RESEARCH ARTICLE

Global Adult Tobacco Survey (GATS): A Case for Change in Definition, Analysis and Interpretation of "Cigarettes" and "Cigarettes Per Day" in Completed and Future Surveys

Pratap Kumar Jena[1]*, Jugal Kishore[2], Bidyut K Sarkar[3]

Abstract

Background: The Global Adult Tobacco Survey has 15 key indicators, cigarettes smoked per day (CPD) among daily smokers being one of them. The first wave of GATS in 14 countries indicated that mean CPD use is higher in women than men in India only, which is contrary to the current understanding of tobacco use globally. This study was undertaken to understand the unusual findings for mean CPD use in the GATS-India survey. Materials and Methods: Items B06a and B06b of the GATS India survey questionnaire that collected information on daily consumption of manufactured and rolled cigarettes were analyzed using SPSS software. Exclusive users were identified from these items after excluding the concurrent users of other tobacco products. Cigarette type, exclusive use and gender stratified analyses were made. Consumption of different types of cigarettes among the mixed users of manufactured and rolled cigarettes were correlated. Results: Higher mean number of CPD use among male daily-smokers was observed than their female counterparts in product specific analysis. Mean CPD as per GATS cigarette definition was higher in males than females for exclusive users but a reverse trend was observed in case of non-exclusive users. Use of manufactured cigarettes increased with increase in use of rolled cigarette among the mixed users and around half of these users reported equal CPD frequency for the both types of cigarettes. Conclusions: The anomaly in mean CPD estimate in GATS-India data was due to inclusion of two heterogeneous products to define cigarettes, variation in cigarette product specific user proportions contributing to the average and non-exclusive concurrent use of other tobacco products. The consumption pattern of cigarettes among the mixed users highlights bias in CPD reporting. Definition, analysis and interpretation of 'cigarettes per day' in the GATS India survey need to be improved by redefining cigarettes and making product specific analyses.

Keywords: Global Adult Tobacco Survey (GATS) - India - cigarettes per day - nicotine dependence - rolled cigarettes

Asian Pacific J Cancer Prev, **14 (5)**, 3299-3304

Introduction

The global tobacco surveillance system (GTSS) has been initiated to monitor the tobacco epidemic and tobacco control interventions. The global adult tobacco survey (GATS), a part of GTSS, is a nationally representative household survey that monitors tobacco use among adults aged 15 years and older with 15 key indicators (Giovino et al., 2012a). The survey has been acclaimed as an internationally comparable tobacco surveillance system and could help in evidence based tobacco control measures (Koplan et al., 2012). Mean number of cigarettes smoked per day (CPD) among the daily cigarette smokers is one of the key GATS indicators.

Number of cigarettes smoked per day (CPD) is a classical measure of cigarette dependence (Dawe et al., 2002) and reflects intensity or heaviness of smoking (IARC, 2008). This measure is important as CPD use is inversely related to ability to quit tobacco (Hyland et al., 2004) and is directly proportional to the probability of developing a tobacco-attributable disease (USDHHS, 2004) and mortality (Doll et al., 2004). Further smoking cessation requires CPD assessment for treatment selection (West et al., 2000) and nicotine gum prescription (USDHHS, 2008). CPD use decreases following the implementation of smoke-free policies (Fichtenberg et al., 2002), price or tax increase (Warner, 2006) and other tobacco control interventions (Manley et al., 1997). CPD use is also product specific and varies across culture (Fagerstrom, 2003; Fagerstrom et al., 2012a). As CPD

*[1]Project STEPS, Public Health Foundation of India, New Delhi, India and Heath Systems Research India Initiative, Bangalore, [2]Department of Community Medicine, Maulana Azad Medical College, [3]Department of Epidemiology and Public Health, University College London (UCL), U.K. and Public Health Foundation of India (PHFI), PHD House, Siri Fort Institutional Area, New Delhi, India *For correspondence: drpratapjena@gmail.com, pratap.jena@phfi.org*

assessment is vital for tobacco cessation planning and tobacco control evaluation, reliable and valid product specific estimation of CPD use is essential.

As per first wave of GATS survey in 14 countries, mean CPD use among daily cigarette smokers is higher in male than their female counterparts except in India (Giovino et al., 2012a). This seems to be intuitively incorrect and contrary to existing literature. Earlier reports have consistently been found that women smoke less CPD than men (Fagerstrom, 2003; CDC, 2012; Young et al., 2012). International Agency for Research in Cancer- IARC (2008) review on 'measuring tobacco use behaviour' suggests that in cultures that consider smoking among women as socially unacceptable, misclassification of use as non use, supposed to be more common. This is particularly important for Indian context and may result in higher under reporting from Indian women respondents. The finding of Giovinio et al. (2012a) seems to be against the established norms. Therefore this study was undertaken to investigate and understand the indicator of mean cigarettes smoked per day (CPD) in India providing unusual findings in GATS India survey. The objective of this study is to review and reanalyze the 'mean CPD use' indicator in GATS-India survey and discuss its implication.

Materials and Methods

GATS India is a nationally representative survey of adults of ≥15 years old and designed to produce stratified estimates of tobacco use prevalence by gender, residence and state (GATS-India Report, 2010). Primary data of GATS-India survey (2009-2010) is available in public domain by CDC, Atlanta. The GATS survey collects information on use of various smoking products and its frequency. Items B06a (On average, how many manufactured cigarettes do you currently smoke per day?) and B06b (On average, how many rolled tobacco in paper leaf do you currently smoke per day?) of GATS India survey questionnaire collects information on cigarette smoked per day among daily smokers. The data recorded against these items do not exclude concurrent use of other tobacco product(s), which could actually affect the CPD frequency. Hence the daily cigarette smokers thus captured through items B06a and B06b are non exclusive users. Using GATS defined syntax (GTSS, 2009) Giovino et al (2012) and GATS-India reported mean CPD among these non exclusive daily cigarette smokers. Above study/reports have defined cigarette users as users of manufactured and/or rolled cigarettes.

In order to circumvent the effect of nicotine administration by the concurrent use of other tobacco product(s), mean CPD for exclusive cigarette users after excluding concurrent use of other tobacco product(s) is also essential. In this study 'exclusive user' is defined as user of only manufactured and/or rolled cigarette but not any other tobacco products. The sex stratified mean CPD was then estimated for both the exclusive and non exclusive users using GATS sample weight.

When manufactured and rolled cigarette is used concurrently, economic consideration would influence more preference of rolled cigarette over manufactured one. To examine such hypothesis, mixed users are examined considering as GATS items as such (non exclusive use) and as per exclusive use definition given above. A correlation between manufactured and rolled cigarette consumption by mixed users. As a non random sub sample was used for analysis of cigarette use behaviour within the same individuals, GATS weight was not applied in this analysis.

Results

Out of 69,296 individuals' surveyed 3,411 (4.92%) adults reported use of manufactured cigarette (non exclusive use) and among them 1447 (42.42%) were users of only manufactured or rolled cigarette (exclusive use) users. Similarly there were 1,144 (1.65%) adults reported rolled cigarette use and among them 399 (34.88%) were exclusive users. Male always outnumbered females in using cigarette products irrespective of exclusive or non exclusive use status. Table 1 enlists 'exclusive' and 'non exclusive' user by cigarette product with their mean CPD frequency. These figures suggest high prevalence of multiple tobacco product use in India. This concurrent use of multiple forms of tobacco product was more common among females than males. Additionally more females used rolled cigarette than manufactured one. A higher proportion of female cigarette users were found to be mixed user of rolled and manufactured cigarette than their male counterparts considering non exclusive use but reverse trend was found when exclusive use was considered.

Table 1. Mean Number of Cigarette Sticks Smoked Per Day: Product Specific Analysis from GATS Data

Users		Use of different types of cigarette products											
		Use of mC (A)		p value	Use of rC (B)		p value	Mixed use of mC and rC (A∩B)		p value	Use of cigarette mC and/or rC (A∪B)		p value
		N	Av		N	Av		N	Av		N	Av	
GATS defined Non Exclusive User	Male	3227	5.6	<0.001	887	6.7	<0.001	320	12.4	<0.001	3794	6.1	<0.001
	Female	184	4.9		257	4.5		90	9.6		351	7.0	
	All	3411	5.5		1144	6.0		410	11.2		4145	6.2	
Exclusive user	Male	1419	6.2	<0.001	341	6.7	<0.001	72	11.9	<0.001*	1688	6.5	<0.001
	Female	28	2.6		58	3.7		3	27.9*		83	3.6	
	All	1447	6.2		399	5.7		75	12.1		1771	6.3	

*Estimates are based on original sample less than 25. and hence not interpretable. Figures under column 'N' represents un-weighted sample frequency and under column 'Av' represent weighted mean number cigarettes used per day (CPD). rC=Rolled cigarette, mC=Manufactured Cigarette. A=Set A, B=Set B, A∩B=Set A conjunction or intersection set B, A∪B= Set A union Set B as used in mathematical logic. P Value means 2 tailed significant of independent 't' test to compare difference between male and female users. Source: GATS-India Survey (2009-10) data available in public domain

Mean number of CPD use among male daily smoker was always higher than their female counterparts, when usages of manufactured and rolled cigarettes were considered separately (i.e. individual product specific analysis). This is true for both exclusive and non exclusive cigarette use analysis. However when use of both type cigarettes was considered concurrently (as in GATS definition), the mean number of cigarettes used per day among female smokers (7) was higher than their male (6.1) counterparts in non-exclusive (GATS) analysis but reverse finding (Male - 6.5, Female - 3.6) was observed in exclusive cigarette use analysis. As far as the mean CPD use among the mixed users was concerned, male had higher average than their female counterparts in non exclusive use analysis. However exclusive use analysis is not interpretable due to small original sample size. Considering the overall exclusive and non exclusive use analysis, mean CPD use among non exclusive users were found to be lower than exclusive users of manufactured cigarette, mixed users of cigarette and GATS defined cigarette users but reverse trend was observed in case of rolled cigarette use.

Table 2 enlists correlation coefficient between manufactured and rolled cigarette use among those individuals who reported mixed use of both the manufactured and rolled cigarette concurrently. The Pearson Correlation Coefficient was estimated to be positive, stronger and significant ($p<0.001$) for both male and female users in case of non exclusive use analysis indicating increase in use of manufactured cigarette along with increase in use of rolled cigarette in case of non exclusive users. When exclusive use was considered the correlation was weak.

Table 3 enlists the cigarette consumption pattern among mixed users of rolled and manufactured cigarette. It suggests that higher number of mixed users (non exclusive use - 76.3%, exclusive use - 61.3%) had used either equal or higher number of manufactured cigarettes than rolled one. This trend was higher among female (90%) than their male (72.5%) counterparts for non exclusive use. In case of exclusive use gender comparison was not possible owing to small original sample size.

Table 2. Correlation between mC and rC Use Among Mixed Users of Rolled and Manufactured Cigarettes

	GATS defined user			Exclusive User		
	N	r	p value	N	r	p value
Male	320	0.75	0.001	72	0.154	0.197
Female	90	0.94	0.001	3	1*	0.001*
All	410	0.761	0.001	75	0.25	0.03

*Based on <25 original sample and hence not interpretable. r=Pearson Correlation Coefficient, N=un-weighted sample size. mC=Manufactured cigarette, rC=Rolled cigarette. Source: GATS-India Survey (2009-10) data available in public domain

Table 3. Cigarette Consumption Pattern Among Mixed Users of Rolled and Manufactured Cigarette

	CPD Frequency among mixed users					
	GATS assessed non exclusive user			Exclusive User		
	mC<rC	mC=rC	mC>rC	mC<rC	mC=rC	mC>rC
Male	88 (27.5)	130 (40.6)	102 (31.9)	27 (37.5)	23 (31.9)	22 (30.6)
Female	9 (10)	66 (73.3)	15 (16.7)	2 (66.7)	1 (33.3)	0 (0)
All	97 (23.7)	196 (47.8)	117 (28.5)	29 (38.7)	24 (32)	22 (29.3)

*Figures represent un weighted n(%), rC= rolled cigarette, mC= manufactured cigarette. mC<rC: mixed users reporting lower consumption of mC than rC. mC=rC: mixed users reporting equal number of cigarette consumption from both types. mC<rC: mixed users reporting higher consumption of mC than rC. Source: GATS-India Survey (2009-10) data available in public domain

Discussion

The product specific analysis of existing GATS-India data reveals that mean CPD use among male daily users is always higher than female for each cigarette type. Analysis of mean CPD use as per GATS definition of cigarette (use of manufactured and/or rolled one) results in higher mean CPD use among females than males. But the same definition for exclusive users yields reverse findings. The anomaly in current GATS defined mean CPD use among different genders is a result of variation in product specific user proportions contributing to the average and non exclusion of concurrent use of other tobacco products while estimating mean CPD. Thus current GATS definition of cigarette may result in erroneous interpretation.

The views expressed by the authors in this paper are aligned to the views recently expressed by Karl Fagerstrom in context of assessment of nicotine dependence. Fagerstrom has suggested for the product specific assessment of dependence and renamed Fagerstrom Test for Nicotine Dependence -FTND, as Fagerstrom Test for Cigarette Dependence - FTCD (Fagerstrom, 2012b). Number of cigarette smoked per day is a key item of this tool. Different forms of nicotine containing tobacco products may have different potential for development of dependence due to different sensory and behavioural characteristics; and also due to different pharmacokinetic and pharmacodynamic effects (Fagerstrom, 2012a).

Nicotine administration is central to tobacco addiction diagnosis (ICD-10) and forms the neuro-biochemical basis of addiction (Foll et al., 2007; IARC, 2008). The behaviour of smokers is controlled by both the positive enforcement - desire to obtain nicotine for its pleasing effect, and the negative enforcement - desire to decrease uncomfortable withdrawal symptoms (IARC, 2008; CDC, 2010). The principle of Nicotine Replacement Theory (NRT) relies on replacing of nicotine in tobacco product(s) with pure form of nicotine, thereby reducing the need for nicotine from tobacco products and thus alleviating withdrawal symptoms when users starts quitting (O' Brien et al., 2003). In this context, use of any nicotine containing tobacco product would influence consumption of another tobacco product, when both the products are being used concomitantly. Therefore product specific analysis after excluding use of other tobacco product is warranted.

This study results suggests that concurrent use of other tobacco product(s) reduce the consumption (i.e. mean cigarette per day) of manufactured cigarette or GATS defined cigarette use. In case of rolled cigarette opposite finding may be due to low cost of it in comparison to other tobacco products resulting in higher consumption. Also this finding may be a result of misreporting in GATS survey (Jena et al., 2012). Hence exclusive and product specific analysis would be ideal to assess true consumption pattern (CPD) among male and female cigarette users.

Global adult tobacco survey has defined cigarette

smoking as use of manufactured or country specific hand-rolled cigarette. Using GATS definition, cigarette use explains 84-100% of smoking behaviour in most GATS countries except in India (41%) and Bangladesh (62%). Further prevalence of manufactured and rolled cigarette among GATS countries were 4.7 to 37.8 percent and 0 to 2.6 percent respectively (Giovino et al., 2012a). Eight out of 14 GATS countries reported low (0-1%) prevalence of rolled cigarette. Thus manufactured cigarette consumption is dominated across GATS countries except in India and Bangladesh but such definition of cigarette fails to explain overall smoking behaviour in India and Bangladesh. Further inclusion of bidi in the cigarette definition to represent overall smoking behaviour results in higher mean CPD among females (10) than males (9.8) in India (Giovino et al., 2012b). However such definition never excluded use of other tobacco products and is against the basic tenets product specific nature of nicotine dependence (Fagerstrom, 2012). The Giovino et al. (2012b) justified cigarette definition to include rolled and manufactured cigarette but not bidi in India as bidi is different from cigarettes (manufactured or rolled) by sources, marketing strategies and users to emphasis. It is important to note that manufactured and rolled cigarette as defined in GATS-India are also differ by source, marketing strategies (no known marketing for rolled cigarette in India) and users. Using the same argument of Giovino et al. (2012b), manufactured and rolled cigarette should not be combined together to estimate mean CPD use. Validity of mean CPD estimation in GATS-India using a definition that combined two heterogeneous products (manufactured & rolled cigarettes) has been questioned in the pretext of variation in smoking pattern and nicotine content per stick in these products that could influence their daily use frequency (Jena et al., 2012).

Additionally in countries where cigarette use represent overall smoking behaviour, prevalence of other forms of tobacco product would be less and it would mean that cigarette users are more or less exclusive users. But in other countries where cigarette use does not represent overall smoking behaviour and multiple smoking tobacco product use is common, there would be more influence of concurrent use of other tobacco product(s) use on mean CPD estimation in these countries.

Also as argued by the Fagerstrom (2012b), very different mean CPD across GATS countries may reflect a difference if buying power rather than the actual difference in nicotine dependence. It may be the buying power that could explain higher use of bidi than manufactured cigarette in India and Bangladesh. Thus the CPD estimated in GATS may not be a valid indicator of nicotine dependence in countries like India and Bangladesh for international comparison.

More over our knowledge about rolled tobacco use is in India is limited. Initially Reddy et al. (2004) classified cigarette as manufactured and roll-your own cigarette and indicated that there were no reports on the use of roll-your-own cigarettes in India. Surprisingly, though Bidi, the commonest form of smoking in India, is considered as a hand-rolled cigarette, it has been kept out of definition of rolled cigarette in GATS and Indian Council of Medical Research (ICMR) NCD risk factor surveillance. The prevalence of hand-rolled cigarette in India was first reported in ICMR NCD risk factor surveillance (NIMS, 2009) and then by GATS-India report (2010). Both these surveillance system used an adapted questionnaire developed earlier by WHO or CDC. It would have been prudent for GATS India group to conduct a qualitative study that could have provided insight into the Indian context specific rolled cigarette use.

However, manufactured cigarette is more or less a standardized product across globe than rolled one owing to country specific nature of rolled cigarettes. In this scenario, mean CPD estimation of manufactured cigarette (not GATS defined cigarette) is more acceptable but at the same time we should also include mean number of bidi smoked per day among daily bidi smoker separately for India and Bangladesh.

GATS-India questionnaire was piloted in Indore, Madhya Pradesh state in Central region of India, by interviewing 166 individuals in Hindi language (GATS-India Report, 2010). The piloting covered only 0.24% of the achieved sample size. However in India there are at least 14 major languages and 35 states/UTs. Therefore the piloting was inadequate and thus an important opportunity was lost to understand the country and culture specific nature of rolled cigarette use in India. The authors have never come across tobacco rolled in maize leave, which is being included in the definition of rolled cigarette use in India. Interestingly despite of higher prevalence of rolled tobacco use than hookah, and cigars-cheroots-cigarillos as indicated as indicated in GATS-India report; there is little knowledge about use of rolled cigarette in India. Thus the current GATS-India definitions have not been adapted to Indian context adequately and therefore suffer from lack of its specificity and confounded by simultaneous use of other forms of tobacco use.

Surveys like GATs that collect self reported tobacco use information are valid ways to estimate tobacco use prevalence (Means et al., 1992; Klesges et al., 1995; IARC, 2008), but the accuracy of CPD data from such surveys is less reliable owing to digit bias and under reporting (Warner, 1978; Hatziandreu et al., 1989). Jena et al. (2013) has also estimated high digit bias in manufactured cigarette use frequency assessment in the GATS-India data and suggested for use of statistical methods to improve digit bias in reporting CPD frequency. Reporting of equal number of consumption of both types of cigarettes by the mixed users in this study indicates biasness in CPD reporting and thus GATS is not a valid way to estimate mean CPD use in the individuals.

Therefore, while the relevance of having comparable international indicators to enable comparison between countries remains, but it is critical to adapt and fine tune tobacco use and tobacco control indicators in resource intensive nationwide surveys like GATS to specific countries like India and Bangladesh. Tools of measurement always need to be validated and pre-tested in the country and settings where they are going to be used. It would be erroneous to blindly use indicators and definitions developed in countries dominated by use of manufactured cigarettes to a country like India where

there are multiple smoking forms other than manufactured cigarettes. In India smokeless tobacco use is the most prevalent form of tobacco usage (26%) versus smoking prevalence of just 14% (GATS-India, 2010). Moreover, 'Bidi' and not 'cigarette' is the commonest smoking form in India and Bangladesh.

To conclude, there are technical flaws in the existing definition, analysis and interpretation of 'cigarettes per day" in GATS survey. Though CPD is an important cigarette consumption indicator, cross sectional survey like GATS is not a valid way to measure the same. Moreover, it is important perhaps to consider adding 'Bidi' to the smoking indicator at least for India and Bangladesh. Further the cigarette definition in GATS needs to be changed to include only manufactured cigarette. Alternatively CPD (or its equivalent measure) should be estimated for different smoking products separately. International agencies like World Health Organization (WHO), Centers for Disease Control, Atlanta (CDC) as well as Indian agencies like Indian Institute of Population Sciences, Mumbai as well as Ministry of Health and Family welfare (MOHFW) spearheading the conduct of the GATS surveys in India need to take note and incorporate necessary changes in GATS-India format to ensure that it measures what it purports to measure and GATS survey retains the credibility of both technical soundness as well as appropriateness to inform public health policy and action in India for tobacco control.

Acknowledgements

We are thankful to CDC, Atlanta, for freely availing the GTSS data in its website, which is being used in this article for analysis and interpretation. We thank Mrs. Sagarika Das for her suggestion to improve the analysis. Disclaimer: Present work represents author's opinion based on their scientific and academic interest for improving scientific deliberation in the field of Tobacco Control.

References

Burns DM, Major JM, Shanks TG (2003). Changes in Number of Cigarettes Smoked per Day: Cross-Sectional and Birth Cohort Analyses Using NHIS. In: Marcus SE, ed., Smoking and Tobacco Control Monograph No. 15-Those Who Continue To Smoke: Is Achieving Abstinence Harder and Do We Need to Change Our Interventions. Bethesda, MD: National Institutes of Health, National Cancer Institute, USDHSS.

Centers for Disease Control and Prevention (2010). How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report of the Surgeon General. Atlanta (GA): CDC, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health (US).

Centers for Disease Control and Prevention (2012). Cigarette smoking among adults-United States, 2011. *Morbidity and Mortality Weekly Report (MMWR)*, **61**, 889-908.

Dawe S, Loxton NJ, Hides L, Kavanagh DJ, Mattick RP (2002). Review of diagnostic screening instruments for alcohol and other drug use and other psychiatric disorders (2nd Ed). Australia: Commonwealth Department of Health and Ageing.

Doll R, Peto R, Boreham J, Sutherland I (2004). Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ*, **328**, 1519.

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

Fagerstrom KO (2012b). Determinants of tobacco use and renaming the FTND to the fagerstrom test for cigarette dependence. *Nicotine Tob Res*, **14**, 75-78.

Fagerström KO, Eissenberg T (2012a). Dependence on tobacco and nicotine products: a case for product-specific assessment. *Nicotine Tob Res*, **14**, 1382-90.

Fichtenberg CM, Glantz SA (2002). Effect of smoke-free workplaces on smoking behaviour: systematic review. *BMJ*, **325**, 188.

Foll BL, George TP (2007). Treatment of tobacco dependence: integrating recent progress into practice. *CMAJ*, **177**, 1373-80.

Giovino GA, Gupta PC, Samet JM et al (2012b). Authors' reply to comments on 'Tobacco use in 3 billion individuals from 16 countries: an analysis of nationally representative cross-sectional household surveys'. *Lancet*, **380**, 1906-07.

Giovino GA, Mirza SA, Samet JM, et al (2012a). Tobacco use in 3 billion individuals from 16 countries: an analysis of nationally representative cross-sectional household surveys. *Lancet*, **380**, 668-79.

Hatziandreu EJ, Pierce JP, Fiore MC et al (1989). The reliability of self-reported cigarette consumption in the United States. *Am J Public Health*, **79**, 1020-23.

Hyland A, Li Q, Bauer JE, et al (2004). Predictors of cessation in a cohort of current and former smokers followed over 13 years. *Nicotine Tob Res*, **6**, 363-69.

International Agency for Research on Cancer (IARC) Handbooks of Cancer Prevention (2008). Tobacco Control Vol. 12: Methods for Evaluating Tobacco Control Policies. Lyon, France: IARC, World Health Organization.

Jena PK, Kishore J & Bandyopadhyay C (2012). Prevalence and patterns of tobacco use in Asia. *Lancet*, **380**, 1906.

Jena PK, Kishore J, Jahnavi G (2013). Correlates of Digit Bias in Self-reporting of Cigarette per Day (CPD) Frequency: Results from Global Adult Tobacco Survey (GATS), India and its Implication. *Asian Pac J Cancer Prev*, 2013, **5**.

Klesges RC, Debon M, Ray JW (1995). Are self-reports of smoking rate biased? Evidence from the second national health and nutrition examination survey. *J Clin Epidemiol*, **48**, 1225-33.

Koplan JP, Mackay J. Curtailing tobacco use: first we need to know the numbers. *Lancet*, **380**, 629 -30.

Manley M, Pierce JP, Gilpin EA et al (1997). Impact of the american stop smoking intervention study on cigarette consumption. *Tobacco Control*, **6**, 12-16.

Means B, Habina K, Swan GE et al (1992). Cognitive research on response error in survey questions on smoking. Meryland, USA: National Center for Health Statistics, United States Department of Health and Human Services, 1-32

National Institute of Medical Statistics (NIMS) (2009). IDSP Non-Communicable Disease Risk Factors Survey, Phase-I States of India (2007-08). New Delhi: NIMS, Indian Council of Medical Research, New Delhi, India.

O'Brien CP (2003). Research advances in the understanding and treatment of addiction. *Am J Addict*, **12**, 36-47.

US Department of Health and Human Services (USDHHS) (2004). The Health Consequences of Smoking: A Report of the Surgeon General. Rockville, MD: USDHHS, CDC, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health (US).

US Department of Health and Human Services (USDHHS)

(2008). Clinical Practice Guideline - Treating Tobacco Use and Dependence: 2008 Update. Rockville, MD: US Dept of Health and Human Services, Public Health Service.

Warner KE (1978). Possible increases in the underreporting of cigarette consumption. *J Am Stat Assn*, **73**, 314-18.

Warner KE (2006). Tobacco policy research: insights and contributions to public health policy. In: Warner KE, Isaacs SL, Knickman JR, editors. Tobacco control policy. Robert Wood Johnson Foundation Health Policy series. v. 3. San Francisco: Jossey-Bass Publishers.

West R, McNeill A, Raw M (2000). Smoking cessation guidelines for health professionals: an update. *Thorax*, **55**, 987-99.

Young D, Yong H, Borland R et al (2012). Trends in Roll-Your-Own Smoking: Findings from the ITC Four-Country Survey (2002–2008). *J Environ Public Health*, **2012**, 406283