RESEARCH ARTICLE

Burden of Smoked and Smokeless Tobacco Consumption in India - Results from the Global adult Tobacco Survey India (GATS-India)- 2009-2010

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Abstract

<u>Background</u>: The Global Adult Tobacco Survey (GATS) was carried out for systematically monitoring tobacco use and for tracking key tobacco control indicators. <u>Materials and Methods</u>: A total of 70,802 households, including 42,647 in rural areas and 28,155 in urban areas, were covered with a three stage sampling design. Data were collected on sociodemographic characteristics, knowledge, attitude and practices of tobacco consumption.<u>Results</u>: GATS-India highlighted that total tobacco use among its residents is overall 34.6%, varying for males (47.9%) and females (20.7%). The rural areas of the country exhibit comparatively higher prevalence rates (38.4%) in comparison to urban areas (25.3%). Overall, Khaini, a smokeless tobacco product (12.0%), is the most popular form of tobacco use among males and females, followed by bidi smoking (9.0%). <u>Conclusion</u>: Results of GATS data can be used as baseline for evaluation of new tobacco control approaches in India integrating culturally acceptable and cost effective measures.

Keywords: Tobacco - smoking - smokeless tobacco - prevalence - consumption patterns

Introduction

Tobacco is the most easily accessible legally available addictive substance which contributes significantly to premature death and long term suffering, being a major risk factor for cardiovascular diseases, chronic obstructive pulmonary diseases, cancers, reproductive outcomes and oral diseases (Sauvaget et al., 2008; Zarocotas, 2011; Sarkar and Reddy, 2012).In addition, one third of the global burden of oral cancer is predominantly attributed to high prevalence of tobacco consumption within India (Byakodi et al., 2012; Gupta et al., 2013). The Ministry of Health and Family Welfare, Government of India, designated the International Institute for Population Sciences (IIPS), Mumbai, as the nodal agency for conducting GATS in India in 2009-2010 with technical assistance from Centers for Disease Control and Prevention, World Health Organization, the Johns Hopkins Bloomberg School of Public Health and Research Triangle Institute International (GATS-India, 2009). It was a representative household survey of all non institutionalized men and women above the age of 15years and was carried out to produce internationally comparable data on tobacco use and other tobacco control indicators. It used a standardized questionnaire, sample design, data collection and management procedures across the nation and its regions (North, West, East, South, Central and North-East) producing estimates by residence (urban and rural) and gender.

Patterns of tobacco use in India

Tobacco is consumed in myriad forms in India which includes smoking as well as smokeless tobacco (Rani et al., 2003; Mathur and Shah, 2011). Bidi is the most popular prevalent smoking product consumed in rural areas (John, 2005; Gupta et al., 2010) in comparison to cigarette smoking more preferably used in urban areas (Gupta et al., 2010). Hookah, chuttas, dhumti, chillum, cigars, cheroots and pipes are some other forms of tobacco smoking in different parts of India (Jindal et al., 2006). Dry tobacco areca nut preparations, such as paan masala, gutkha and mawa are also popular in many parts of India (Rooban et al., 2010). Furthermore, oral tobacco such as mishri, gul, gudakhu are widely used as topical applications on teeth and gums (Rani et al., 2003).

Smokeless tobacco is consumed predominantly by chewing in form of pan (piper betel leaf filled with sliced areca nut, lime, catechu, and other spices chewed with or without tobacco), pan-masala or gutkha (a chewable tobacco containing areca nut), and mishri (a powdered tobacco rubbed on the gums as toothpaste) (Gupta and Ray, 2003; Dobe et al., 2006). Use of smokeless tobacco is a socially acceptable addiction especially in Eastern, Northern and North- eastern parts of the country

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(Reddy and Gupta, 2004). Table 1 illustrates the findings of nationwide surveys on tobacco use among Indian residents in brief and explains the limited data on tobacco consumption available based on the information collected in the past as a part of National sample surveys (NSS) and National.

Most of the past studies on tobacco use prevalence have either been based on localized studies with an urban bias or based on non-representative sample surveys with sociodemographic predictors of tobacco smoking and chewing being poorly understood (Rani et al., 2003). Moreover, prevalence estimates done in the past in India remain non-representative and quite speculative.

This paper is based on data available from the Global Adult Tobacco Survey-India Report (GATS-India, 2009). The findings of the study, including the demographic trends as well as socioeconomic determinants, will assist in estimating and monitoring burden of tobacco use prevalence and further aid policy makers to track and formulate tobacco control strategies.

Materials and Methods

Data and methods

A nationally representative probability sample has been used in this survey to provide estimates of internationally comparable data on tobacco use and other tobacco control indicators using a standardized questionnaire, sampling design, data collection and management procedures across all geographical regions for both urban, rural areas including state estimates by gender.

Study population

It included only household members who were Indian citizens, aged 15 years and above, living in their primary residence before the survey date and voluntarily participated in the survey after signing the consent form with right to refuse to answer any question without providing reason. The institutional population comprising of those living in collective places like student's dormitories, hospitals, hotels, prisons, military barracks, etc were excluded from the study.

Sampling design

GATS was conducted in all 29 Indian states (including Delhi) and two Union Territories- Chandigarh and Puducherry, covering about 99.92% of the total population inclusive of both rural and urban areas according to 2001 census. In urban areas, three stage sampling was adopted for the selection of households. The primary sampling units were the city wards, secondary sampling units were the census enumeration blocks and tertiary sampling unit were the households. At first stage, the list of all the wards from all cities and towns of the State/UT formed the urban sampling frame from which a required sample of wards, i.e., primary sampling units , was selected using probability proportional to size sampling. At second stage, a list of all census enumeration blocks (CEBs) in every selected ward formed the sampling frame from which one CEB was selected by proportion of population size (PPS) from each selected ward. At third stage, a list of all the residential households in each selected CEB formed the sampling frame from which a sample of required number of households was selected.

In rural areas, two-stage sampling was adopted for the selection of households. The primary sampling units were the villages and the secondary sampling units were the households. All the villages are first stratified into different strata by using geographical regions, and further stratified by village size, proportion of scheduled caste, scheduled tribe population and female literacy. At the first stage, the list of all the villages in a state/UT formed the sampling frame. The required numbers of villages, i.e. (PSUs), were selected according to the proportion of population size sampling, within each stratum. At the second stage, a list of all the residential households in each selected village formed the sampling frame from which a sample of required number of households was selected.

In large villages a household listing operation carried out in each sample area provided the necessary frame for selecting households at the second stage in rural areas and at the third stage in urban areas. The household listing operation involved, preparing up-to-date location and layout sketch maps, assigning a GATS-India specific number to each structure, recording addresses of the structures, identifying residential structures, and then listing the names of the head of the households.

Further, systematic sampling was done to select the required number of households. Half of the selected households were randomly assigned to be 'male' households where only the males were interviewed and the other half were assigned to be 'female' households where only females were interviewed. At the last stage, one individual was randomly picked from each selected

Table 1. Prevalence of Tobacco Use in India (Gupta and Ray, 2007)

	Survey	NSS 52nd Round	NFHS-2	NHSDAA	NFHS-3	GATS	Sample Registration Survey
	Year	1995-1996	1998-1999	2002	2005-2006	2009-2010	2010
Male	Tobacco users	51.3	46.5	61	57.6	47.9	NA
	Smokers	35.3	29.3	NA	33.4	15	26.1
	Users of smokeless tobacco	24	28.1	NA	36.4	23.6	NA
Female	Tobacco users	10.3	13.8	NA	10.8	20.3	NA
	Smokers	2.6	2.4	NA	1.4	1.9	2.3
	Users of smokeless tobacco	8.6	12	NA	8.4	17.3	NA

*NSS: National Sample Survey. NFHS: National Family Health Survey. NHSDAA: National Household Survey of Drugs and Alcohol. SRS: Sample Registration System. GATS: Global Adult Tobacco Survey

household by elementary random sampling.

Sample size

Following the standard guidelines of GATS Sample Design Manual, the initial target sample size for each region was fixed at 8,000 households. At State/UT level, a minimum sample size of 2,000 for larger states (1,000 for each male and female interview) and 1,500 for smaller-size states from North-East region was allocated. The overall sample size of 8,000 at national level or 2,000 for each of the male and female groups by the cross of urban/rural areas was determined with the assumption that, i) the estimates computed at the national level should have a margin of error of 3 percentage points or less for tobacco use rates of 40 percent with 95 percent confidence and ii) since a multi-stage design was employed, it should compensate for an increase in the variance to the extent of having a design effect of 2.00. The total target sample size at the national level was 70,802 households, including 42,647 in rural areas and 28,155 in urban areas. The sample data was weighted to improve representativeness of the sample in terms of size, distribution and characteristics of the study population. 30 households from each primary sampling unit were selected from both rural and urban areas. The overall response rate was 91.8% including both at the household and individual level.

Questionnaires

Pretested household and individual questionnaires in English, further back translated into 19 Indian languages, were used to collect the data. The household questionnaire was administered to the head of the household or any adult member in the absence of head. For all listed household members, basic information on age and sex along with number of users of smoked and smokeless tobacco was collected.

The individual questionnaire was administered to individual age 15 years and above, selected randomly for the interview through handheld machines (portable hand held computers used for electronic data collection). Consent was taken from all the participants and information was collected on demographic and socioeconomic determinants such as age, sex, education, occupation and possession of household items. Explicit information was also registered on use and types of smoked and smokeless tobacco, second hand smoke, cessation, economics, role of media and knowledge, attitude and practices of the tobacco consumers along with information on initiation of age for the use of tobacco.

Results

Prevalence of tobacco use in India

Overall: Overall prevalence of tobacco use is illustrated in the Figure 1. More than one –third (34.6%) of Indians use tobacco in some form: smoking, chewing, application to teeth and gums or sniffing. Among these tobacco users, 20.6% consumed only smokeless tobacco, 8.7% smoked only, and 5.3% used both smoked as well as smokeless tobacco.

Area of residence: About two in five Indian residents from rural areas (38.4%) use tobacco in some form or the other as compared to one in four (25.3%) from urban areas. In rural areas, 9.1% smoked only, 23.3% consumed only smokeless tobacco and 6.0% both smoked and consumed smokeless tobacco. In urban areas, 7.7% smoked only, 14.1% consumed only smokeless tobacco and 3.6% both smoked and consumed smokeless tobacco.

Gender differences: The proportion of males consuming tobacco in any form was 47.9% as compared to only 20.3% amongst females. Tobacco consumption in its all forms was observed to be higher in rural areas (52.3%) as compared to urban areas (37.5%). Similarly, females from rural areas consumed more tobacco (23.7%) in contrast to urban areas (11.8%). Nonetheless, prevalence of smokeless tobacco use was much higher amongst females (10.7% in urban areas and 20.0% in rural areas) as compared to smoking (0.7% in urban areas and 2.3% in rural areas). Figure 2 illustrates the prevalance of current tobacco use by its pattern among males and females.
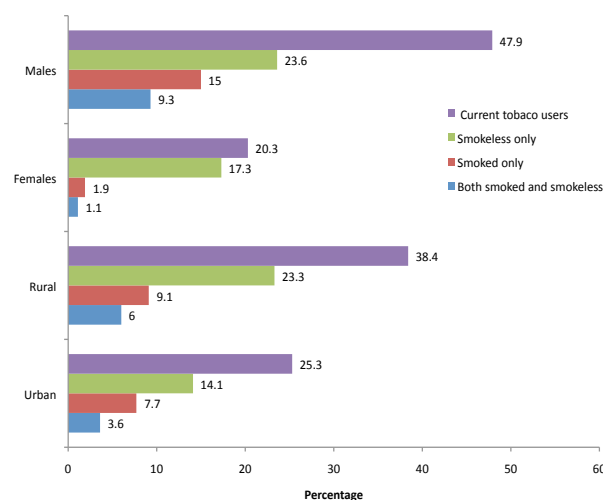

Figure 1. Prevalence of Current Tobacco Use by its Pattern (% distribution). "Current use" refers to daily and less than daily use. "Adults" refers to persons age 15 years and older. Data have been weighted to be nationally representative of all non-institutionalized men and women age 15 years and older. Percentages reflect the prevalence of each indicator in each group, not the distribution across groups
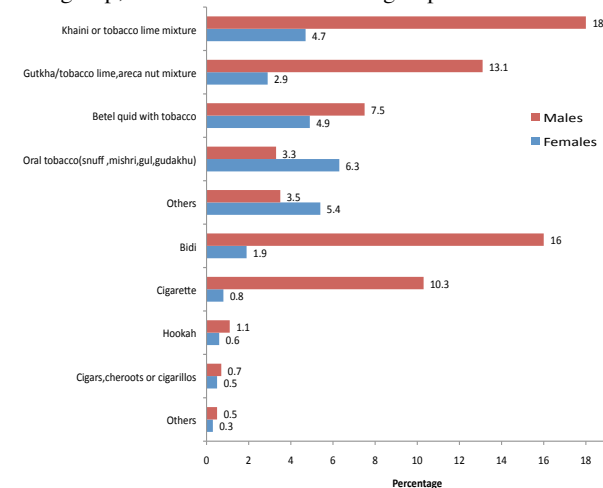

Figure 2. Prevalance of Smoking and Smokeless Tobacco among Adults (% distribution)
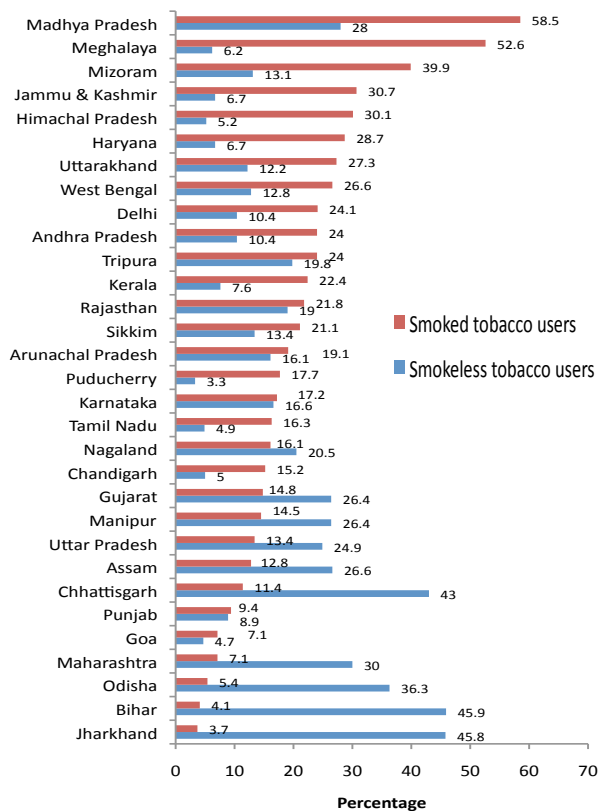
Figure 3 — Prevalence of Smokeless and Smoked Tobacco users among Males (Percentage)

State	Smoked tobacco users	Smokeless tobacco users
Madhya Pradesh	58.5	28
Meghalaya	52.6	6.2
Mizoram	39.9	13.1
Jammu & Kashmir	30.7	6.7
Himachal Pradesh	30.1	5.2
Haryana	28.7	6.7
Uttarakhand	27.3	12.2
West Bengal	26.6	12.8
Delhi	24.1	10.4
Andhra Pradesh	24	10.4
Tripura	24	19.8
Kerala	22.4	7.6
Rajasthan	21.8	19
Sikkim	21.1	13.4
Arunachal Pradesh	19.1	16.1
Puducherry	17.7	3.3
Karnataka	17.2	16.6
Tamil Nadu	16.3	4.9
Nagaland	20.5	16.1
Chandigarh	15.2	5
Gujarat	26.4	14.8
Manipur	26.4	14.5
Uttar Pradesh	24.9	13.4
Assam	26.6	12.8
Chhattisgarh	43	11.4
Punjab	9.4	8.9
Goa	7.1	4.7
Maharashtra	30	7.1
Odisha	36.3	5.4
Bihar	45.9	4.1
Jharkhand	45.8	3.7

Figure 3. Prevalence of Smokeless and Smoked Tobacco users among Males

Figure 4 — Prevalence of Smokeless and Smoked Tobacco users among Females (Percentage)

State	Smokeless tobacco	Smoked tobacco
Mizoram	42.6	12.5
Chhattisgarh	37.9	0
Tripura	37.7	4.6
Odisha	35.5	0.7
Jharkhand	34.9	0.5
Meghalaya	33.1	0.7
Bihar	32.3	5.4
Nagaland	30.6	6.4
Manipur	30.4	4.8
Assam	23.1	0.1
Arunachal Pradesh	20.5	4
Maharashtra	18.8	0
Sikkim	17.3	9.9
West Bengal	17.3	1.5
Madhya Pradesh	16.7	0.5
Karnataka	16	0.2
Andhra Pradesh	13.1	4.3
Uttar Pradesh	12.4	3.3
Gujarat	9.9	0.3
Kerala	8.5	0
Tamil Nadu	8.3	0
Rajasthan	7.6	4.5
Puducherry	6.3	0
Goa	3.2	0.9
Delhi	2.6	0.9
Jammu & Kashmir	6.2	2.5
Uttarakhand	3.8	1.9
Haryana	4.3	1.1
Chandigarh	1	0.6
Himachal Pradesh	3.1	0.6
Punjab	0.4	0.2

Figure 4. Prevalence of Smokeless and Smoked Tobacco users among Females

State and regional level variation

Figures 3 and 4 show a wide range of gender difference in prevalance of tobacco use in all its forms across the country. Males and females from the North East and Central regions of the country exhibt the maximum prevalence of tobacco use in its various forms.

The Eastern region shows the highest prevalence of tobacco use, i.e. 59% among males and 31% among females in contrast to Northern part of the country which exhibits the lowest prevalence of tobacco use, i.e 32% for males and 4% for females. The state level variation among males ranges from 73% in Mizoram and Meghalaya to 13% in Goa. The prevalence of tobacco use among females also varies as its the highest in Mozoram with 62% in contrast to 1% in Punjab. Similarly, Chandigarh, Delhi, Himachal Pradesh and Goa less than 5% of adult females use tobacco in any form (Kaur and Jain, 2011).

Literacy: Overall, tobacco use prevalence was 44.4% among population with no formal education and 20.7% among population with secondary or more education. Prevalence of tobacco use decreased from 68% among males and 32.7% among females with no formal education to 30.5% among males and only 3.6% among females with secondary or more education respectively.

Employment: Self employed (48.9%) closely followed by retired and unemployed (46.8%) were recorded as much more common tobacco users in comparision with the students (7.5%).

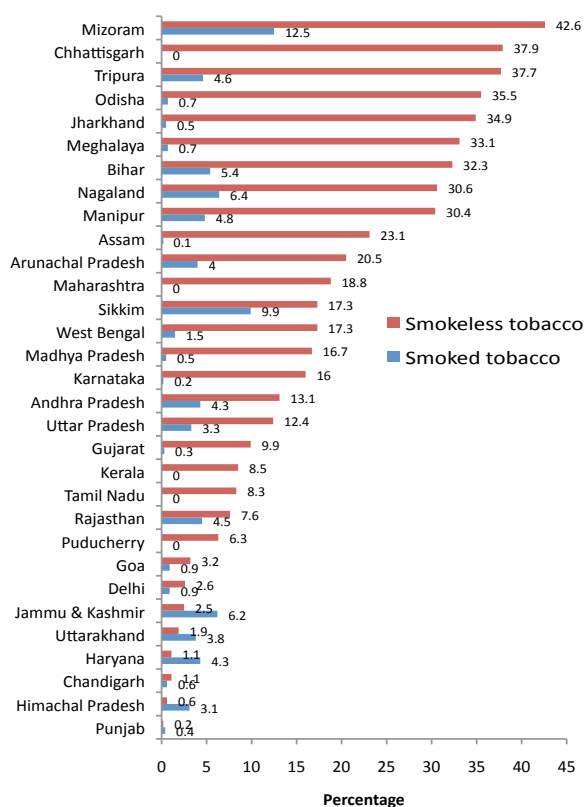Age (Demographics): The prevalence of tobacco use is the least in the youngest age group surveyed (15-24 years) at 18.4% and the highest in 65 and above age group at 47.8%. Amogst males, the prevalence increases from the least in age group of 15-24 years (27.4%) to 61.1% in the age group of 45 to 64 years before decreasing to 55.7% in the 65 and above age group. Amongst females, the prevalence of tobacco use increases with age from 8% at age 15-24 years to 40% at age group of 65 and above. The proportion of males who use both forms of smoking as well as smokeless tobacco is highest in the age group 25-44 years (12%) and among females, this proportion is highest among those, age 65 years and above (4%). Figure 5 and 6 illustrate the prevalence of tobacco use in Indian residents age 15 years and above in various parts of the country.

Consumption pattern of smoking and smokeless tobacco products

Prevalence of smokeless tobacco use (26%) is significantly more than that of smoking (14%). Amongst the tobacco users, 8.7% smoked only, 20.6% consumed only smokeless tobacco and 5.3% both smoked as well as consumed smokeless tobacco. Distributions of consumption of smokeless and smoked tobaccos across India are illustrated in Figures 5 and 6.

"Khaini" (Tobacco lime mixture) is the most commonly used tobacco product (Overall-12%, Males-18%, Females-5%) followed by bidi (Overall-9%, Males-13%, Females-2%).

Prevalence of smokeless tobacco: "Khaini" is the most commonly used smokeless tobacco product (12%)
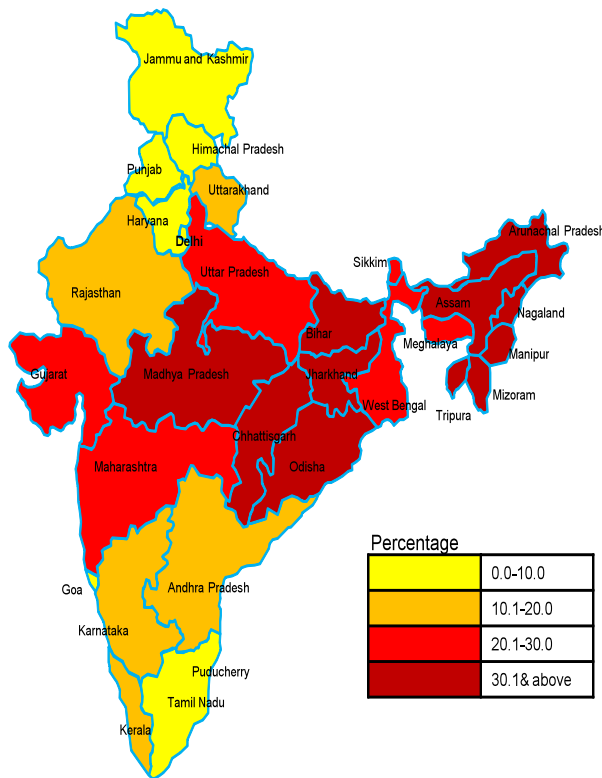
Figure 5. Use of Smokeless Tobacco in India (%Distribution of Adults age 15 years & Above)

Figure 6. Use of Smoked Tobacco in India (%Distribution of Adults age 15 years & Above)

followed by "gutkha" at 8%, betel quid at 6% and 5% using "other" tobacco products like mishri, gul and gudakhu. Prevalence of all the smokeless tobacco products is lower among females as compared to males except in "other" tobacco products which are more commonly used by females. Prevalence of almost all smokeless tobacco products has been found to decrease with improving education level both among males and females.

Prevalence of tobacco smoking: Fourteen percent of all Indian residents smoke tobacco, with 76% out of these being daily smokers. Prevalence of smoking is much lesser among females at 3% as compared to 24% among males. Also, smoking prevalence is higher in rural areas (15%) as compared to urban areas (11%).

The most commonly smoked tobacco product is Bidi (9%) followed by cigarette (6%), hookah (1%) and less than 1% smoke cigars and cheroots. Amongst all smoking products, the prevalence of cigarette smoking is higher in urban areas (13% among males) as compared to rural areas (9% among males). Prevalence of use of all other smoking products is higher in rural areas- 19% and 1% of males smoke bidis and hookah respectively in rural areas as compared to 10% and 0.4% in urban areas

Discussion

The GATS-India study is unique in the fact that it has estimated globally accepted key tobacco (smoking and smokeless) indicators for the first time in India using standardised techniques of Global Adult Tobacco Survey. The studies done in the past either collected data from
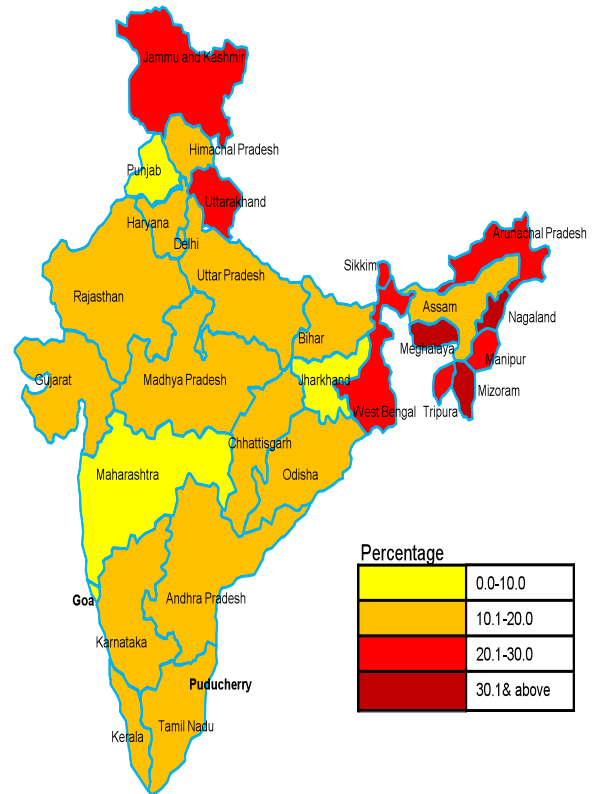
very small geographical regions which were not nationally representative or the national level studies (e.g. NFHS-2 survey) which collected multiple demographic indicators with only limited focus on tobacco consumption. Hence, it was difficult to validate the results of these past studies. The findings of this study including the demographic trends as well as socioeconomic determinants are likely to assist the policy makers in estimating and monitoring burden of tobacco use prevalence as well as formulate tobacco control strategies (Prabhakar et al., 2012).

The prevalence estimated by this study is significantly higher than estimated in the past studies (including NSS and NFHS). Overall prevalence was estimated to be 30% in NFHS study whereas it has been estimated at 35% in GATS-India. The demographic and socioeconomic characteristics of tobacco use prevalence are also significantly different as compared to past studies. Table1 clearly illustrates the comparison of tobacco use prevalence estimates in the past studies and their comparison with GATS-India results. The most likely reasons for these significant differences are differences in methodology of various studies as well as the population base of the studies with GATS- India having the largest and most nationally representative population base amongst all the studies considered. In addition to population base, even data collection techniques were different in these surveys as compared to data collection by hand held devices and tobacco use centric questionnaires used in GATS- India.

GATS-India used individual self reporting of tobacco use whereas NFHS-2 and NSS simply estimated the tobacco use prevalence by asking a household informant about use of tobacco by other household members.

However, this household informant may not be aware of the use of tobacco use by other household members leading to lower prevalence reporting. The questionnaire used in GATS-India did not use any proxy reporting of tobacco use to avoid potential under-reporting of prevalence. The phrasing of questions about tobacco consumption ensured that interpretation of tobacco products was not left to the informant and details were recorded through leading questions.

The age adjusted prevalence rates in GATS-India showed that more than one -third (35%) of Indian residents use tobacco in some form: smoking, chewing, application to teeth and gums or sniffing. The prevalence is estimated to be much higher at 38% in rural areas as compared to 25% in urban areas with male predominance (as in the past studies). The NFHS Survey had estimated the national tobacco use prevalence at 30% with male predominance (46.5%). Surprisingly, consumption of tobacco in both forms, smoking as well as smokeless, is highest in the group 65 years and above amongst females (4%) and in the age group of 25-44 years amongst males (12%).

GATS- India clearly establishes that the public health problem posed by smokeless tobacco is significantly more than smoking, with 'khaini' being the most commonly used tobacco at a much higher prevalence rate than 'bidi' smoking. Mulitple tobacco products consumers also are a very large proportion at 5.3% of population and pose a special challenge in the form of more difficulty in quitting, longer durations and higher doses of tobacco use and an increased likelihood of experiencing tobacco-related morbidity and mortality. Policy makers need to be aware that tobacco industry may promote smokeless tobacco as an alternative to smoking, especially in place where smoke-free laws are strictly enforced. Anti-tobacco policies and other interventions that prevent initiation and encourage cessation of both tobacco products are needed, particularly in states with a high prevalence of smokeless tobacco use and cigarette smoking. The most worrying aspect is the common social acceptance and even endorsement of smokeless tobacco products as compared to relative ostracization of tobacco smoking.

There is significant variation across different states regarding both smoking as well as consuming smokeless tobacco. This possibly reflects the distinct regional, cultural, religious and social patterns regarding tobacco consumption. For example, Punjab has a dominant population of Sikhs (Sikhism prohibits consumption of tobacco) leading to one of the lowest tobacco consumption levels. Also, the tobacco chewing is more prevalent in the Central, Eastern and Northeastern states whereas smoking is relatively more common in Northern states. These interstate and regional differences need further exploration regarding their causation as they may have implications for public health policies related to tobacco control and their relevance in local social, cultural and religious patterns of tobacco use.

Tobacco use has been found inversely proportional to income levels and literacy with highest tobacco use found amongst the poorest and least educated. This is very much comparable to findings of previous studies in India as well as other countries (Sansone et al., 2012).

Although the reason for this relationship is not well established, it can be postulated that relatively poor and less educated population have more exposure to conditions predisposing them to tobacco use, have lessser awareness of the hazards of tobacco use and have higher risk taking behaviour (Sansone et al., 2012). These findings suggest that the disporportionately high burden of tobacco use in disadvantaged groups will necessitate use of different strategies for tobacco control in different socioeconomic and cultural groups as effectiveness as well as access to various programmes across these groups is likely to be variable.

Trends of tobacco consumption over the years could not be assessed due to the nature of data. However, the prevalence of tobacco use was found to be the lowest in the younger age groups (15-24 years) with tobacco use increasing with age. This is possibly partly due to actual increase in tobacco use prevalence with age and partly due to under-reporting in the younger age groups. This has policy implications that tobacco control programmes need to focus not just on youth to prevent initiation into tobacco use but also on the older age groups.

In conclusion, considering overall high prevalence, significant mortality, morbidity and huge burden of health cost due to tobacco use in India, there is a need to develop intersectoral, evidence based, culturally acceptable cost effective interventions for control of smoking and smokeless tobacco use (Murthy and Saddichha, 2010).

Effective tobacco control strategies need to be based on intersectoral approach with various ministries, health departments, panchayti raj Institutions, public health institutions, civil society groups etc. Tobacco control initiatives should be integrated with National Health Programmes and National Rural Health Mission. There should be strict enforcement of laws to prevent minors from accessing tobacco products (Majra and Gur, 2009; Kaur and Jain, 2011). There should be planning and formulation of supply reduction strategies for tobacco like promoting alternate crops to tobacco.

Raising taxes on all forms of tobacco will definitely reduce the affordability and dissuade current tobacco users from continuing use (Kaur and Jain, 2011; Chaloupka 2013). Health warnings on tobacco packages should be intense enough to create their impact (Kaur and Jain, 2011). Both medical and dental health professionals should be sensitized and trained to help the smokers quit their habits (Maseeh and Kwatra, 2005; Majra and Gur, 2009; Vanka et al., 2009). Nonetheless, active tobacco cessation services in the (Maseeh and Kwatra, 2005; Kishore et al., 2013) form of tobacco cessation centers under both government and private sectors (Mehrotra et al., 2010).

Policy planning, health education programmes, media messages and other interventions need to be directed not only against smoking but a renewed focus needs to be directed towards equally harmful but socially more accepted smokeless tobacco products which are more commonly used as compared to smoking (Koh and Sebelius, 2013).

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