Nicotine & Tobacco Research, 2018, 1529–1532
doi:10.1093/ntr/ntx276
Brief report
Received January 6, 2017; Editorial Decision December 7, 2017; Accepted December 21, 2017

Brief report

The Poorest of Poor Suffer the Greatest Burden From Smokeless Tobacco Use: A Study From 140 Countries

Dhirendra N. Sinha PhD[1], Prakash C. Gupta PhD[2], Amit Kumar PhD[1], Deeksha Bhartiya PhD[1], Naveen Agarwal MPS[3], Shashi Sharma PhD[1], Harpreet Singh PhD[4], Mark Parascandola PhD[5], Ravi Mehrotra PhD[1]

[1]National Institute of Cancer Prevention and Research, Noida, India; [2]Healis Sekhsaria Institute for Public Health, Mumbai, India; [3]World Health Organization, Regional Office for South-East Asia, New Delhi, India; [4]Indian Council of Medical Research, New Delhi, India; [5]National Cancer Institute, USA

Corresponding Author: Dhirendra N. Sinha, WHO FCTC Global Knowledge Hub on Smokeless Tobacco, National Institute of Cancer Prevention and Research, Noida 201301, India. Telephone: 91-120-2446935; Fax: 91-120-2579473; E-mail: dhirendrasinha1@gmail.com

Abstract

Background: The full extent of global smokeless tobacco (SLT) use and its association with key demographic factors such as gender, place of residence, and household or country income status is not yet known.

Methods: The global burden of SLT use among adults was estimated using nationally representative data of 140 countries by gender and country income group. Countries were grouped in Group 1 (low and low-middle income countries combined) and Group 2 (upper middle and high income countries combined). The number of male and female SLT users was calculated using prevalence and population estimates of corresponding age groups.

Results: Nearly one in 10 males and one in 20 females used SLT in some form. SLT use prevalence was significantly higher among males ($p < .001$) and females ($p < .001$) in Group 1 countries compared with their counterparts in Group 2 countries. However, for both Group 1 ($p < .01$) and Group 2 ($p < .01$), males were more likely to use SLT than females. Nearly 91% of a total 356 million adult SLT users resided in Group 1 countries, with 81.6% in countries of WHO South-East Asia region (SEAR). In SEAR and African region, SLT use was higher in rural areas and poorest communities.

Conclusion: The majority of the burden of SLT use is on lower and lower middle income countries with the greatest burden on the poorest segments of the population in these countries.

Implications: This study brings the comprehensive information on epidemiology of SLT use among adults at global level. Ninety percent of SLT burden is in low and low-middle income group of countries and more specifically among the poorest group in such countries. These countries need to have strategies to implement different provisions of the WHO Framework Convention on Tobacco Control. The program in such countries should be targeted towards the poorest communities for effective SLT control.

Introduction

Smokeless tobacco (SLT) use has led to the loss of over 1.5 million disability adjusted life years (DALYs) among 113 countries.[1] More than 650 000 deaths have been attributed to SLT use in 133 countries.[2] SLT use among adults is on the rise in countries of South East Asia region, home of over 80% of global users.[3,4] In India, the

economic cost of treating tobacco related diseases was 6.7 billion USD in 2011, nearly 25% of which was attributed to smokeless tobacco use.[5]

Although SLT use has serious health and economic implications, this burden has not been given due importance internationally. Recently, Global Burden of Diseases, Injuries, and Risk Factors Study (GBD 2016) has included the burden attributable to smokeless tobacco. In their study it was found that RR (Relative Risk) of SLT was higher than one for oral cancer and esophageal cancer except for snuff or snus.[6] The World Health Organization Framework Convention on Tobacco Control (WHO FCTC) 2014 implementation global progress report provide only limited information on SLT use prevalence and control efforts.[7] One hundred and eighty countries that have ratified the WHO FCTC are obliged to monitor information on tobacco use, including SLT use among both adults and youth and related indicators using standard protocols for national and international comparability;[7] however, specific actions have been limited to date.[8]

Addressing smokeless tobacco use has begun to gain attention through the FCTC process. WHO FCTC global knowledge hub on smokeless tobacco has been established in India with a mandate to create scientific evidence on different aspects of SLT control and help member states in improving SLT control.

In 2014, based on smokeless tobacco use prevalence from 70 countries, the number of SLT users was estimated to be 302.4 million worldwide.[9] In 2015, based on information from 121 countries,[10] the global estimate of SLT users was calculated to be 351.9 million. Information on the prevalence of smokeless tobacco use among adults along with associated demographic factors is available in several independent studies for individual countries or groups of countries.[9–18] However, the demographic factors associated with SLT use, such as gender, place of residence, and economic status of the countries and families, have not yet been explored at a global level. This knowledge would help in understanding the patterns of SLT use and suggesting points of intervention to address the problem of SLT use worldwide.

This study computed the global burden of SLT use among adults based on prevalence from 140 countries and studied the relationship of the gender, the income of the country and family, and the place of residence to prevalence.

Methods

The information was obtained from various sources including published WHO reports,[11] other multi-country international reports,[1–3,9–16] as well as individual country reports[17,18] (Supplementary Table 1). The data for prevalence of current SLT use (defined as use within past 30 days) for adults was obtained for 145 countries. Adults were age 15 years and plus. The most recent national estimates obtained from population based surveys of current SLT use were included in calculations. The four countries having sub national estimates (adults) and one country having other definitions of current SLT use (e.g. SLT use in past 12 months) were excluded from the calculations.

The countries were categorized by income group following the World Bank classification,[19] which provides four major income groups, namely, LICs (Low income countries), LMICs (Lower middle income countries), UMICs (Upper middle income countries), and HICs (High income countries). Two income groups were constituted for the analysis: Group 1, which includes LIC + LMIC, and Group 2 with HIC + UMIC.

The prevalence of SLT use was computed by gender for all countries and, additionally, by place of residence and family income for Group 1 countries in South-East Asia Region (SEAR) and African Region (AFR). Mean prevalence of SLT use for countries were computed using the standard weighting calculation as given below:

$$\bar{x} = \frac{\sum_{i=1}^{n}(x_i \times w_i)}{\sum_{i=1}^{n} w_i}$$

where $\bar{x}$ = weighted mean, w = population of individual countries, x = prevalence of individual countries.

Based on asymmetry of the distribution, Mann–Whitney U test was employed for calculating the significance for difference.

The number of male and female SLT users of the corresponding age groups in the respective countries was computed using the standard method.[9,10] The population figures were taken from UN population reports for 2015.[20] Numbers of users were calculated for different categories and sub regions, such as by country income group and by WHO region. SPSS version 16 was used for statistical computations.

In low-middle income and low income countries of SEAR and AFR, difference in smokeless tobacco use prevalence by place of residence (urban vs. rural population) was compared. Further, prevalence in such countries were seen between richest and poorest. All countries included in this study had five socioeconomic (SES) categories. Categories one with highest family income and category five with lowest family income groups were compared.

Results

Prevalence and Demographic Associations of SLT Use

For 140 countries, the mean prevalence of SLT use was 10.4% among males and 5.6%among females. The male–female differential persisted across all classifications. Table 1 shows the mean prevalence of smokeless tobacco use by gender, place of residence (urban vs. rural) and family income across different country income groups. The mean prevalence of SLT use was significantly higher among both males and females of Group 1 countries (18.4% male, 10.4% female) compared with their counterparts in Group 2 countries (1.9% male, 0.5% female; $p < .001$). Indeed, the mean prevalence was 20 fold higher in females and 10 fold higher in males of Group 1 countries compared to Group 2 countries.

Distribution of Adult SLT Users

In 140 countries, there were estimated 356 million SLT users, out of which 65.8% (234 million) were males while 34.2% (122 million) were females (Supplementary 1).

Table 1. Weighted Mean Prevalence of Smokeless Tobacco Use Among Adults by Income of Countries and Gender

Country Groups	Demographic variables	Mean SLT use (%) ± SD	p value
Global	Male	10.4 ± 13.4	$p < .001$
	Female	5.6 ± 8.1	
HIC*+UMIC*	Male	1.9 ± 3.0	$p < .01$
	Female	0.5 ± 1.4	
LIC*+LMIC*	Male	18.4 ± 14.5	$p < .01$
	Female	10.4 ± 8.9	
HIC+UMIC vs. LIC+LMIC	Male vs. Male	—	$p < .001$
HIC+UMIC vs. LIC+LMIC	Female vs. Female		$p < .001$

*HIC, high income country; LIC, low income country; LMIC, lower middle income country; UMIC, upper middle income country.

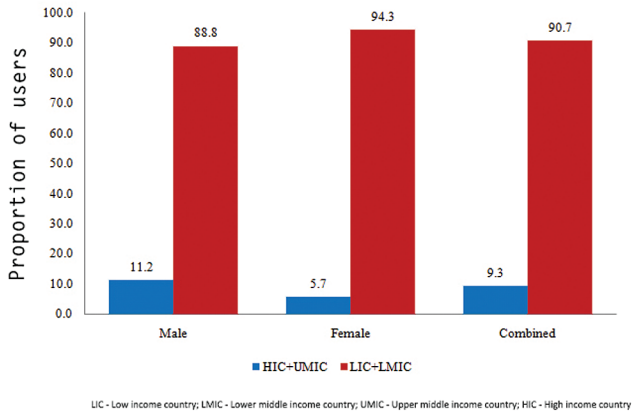

Figure 1. Proportion of smokeless tobacco users by income group of countries and gender.

Globally, 88.5% of adult SLT users live in 11 countries of the world: India (237.4 million, 66.6%), Bangladesh (30.5 million, 8.5%), Myanmar (12.6 million, 3.5%), Pakistan (9.7 million, 2.7%), USA (9.6 million, 2.6%), China (4.1 million, 1.2%), Indonesia (3.2 million, 0.9%), Nepal and Colombia (3.0 million, 0.9% each), and Madagascar (2.5 million, 0.7%), (Supplementary Table 1; Supplementary 1 Figure 2).

Of all SLT users, overall 90.7% resided in Group 1 countries, 9.3% in Group 2 countries (Figure 1).A higher proportion of female (94.3%) than male (88.8%) users resided in LIC and LMICs.

Of all SLT users 81.6% lived in South-East Asia region (SEAR) followed by the African region (AFR); 4.8%), American region (AMR; 4.3%), Eastern Mediterranean region (EMR; 3.8%), European region (EUR; 3.3%), and Western Pacific region (WPR; 2.2%), Supplementary Figure 1.

SLT Use by Place of Residence and Income of the Family in LIC and LMICs

SLT use is 1.2–8 times higher in rural areas as compared to urban in countries of SEAR and AFR (Supplementary 1 Table 2; Supplementary 1 Figure 3). SLT use was 1.5–17 times higher among poorest section as compared to the richest section in countries of SEAR and AFR (Supplementary 1 Table 3; Supplementary Figure 4).

Discussion

Smokeless tobacco use is a global epidemic affecting 140 countries representing 93.8% of the global population. This study provides a more representative global estimate as compared to the earlier studies that were based on findings from 70 and 121 countries respectively.[9,10] The WHO had estimated global SLT use prevalence for male as 12% and for female 7% in 2014.[8] The present study estimates 10.4% SLT use among males and 5.6% among females. This study also provides a more accurate and updated estimate of users by region. Nearly 82% of global SLT users lived in SEAR, which is one percent less than a previous estimate.[10] This one percent is made up in the African region, where the global estimate changed from 4% to 5%.

Lack of availability of data on SLT use among adults was a major challenge in the past which has been compensated by secondary analyzed data published in recent years.[12–16] The available data on SLT use, however, lacks uniformity in various aspects. This creates difficulty in accurate comparison of prevalence across different countries and also across different time periods as different survey instruments, sampling methods and age groups have been used at different times. Now countries may use the Standard Tobacco Questions for Surveys (TQS) developed by WHO and CDC in ongoing surveys so that uniformity in the available SLT data may be maintained.

Our analysis reveals that the mean prevalence of current use of SLT was significantly higher among males in both group 1 ($p < .01$) and group 2 countries ($p < .01$) compared to females. However, the prevalence among females is higher than males in some high burden countries, such as Bangladesh (27.9% vs. 26.9%) and Timor-Leste (26.8% vs. 16.1%). It was observed that nearly 95% of global female users lived in LIC and LMICs, (Figure 1) perhaps because the use of SLT by women is more socially acceptable in LIC and LMICs. Apart from cultural acceptance, easy accessibility and affordability of smokeless tobacco and tobacco industry interference are additional reason for its higher use among people in LIC and LMICs.

This study provides further support that most of the high smokeless tobacco use burden countries are LICs and LMICs. India, Bangladesh, Myanmar, Indonesia, Pakistan, Nepal, and Madagascar are among the top 10 countries with high SLT use prevalence and contribute high numbers of SLT users to the overall global estimate. Although SLT use prevalence was comparatively low in the USA, China, and Indonesia, they also come into the list of 10 top high burden countries because of their large population size.

Overall almost 91% of SLT users reside in LICs and LMICs, and the greatest burden in these countries is among the poorest families. But, though smokeless tobacco use is major problem in LIC and LMICs, limited progress has been made in implementing effective tobacco control strategies targeted at SLT in these countries. Taxes on smokeless tobacco products tend to be lower than those on cigarettes and the affordability of SLT products has increased over the years due to inadequate taxation.[21] Evidence demonstrates that increased taxes on raw tobacco and on SLT products are one of the most effective tools[9] to reduce SLT use and its affordability. In order to achieve the UN target of a 30% reduction in tobacco use by 2025, greater attention is needed, especially in LICs and LMICs and in the SEAR region, to the burden of SLT use, along with the implementation of evidence based strategies for its control.

Limitations

Adult prevalence is based on surveys, reported by self or family members; not authenticated by biomarkers. WHO region-wise sample coverage for adults was more than 85% for all regions with the exception of the Eastern Mediterranean Region (EMR; 66.6%). Age group coverage for the survey results were not the same for all countries. The majority of the studies were for 15+ whereas the second largest group was 25+. All prevalence data reported is not for the same calendar year.

Supplementary Material

Supplementary 1, Supplementary Tables 1–3, and Supplementary Figures 1–3 can be found online at https://academic.oup.com/ntr/

Funding

This work was supported by the projects "Second phase of task force Biomedical Informatics Centers of ICMR" (Project No. BIC/12(06)/2013) and

WHO FCTC Global Knowledge Hub on Smokeless Tobacco (Reference No 2016/643768-0).

Declaration of Interest

None declared.

Ethics Approval

Not Applicable

Data Sharing Statement

Data can be shared in public domain after publication of this manuscript.

Acknowledgments

DNS conceptualized the problem. Data were collected by AK, DNS, and NA. Analysis was done by DNS, AK, DB, PCG, and SS. Paper was drafted by DNS, DB, and AK. Manuscript was reviewed by RM, PCG, HS, and MP.

References

1. Siddiqi K, Shah S, Abbas SM, et al. Global burden of disease due to smokeless tobacco consumption in adults: analysis of data from 113 countries. *BMC Med*. 2015;13:194.
2. Sinha DN, Suliankatchi RA, Gupta PC, et al. Global burden of all-cause and cause-specific mortality due to smokeless tobacco use: systematic review and meta-analysis. *Tob Control*. 2018;27(1):35–42.
3. Sinha DN, Rizwan SA, Aryal KK, Karki KB, Zaman MM, Gupta PC. Trends of smokeless tobacco use among adults (aged 15-49 years) in Bangladesh, India and Nepal. *Asian Pac J Cancer Prev*. 2015;16(15):6561–6568.
4. Sinha DN, Bhartiya D, Kumar A, et al. Men in Myanmar submerged in tobacco: Women following. *Nicotine Tob Res*. 2016;pii:ntw314.
5. Ministry of Health and Family Welfare, Government of India, New Delhi. Executive Summary-Economic Burden of Tobacco Related Disease, updated 2011. http://www.searo.who.int/india/topics/tobacco/economic_burden_of_tobacco_related_diseases_in_india_executive_summary.pdf. Accessed November 25, 2016.
6. GBD 2016 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2017;390(10100):1345–1422.
7. WHO FCTC. Global progress report on implementation of the WHO Framework Convention on Tobacco Control, 2014. http://www.who.int/fctc/reporting/2014globalprogressreport.pdf. Accessed November 25, 2016.
8. Conference of the Parties to the WHO Framework Convention on Tobacco Control, Sixth session, Moscow, Russian Federation, 13–18 October 2014, Provisional agenda item 4.4.1, FCTC/COP/6/9, 28 May 2014, Control and prevention of smokeless tobacco products. http://apps.who.int/gb/fctc/PDF/cop6/FCTC_COP6_9-en.pdf. Accessed December 13, 2016.
9. National Cancer Institute and Centers for Disease Control and Prevention. *Smokeless tobacco and public health: a global perspective*. Bethesda, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Institutes of Health, National Cancer Institute. NIH Publication No. 14–7983; 2014. http://cancercontrol.cancer.gov/brp/tcrb/global-perspective/index.html. Accessed December 10, 2016.
10. Sinha DN, Agarwal N and Gupta PC. Prevalence of Smokeless Tobacco Use and Number of Users in 121 Countries. *BJMMR*. 2015;9(6):1–20.
11. WHO. *WHO report on the global tobacco epidemic, 2015: raising taxes in tobacco*. Geneva: World Health Organization; 2015. http://www.who.int/tobacco/global_report/2013/appendix_xi_table_11_2.pdf. Accessed December 12, 2016.
12. Ansara DL, Arnold F, Kishor S, et al. *Tobacco use by men and Women in 49 Countries with Demographic and Health Surveys. DHS Comparative Reports No.31*. Calverton, MD: ICF International; 2013.
13. Sreeramareddy CT, Pradhan PM, Mir IA, Sin S. Smoking and smokeless tobacco use in nine South and Southeast Asian countries: prevalence estimates and social determinants from demographic and health surveys. *Popul Health Metr*. 2014;12:22.
14. Sreeramareddy CT, Pradhan PM, Sin S. Prevalence, distribution, and social determinants of tobacco use in 30 sub-Saharan African countries. *BMC Med*. 2014;12:243.
15. Sreeramareddy CT, Pradhan PM. Prevalence and social determinants of smoking in 15 countries from North Africa, central and Western Asia, Latin America and caribbean: secondary data analyses of demographic and health surveys. *PLoS One*. 2015;10(7):e0130104.
16. Agaku IT, Filippidis FT, Vardavas CI, et al. Poly-tobacco use among adults in 44 countries during 2008-2012: evidence for an integrative and comprehensive approach in tobacco control. *Drug Alcohol Depend*. 2014;139:60–70.
17. CDC. Global Tobacco Surveillance System Data (GTSSData). http://nccd.cdc.gov/GTSSData/Ancillary/Documentation.aspx?SUID=4&DOCT=1. Accessed December 12, 2016.
18. *World Health Organization, STEPS country reports*. Geneva: World Health Organization. http://www.who.int/chp/steps/reports/en/. Accessed April 28, 2016.
19. World Bank. World Bank Country and Lending Groups. 2016. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519. Accessed December 22, 2016.
20. *World Population Prospects: The 2012 Revision*. New York: Population Division, Department of Economics and Social Affairs, United Nations Secretariat; 2013.
21. Nargis N, Hussain AK, Fong GT. Smokeless tobacco product prices and taxation in Bangladesh: findings from the International Tobacco Control Survey. *Indian J Cancer*. 2014;51(suppl 1):S33–S38.