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Original article

Predictors and Patterns of Cigarette and Smokeless Tobacco Use Among Adolescents in 32 Countries, 2007–2011

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 A B S T R A C T

Purpose: This study compared data from 32 countries to assess predictors and patterns of cigarette and smokeless tobacco (SLT) use among students aged 13–15 years old.

Methods: Data from the 2007–2008 Global Youth Tobacco Surveys were analyzed for students aged 13–15 years in 31 countries located in all six World Health Organization regions. In addition, the 2011 National Youth Tobacco Survey was analyzed for U.S. students aged 13–15 years. Country-specific prevalence of current smoking, current SLT use, and concurrent use patterns were assessed.

Results: The national prevalence of current cigarette smoking among students aged 13–15 years ranged from 1.8% (Rwanda) to 32.9% (Latvia), whereas current SLT use ranged from 1.1% (Montenegro) to 14.4% (Lesotho). In the U.S. and most European countries surveyed, current smoking prevalence was significantly higher than SLT prevalence, in contrast to patterns observed in low- and middle-income countries. Also, in most of the surveyed countries outside of Europe and the United States, SLT use among girls was as common as their use of cigarettes, and not significantly different from use by boys. When compared with U.S. adolescents, the odds of SLT use were highest among African adolescents (adjusted odds ratio = 3.98; 95% CI: 2.19–7.24) followed by those in the Southeast Asian region (adjusted odds ratio = 2.76; 95% CI: 1.38–5.53).

Conclusions: Region-specific patterns of tobacco use were noticed. Furthermore, it is alarming that in several low- and middle-income countries, the prevalence of SLT use among females did not differ from that among males, suggesting the possibility of a future shared burden of disease between both males and females.

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 IMPLICATIONS AND
 CONTRIBUTION

Significant differences in the pattern of tobacco use among adolescents were observed by geographical region. Smokeless tobacco use was higher among adolescents observed in low- and middle-income countries, whereas cigarette smoking prevalence was higher in high-income countries. Moreover, in most low- and middle-income countries, no differences in smokeless tobacco use by gender were noticed, suggesting a partial transition of future burden of smokeless tobacco-related disease toward females.

Tobacco use is one of the leading preventable causes of morbidity and mortality globally. About 5 million deaths are attributable to tobacco annually and, by 2020, the figure is expected to exceed 10 million, with approximately 70% of these deaths

occurring in developing countries [1]. Because tobacco experimentation and use takes places usually during adolescence—the same time when health related behaviors are usually formulated—it is important to understand the predictors and patterns of use by adolescents globally [2].

Although declines in cigarette smoking have been observed in developed nations in recent years, the reverse has occurred in several low- and middle-income countries (LMICs). Along with Asia-Pacific, the Middle East and Africa have continued to see increased cigarette volume sales at a higher rate than the rest of

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the world [3]. Meanwhile, the use of smokeless tobacco (SLT) products has remained unchanged in several developed and developing regions of the world [4,5]. The types of SLT products across the globe vary widely. In the Western world, low-nitrosamine SLT products such as Swedish-style snus have continued to increase in popularity in recent times [6]. Nevertheless, the reality remains that most SLT users outside of certain European countries commonly use the conventional or the traditional forms of SLT with a relatively high level of toxins [7], including oral and nasal snuff.

Adolescence, which represents the transition from childhood to adulthood, is closely tied to the structure of adult society. Adolescents are at a very critical developmental stage and may be easily susceptible to proximal or environmental influences to use tobacco [8]. Considering the cultural differences in global adult tobacco use [9], it is conceivable that adolescents' experiences with tobacco use may vary across cultures. Differences in availability, regional affordability, and cultural acceptance of tobacco may indeed play an important role in product use; however, relatively little is known about the global patterns of tobacco use among adolescents of different regions and economies [10]. Therefore, this study compared the patterns of cigarette and SLT use among adolescents aged 13–15 years from 32 countries by geographical area and gross national income (GNI) during 2007–2011.

Methods

Sources

All analyses in this study were performed on publicly available, deidentified data, which was Institutional Review board–waived as nonhuman research. Data were obtained from two different survey types: the Global Youth Tobacco Survey (GYTS) and the U.S. National Youth Tobacco Survey (NYTS).

The GYTS is a standardized, school-based anonymous questionnaire survey that collects tobacco use data at 4-year intervals from students aged 13–15 years [10]. For this analysis, we established three exclusion criteria a priori: (1) all sub-national (i.e., provincial, city, or state level) data were excluded to allow direct comparisons of country-level data; (2) all countries whose most recent national GYTS data were collected before 2007 were excluded to allow for assessment of more recent estimates; and (3) countries with no data on SLT use or those in which the question wording lumped SLT together with other smoked tobacco products were excluded to allow a uniform cross-country assessment of distinct tobacco use patterns. In total, 31 countries from the six World Health Organization (WHO) regions in which the GYTS was administered satisfied our inclusion criteria and included: seven from the African region (Botswana, Lesotho, Madagascar, Rwanda, Seychelles, South Africa, and Togo); four from the Eastern Mediterranean region (Iran, Qatar, Tunisia, and Yemen); 10 from the European region (Croatia, Estonia, Hungary, Kyrgyzstan, Latvia, the Former Yugoslav Republic [FYR] of Macedonia, Republic of Moldova, Montenegro, Serbia, and Slovenia); four from the region of the Americas exclusive of the United States (Barbados, Belize, Panama, and Trinidad and Tobago); two from Southeast Asia (Myanmar and Sri Lanka); and four from the Western Pacific region (Cook Islands, Republic of South Korea, Mongolia, and Philippines). Overall response rates ranged from 51.9% (Mongolia) to 96.0% (Botswana).

The NYTS is a repeated biennial national cross-sectional survey of U.S. middle and high school students [11]. The 2011 NYTS had an overall response rate of 72.7%.

An overview of the sample size and gender distribution by country is depicted in Table 1.

Definitions

Current cigarette smoking was defined as a report by an adolescent that he or she smoked cigarettes on ≥ 1 day during the past 30 days. Current SLT use was defined as a report by an adolescent that they used chewing tobacco, snuff, or dip on ≥ 1 day during the past 30 days. For all 32 countries in the study, selected question items were similarly worded, thus allowing for direct comparisons.

Data analysis

Country-specific estimates of current smoking, current SLT use, and dual cigarette-SLT use were assessed overall and by sex. Analyses were restricted to students aged 13–15 years to enhance cross-country comparability. Within-group differences were assessed using χ^2 statistics ($p < .05$). Estimates with relative standard error $\geq 40\%$ were deemed statistically unreliable.

To further assess regional differences in tobacco use, logistic regression analyses were performed, with current smoking, current SLT use, and dual cigarette-SLT use as primary outcomes, adjusting for age, sex, survey year, geographic region, and income category of country. Income group categorization was based on the countries' 2011 GNI (World Bank classification) [12]. These included: low-income countries (GNI \leq \$1,025, $n = 5$ countries: Madagascar, Rwanda, Togo, Kyrgyzstan, and Myanmar); lower-middle income (GNI between \$1,026 and \$4,035, $n = 6$ countries: Lesotho, Yemen, Republic of Moldova, Sri Lanka, Mongolia, and Philippines); upper-middle income (GNI between \$4,036 and \$12,475, $n = 12$ countries: Botswana, Seychelles, South Africa, Islamic Republic of Iran, Tunisia, Hungary, FYR Macedonia, Montenegro, Serbia, Belize, Panama, and Cook Islands); and high-income countries (GNI: \geq \$12,476, $n = 9$ countries: Qatar, Croatia, Estonia, Latvia, Slovenia, Barbados, Trinidad and Tobago, South Korea, and the United States).

All analyses were weighted and performed with Stata version 11 (StataCorp 2009, College Station, TX).

Results

Cross-country comparison of cigarette and SLT use

Our findings indicated that the overall prevalence of current cigarette smoking among students aged 13–15 years differed by region and country, and ranged from 1.8% (Rwanda) to 32.9% (Latvia) (Table 2). The prevalence of current smoking among 13–15 year olds in the United States was 8.0%. Median prevalence of current cigarette smoking for the other regions included: African (median = 13.6%; range 1.8%–21.5%); Eastern Mediterranean (median = 5.2%; range 3.0%–8.3%); European (median = 15.8%; range 4.4%–32.9%); the Americas exclusive of the United States (median = 9.7%; range 4.3%–12.9%); Southeast Asian (median = 3.1%; range 1.3%–4.9%), and Western Pacific (median = 13.2%; range 6.9%–30.0%) regions. Three of the seven African countries surveyed (Madagascar, South Africa,

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