.

Gupta PC, Ray CS, Sinha DN, Singh PK (2011). Smokeless tobacco: A major public health problem in the SEA region: A review. *Indian J Public Hlth*, **55**, 199-209.

Hart J, Hyun S (2012). Cancer mortality, state mean elevations, and other selected predictors. *Dose-Response*, **10**, 58-65.

Hyunyi C, Salmon CT (2007). Unintended effects of health communication campaigns. *J Communication*, **57**, 293-317.

Ip DT, Cohen JE, Bondy SJ, et al (2012). Do components of current 'hardcore smoker' definitions predict quitting behaviour? *Addiction*, **7**, 434-40.

Irvin JE, Hendricks PS, Brandon TH (2003). The increasing recalcitrance of smokers in clinical trials II: Pharmacotherapy trials. *Nicotine and Tobacco Res*, **5**, 27-35.

Jarvis MJ, Wardle J, Waller J, Owen L (2003). Prevalence of hardcore smoking in England, and associated attitudes and beliefs: cross sectional study. *Bri Med J*, **326**, 1061.

Jayakrishnan R, Mathew A, Lekshmi K, et al (2012). Assessment of Nicotine Dependence among Smokers in a Selected Rural Population in Kerala, India. *Asian Pac J Cancer Prev*, **13**, 2663-7.

Jena PK, Kishore J (2012). Prevalence and correlates of hardcore smoking in india. research and reviews. *A J Med*, **2**, 16-24.

Kotz D, West R (2009). Explaining the social gradient in smoking cessation: It's not in the trying, but in the succeeding. *Tobacco Control*, **18**, 43-6.

Lichtenstein E, Keutzer CS (1973). Implications of Psychological research for smoking control clinics. *Hlth Service Report*, **99**, 535-40.

Lund M, Lund KE, Kvaavik E (2011). Hardcore smoking in Norway 1996-2009. *Nicotine and Tobacco Res*, **13**, 1132-9.

MacIntosh H, Coleman T (2006). Characteristics and prevalence of hardcore smokers attending UK general practitioners. *BMC Family Practice*, **7**, 24.

Ministry of Health and Family Welfare (2010). Global Adult Smoking Survey (GATS)–India, 2009–10. Ministry of Health and Family Welfare, Govt. of India, New Delhi.

Pierce JP, Farkas AJ, Gilpin EA (1998). Beyond stages of change: the quitting continuum measures progress towards successful smoking cessation. *Addiction*, **92**, 277-86.

Reddy KS, Gupta PC (Editors) (2004). Report on Tobacco Control in India. Ministry of Health and Family Welfare, Government of India, New Delhi.

Reid JM, Hammond DP, Driezen PM (2010). Socio-economic status and smoking in Canada, 1999–2006: has there been any progress on disparities in tobacco use? *Canadian J*

Public Hlth, **101**, 73.
Schaap MM, van Agt HM, Kunst AE (2008). Identification of socioeconomic groups at increased risk for smoking in European countries: Looking beyond educational level. *Nicotine and Tobacco Res*, **10**, 359-69.
Schmahl D, Lichtenstein E, Harris DE (1972). Successful treatment of habitual smokers with warm, smoky air, and rapid smoking. *J Consult Clin Psychol*, **38**, 105-11.
Velicer WF, Rossi JS, Prochaska JO, DiClemente CC (1996). A criterion measurement model for health behavior change. *Addictive Behaviors*, **21**, 555-84.
Warner KE, Burns DM (2003). Hardening and the hard-core smoker: Concepts, evidence, and implications. *Nicotine and Tobacco Res*, **5**, 37-48.