

Prevalence, patterns and contributing factors for tobacco usage amongst Saudi population – analysis from SHIS 2013

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Abstract. – OBJECTIVE: The present study aimed to determine the prevalence, patterns and contributing factors for tobacco usage amongst Saudi population.

MATERIALS AND METHODS: Between April and June 2013, a cross-sectional study was organized among 10735 individuals aged 15 years or older. The survey consisted of face-face interview for collecting data on socio-demographics, tobacco usage, diet, physical activity and comorbidities. Univariate and multivariate binary logistic regression was applied to check for the association of prevalence (both smoked and smokeless) with socio-demographic factors. The strength of association was examined by approximating odds ratios (OR) with their 95% CI using SPSS software and *p*-value set at < 0.05.

RESULTS: A total of 10195 respondents aged from 15 to 101 were considered. Overall prevalence of current smoking was 12.8%. Daily smoking was reported by 12% of the population. Sex, age group, education, married and occupation were strong predictors of tobacco use in both univariate and multivariable model. From multivariable model, men were 14.54 times more likely to smoke tobacco (aOR 14.54, 95% CI 11.07-19.11) when compared with women. Respondents between 15 to 30 years, 31 to 45 years, were 3.36 times (aOR 3.36, 95% CI 2.29-4.93) and 3.51 times (aOR 3.51, 95% CI 2.47-4.98) more likely to smoke tobacco when compared to >60 years.

CONCLUSIONS: The results of present study indicate a significant, but differing purpose of

sex, age group, education, marital status and work status on tobacco usage in the country.

Key Words:

Association, Prevalence, Tobacco, Global adult tobacco survey, World Health Organization, Saudi Arabia.

Introduction

Tobacco usage claims nearly 7 million deaths worldwide, among which 6 million are smokers and approximately 890,000 are non-smokers, those exposed to second-hand smoking¹. Tobacco use is a foremost avoidable cause of diseases worldwide. Many adverse health outcomes are seen, such as coronary heart disease, stroke, respiratory diseases, adverse reproductive outcomes, and multiple types of cancer, including lung cancer. An estimated proportion of 80% of the world's 1.1 billion smokers is from low- and middle-income countries². Evidence suggests a drastic increase in chronic diseases in developing countries, and by 2030, 8 million deaths are anticipated if tobacco usage remains uncontrolled during the 21st century³.

The MPOWER includes monitoring of tobacco use and prevention policies, protecting people from smoking tobacco, offering support in quitting tobacco, warning on adverse outcomes

of smoking, enforcing laws on an advertisement, promotion and sponsoring of tobacco products and by increasing taxation on tobacco is a strategy of Framework Convention on Tobacco Control (FCTC) implemented by the World Health Organization (WHO³). One hundred and eighty-one countries have endorsed WHO FCTC until January 2018. By 2030, WHO's objective is to bring down tobacco consumption to 30% amongst ≥ 15 years⁴.

To determine the progress of the MPOWER strategy, World Health Organization encouraged a classical family unit survey of non-institutionalized individuals aged ≥ 15 years using a standardized questionnaire, sampling technique, and appropriate methods of data collection named as Global Adult Tobacco Survey (GATS). During 2008-2016, 28 countries took this survey to evaluate the prevalence of smoking, attempts to quit, and awareness about the health hazards of smoking. According to this survey, the prevalence of smoking was 22.5%, and 42.5% of these smokers made a quit attempt in earlier 12 months⁵.

Western countries and many developing countries have reported an association between social and economic determinants like age, education, gender, occupation, ethnicity, and place of residence at all levels. Demographic Health Surveys from Bangladesh, Egypt, India, Philippines, Turkey, Ukraine, and Vietnam provided data on the prevalence of tobacco usage (with some limitations on age groups and gender representation). A high majority of tobacco consumption was seen in men and disadvantaged sections of the population residing in rural areas, with less education and lower socioeconomic status. The accurate prevalence of tobacco consumption remains unanswered, as the facts and figures of these surveys focused only on borderline data rather than the objective of these surveys⁶.

Unfortunately, an increasing trend of consuming tobacco is seen in most developing countries, including Saudi Arabia, which stands in fourth place globally, especially in sales and import of tobacco. Annually, > 4700 deaths are recorded due to diseases related to tobacco. At the same time, >116 000 children and 28,89,000 adults are daily tobacco users and 1,59,100 individuals are current smokers. Overall the prevalence of smoking is 12.2% in Saudi, with men more likely to smoke than women (21.5% vs. 1.1%). Besides, 23.3% of the Saudi population is exposed to secondary smoke for at least 24 hours/week at home, work, or school⁷ out of which 32.3% were men and 13.5%. World Health Organization (WHO)

assumed approximately 24% of the population to be smokers by 2025 if prevention strategies on tobacco usage are not implemented.

Since the last two decades, progression has been made in improving health standards in Saudi Arabia (KSA). A drastic transition from communicable, maternal, and perinatal diseases progressing toward non-communicable conditions was observed in The Kingdom, changing the burden of disease profile. In 2012, a five-year collaboration between The Ministry of Health of the KSA and Health Metrics and Evaluation (IHME) was made in integrating health information systems in the Kingdom. To begin with, the collaboration implemented a population-based surveillance system that integrates multiple data sources at the local level in tracking risk factors for chronic disease. Saudi Health Interview Survey (SHIS) was a cross-sectional study covering all 13 regions of KSA using a multi-stage sampling method targeting adults 15 years and older. The main aim of the study was to determine the prevalence of non-communicable diseases and their risk factors. The prevalence of smoking was 21.1% in males and 1.1% in females in the age group of 15-65. According to this survey, the focus should be on preventing the risk factors of chronic diseases by improving diet, reducing smoking, and increasing physical activity⁸. To our knowledge, data on recent estimates of tobacco prevalence and its correlation with other associated factors and comorbidities among the Saudi population have not been documented. Therefore, this study investigated the prevalence, patterns, and contributing factors for tobacco usage among Saudi people. The study's objective is to determine the prevalence, patterns, and contributing factors for tobacco usage amongst the Saudi population.

Materials and Methods

Study Design

A Cross-Sectional Study.

Source Population

Thirteen states of Saudi Arabia.

Study Population

Adults aged 15 years and above from all the 13 states.

Study Setting

Population-based study.

Sample Size and Sampling Technique

A total of 12,000 family units were selected and approached using a multi-stage stratified probability sampling technique. Out of 12,000, 10,821 completed the survey administered at a 90% response rate (10,821/12,000) (Figure 1).

Ethical and Informed Consent

Ethical permission was obtained from the Saudi Ministry of Health and its Institutional Review Board (IRB). Written informed consent was obtained from all the participants to avoid anonymity and voluntary participation. They were explained in detail about the information present in the questionnaire.

Inclusion Criteria

- Men and women aged 15 years or older.
- Who are permanent residents of that place.

Exclusion Criteria

- Who are not permanent residents.
- Travellers on vacation.
- Army people etc.
- People from inaccessible and isolated areas.

Data Collection

A face-face interview was carried using a selected summary of adult questionnaire from Saudi Health Interview Survey (SHIS), consisting of information regarding socio-demographics, tobacco usage, diet, physical activity, and comorbidities. The validation of the questionnaire was not mentioned in the SHIS. Interviewers were trained before the survey commenced so that the survey protocol and procedures for administration would be identical across the country.

Saudi Health Interview Survey (SHIS)⁸

The SHIS is based on a multistage representative sample of adults 15 years or older. The survey was conducted covering all regions in the Kingdom of Saudi Arabia using probability proportional to size. The study was used to estimate the prevalence of some of the risk factors of non-communicable diseases through interview, physical examination, and laboratory examination of blood samples of study participants.

The Ministry of Health of the KSA was investing in reforming its health information systems and began a five-year collaboration with the Institute for Health Metrics and Evaluation (IHME)

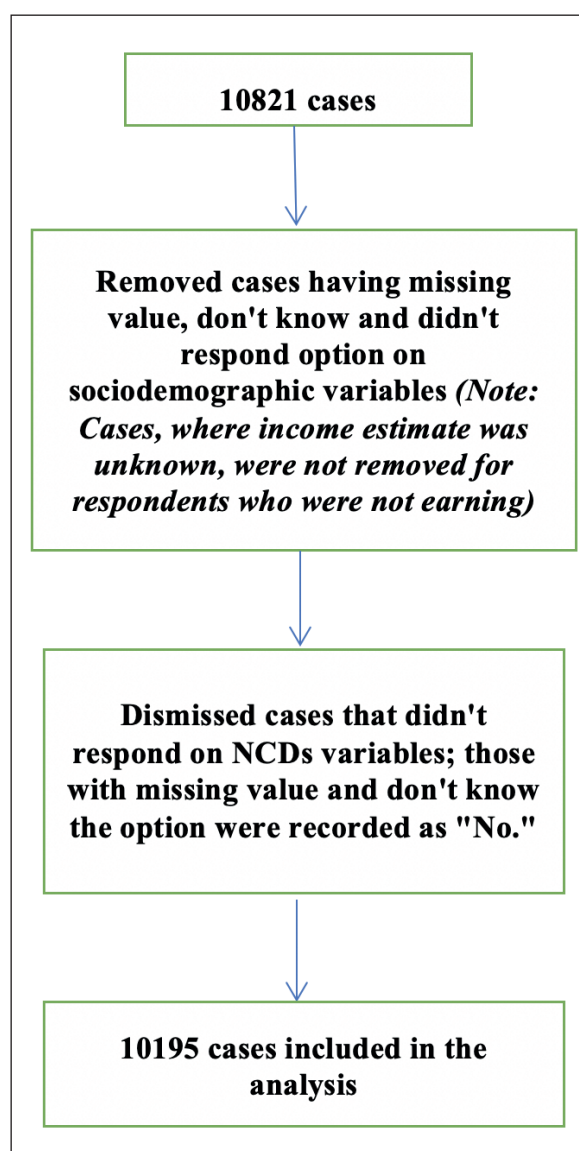


Figure 1. Sample size selection.

in 2012 to implement an integrated health information system in the Kingdom. The first step of this collaboration was to implement a population-based surveillance system that integrates multiple data sources to track the risk factors for chronic diseases at the local level. The system captured the complete spectrum of relevant information from socioeconomic context and health risk factors to disease incidence and the resulting cascade of hospitalizations, outpatient visits, and use of and adherence to interventions. The information enabled, Kingdom of Saudi Arabia to gain more information regarding health outcomes, health risk factors, health services, and

socioeconomic determinants. Furthermore, it will allow them to evaluate disparities in health and tailor interventions confronting chronic diseases in KSA. The primary objective of the Saudi Health Interview Survey (SHIS) was to collect data on health and demographic characteristics in order to assess the prevalence of several chronic conditions and identify their risk factors. The information provided by the survey helped the Ministry of Health in understanding the health of people in the Kingdom of Saudi Arabia and provided a sound basis to better develop and implement preventive and curative programs throughout the Kingdom. The SHIS includes the following modules:

Household roster (Module 1)

Selected adult questionnaire (Module 2, part 1)

- a. Socio-demographic information
- b. Tobacco use
- c. Diet
- d. General health status and functional health status
- e. Physical activity
- f. Access to and utilization of health care
- g. Oral health
- h. History of chronic conditions
- i. Inventory of medications for chronic conditions
- j. Miscellaneous health behaviours

Selected adult physical measurements (Module 2, part 2)

- a. Anthropometry
- b. Blood pressure, heart rate, and respiration

Disposition codes (Module 3)

Selected adult biochemical measurements (completed at a local clinic) (Module 4)

- a. Fasting lipid profile
- b. Hemoglobin A1c.

Study Variables

Prevalence of tobacco usage was considered as the primary outcome variable. Other sociodemographic data, education, and occupation background were considered as explanatory variables.

Statistical Analysis

Descriptive analysis was carried out by frequency and proportion for tobacco behaviours among the study population. Univariate and multivariable binary logistic regression was applied to check for the association of prevalence (both smoked and smokeless) with sociodemographic factors. Unknown income estimate was not compared with the reference category in the logistic

regression. The strength of association was examined by approximating unadjusted and adjusted odds ratios (OR) with their 95% CI using SPSS software (SPSS Inc., Chicago, IL, USA) and unadjusted p -value set at < 0.05 .

Adjusted p -value (e.g. Bonferroni adjustment) was not computed as the analysis was done for the exploratory purpose and not for confirmative purpose. Moreover, adjusting the p -value for reducing the type I errors increases type II errors⁹.

Results

The final analysis was carried for 10195 respondents aged 15 to 101 years. The prevalence of smoking in the present study was 12.8%, and 12% were daily tobacco smokers. Meanwhile, the prevalence of smokeless tobacco in the present study was 0.6%, and 0.5% were daily smokeless tobacco consumers (Table I).

Prevalence of smoked tobacco was found higher in male, age group 31 to 45 years, the high school completed respondents, currently married, self-employed, 7,000 Riyals to less than 10,000 Riyals income-earning respondents. Men in the age group of 31-45 years, respondents who can read and write, currently married, retired, 5,000 Riyals to less than 7,000 Riyals income-earning respondents showed a high prevalence of smokeless tobacco (Table II).

Table III shows binary logistic regression for smoked tobacco and smokeless tobacco. Sex, age group, education, marital status, and work status were significant predictors of smoked tobacco in univariate and multivariable models. Sex, age group, education, and income estimate were substantial predictors of smokeless tobacco in univariate and multivariable models.

From the multivariable model, males were 14.54 times more likely to smoke tobacco (aOR 14.54, 95% CI 11.07-19.11, $p < 0.001$) as compared to females. Respondents in the age group 15 -30 years, 31- 45 years, 46 - 60 years were 3.36 times (aOR 3.36, 95% CI 2.29-4.93, $p < 0.001$), 3.51 times (aOR 3.51, 95% CI 2.47-4.98, $p < 0.001$), and 3.15 times (aOR 3.51, 95% CI 2.28-4.36, $p < 0.001$) more likely to smoke tobacco in comparison with respondents of > 60 years. Respondents who can read and write, completed primary school, high school, intermediate school /technical training were 1.72 times (aOR 1.72, 95% CI 1.13-2.62, $p = 0.011$), 1.61 times (aOR 1.61, 95% CI 1.1-2.34, $p = 0.013$), 1.71 (aOR 1.71, 95% CI 1.18-2.46,

Table I. Tobacco behaviours among Saudi population (N=10195).

Tobacco behaviour	Frequency	Percentage
Smoked tobacco ever	1734	17.0%
Smoke tobacco currently	1302	12.8%
Smoke tobacco daily	1223	12.0%
Consume smokeless tobacco ever	126	1.2%
Consume smokeless tobacco currently	65	.6%
Consume smokeless tobacco daily	51	.5%

$p=0.004$) and 1.53 times (aOR 1.53, 95% CI 1.05-2.22, $p=0.025$) were more likely to smoke tobacco in comparison with respondents who cannot read and write. Separated/divorced/wid-

owed had higher odds of tobacco smoking (aOR 1.65, 95% CI 1.14-2.39, $p=0.008$) compared to those who never married in the adjusted analysis. Self-employed were 1.45 times (aOR 1.45, 95% CI

Table II. Prevalence of smoked and smokeless tobacco according to socio-demographic factors (N=10195).

Socio-demographic factors	Smoke tobacco currently		Consume smokeless tobacco currently	
	Yes (%)	No (%)	Yes (%)	No (%)
Sex				
Female (n=5252)	94 (1.8%)	5158 (98.2%)	9 (0.2%)	5243 (99.8%)
Male (n=4943)	1208 (24.4%)	3735 (75.6%)	56 (1.1%)	4887 (98.9%)
Age group				
15 to 30 (n=3866)	427 (11.0%)	3439 (89.0%)	19 (0.5%)	3847 (99.5%)
31 to 45 (n=3508)	551 (15.7%)	2957 (84.3%)	28 (0.8%)	3480 (99.2%)
46 to 60 (n=1807)	261 (14.4%)	1546 (85.6%)	12 (0.7%)	1795 (99.3%)
>60 (n=1014)	63 (6.2%)	951 (93.8%)	6 (0.6%)	1008 (99.4%)
Education				
Can't read or write (n=1373)	51 (3.7%)	1322 (96.3%)	9 (0.7%)	1364 (99.3%)
Can read and write (n=658)	64 (9.7%)	594 (90.3%)	7 (1.1%)	651 (98.9%)
Primary school completed (n=1083)	139 (12.8%)	944 (87.2%)	7 (0.6%)	1076 (99.4%)
High school completed (n=2874)	476 (16.6%)	2398 (83.4%)	19 (0.7%)	2855 (99.3%)
Intermediate school completed/Technical training (n=1803)	234 (13.0%)	1569 (87.0%)	18 (1.0%)	1785 (99.0%)
College / University/ Post Graduate completed (n=2404)	338 (14.1%)	2066 (85.9%)	5 (0.2%)	2399 (99.8%)
Marital status				
Never married (n=2733)	326 (11.9%)	2407 (88.1%)	16 (0.6%)	2717 (99.4%)
Currently married (n=6623)	909 (13.7%)	5714 (86.3%)	44 (0.7%)	6579 (99.3%)
Separated/divorced/widowed (n=839)	67 (8.0%)	772 (92.0%)	5 (0.6%)	834 (99.4%)
Work status				
Government employee (n=2955)	630 (21.3%)	2325 (78.7%)	21 (0.7%)	2934 (99.3%)
Homemaker (n=2510)	42 (1.7%)	2468 (98.3%)	6 (0.2%)	2504 (99.8%)
Non-government employee (n=430)	124 (28.8%)	306 (71.2%)	4 (0.9%)	426 (99.1%)
Retired (n=758)	138 (18.2%)	620 (81.8%)	12 (1.6%)	746 (98.4%)
Self-employed (n=384)	119 (31.0%)	265 (69.0%)	5 (1.3%)	379 (98.7%)
Student (n=1805)	132 (7.3%)	1673 (92.7%)	10 (0.6%)	1795 (99.4%)
Unemployed (n=1353)	117 (8.6%)	1236 (91.4%)	7 (0.5%)	1346 (99.5%)
Income estimate				
Less than 3,000 Riyals (n=1399)	159 (10.7%)	1332 (89.3%)	16 (1.1%)	1475 (98.9%)
3,000 Riyals to less than 5,000 Riyals (n=1604)	200 (12.5%)	1404 (87.5%)	14 (0.9%)	1590 (99.1%)
5,000 Riyals to less than 7,000 Riyals (n=1419)	220 (15.5%)	1199 (84.5%)	17 (1.2%)	1402 (98.8%)
7,000 Riyals to less than 10,000 Riyals (n=1647)	277 (16.8%)	1370 (83.2%)	9 (0.5%)	1638 (99.5%)
10,000 Riyals to less than 15,000 Riyals (n=1491)	216 (15.4%)	1183 (84.6%)	2 (0.1%)	1397 (99.9%)
15,000 Riyals to less than 20,000 Riyals (n=654)	97 (14.8%)	557 (85.2%)	3 (0.5%)	651 (99.5%)
20,000 Riyals or more (n=453)	65 (14.3%)	388 (85.7%)	2 (0.4%)	451 (99.6%)
Unknown (n=1528)	68 (4.5%)	1460 (95.5%)	2 (0.1%)	1526 (99.9%)

Table III. Logistic regression results of socio-demographic factors associated with tobacco.

Sociodemographic factors	Smoking tobacco currently						Having smokeless tobacco currently					
	Univariate model			Multivariable model			Univariate model			Multivariable model		
	cOR (95% CI)	p-value	df (model)	aOR (95% CI)	p-value	df (model)	cOR (95% CI)	p-value	df (model)	aOR (95% CI)	p-value	df (model)
Sex												
Female (Reference)	1.000		1	1.000		24	1.000		1	1.000		24
Male	17.75 (14.33-21.98)	0.00001		14.54 (11.07-19.11)	0.00001		6.68 (3.3-13.51)	0.00001		8.03 (2.77-23.27)	0.00012	
Age group												
> 60 (Reference)	1.000		3	1.000			1.000		3	1.000		
15 to 30	1.87 (1.42-2.47)	0.00001		3.36 (2.29-4.93)	0.00001		0.83 (0.33-2.08)	0.69100		3.74 (0.96-14.61)	0.05733	
31 to 45	2.81 (2.15-3.69)	0.00001		3.51 (2.47-4.98)	0.00001		1.35 (0.56-3.27)	0.50400		5.84 (1.87-18.25)	0.00239	
46 to 60	2.55 (1.91-3.39)	0.00001		3.15 (2.28-4.36)	0.00001		1.12 (0.42-3)	0.81700		2.34 (0.83-6.61)	0.10903	
Can't read or write (Reference)	1.000		5	1.000			1.000		5	1.000		
Can read and write	2.79 (1.91-4.09)	0.00001		1.72 (1.13-2.62)	0.01100		1.63 (0.6-4.4)	0.33470		1.01 (0.35-2.88)	0.98308	
Primary school completed	3.82 (2.74-5.32)	0.00001		1.61 (1.11-2.34)	0.01309		0.99 (0.37-2.66)	0.97770		0.37(0.12-1.11)	0.07697	
High school completed	5.15 (3.83-6.92)	0.00001		1.71 (1.18-2.46)	0.00418		1.01 (0.46-2.24)	0.98320		0.39(0.14-1.09)	0.07215	
Intermediate school completed/Technical training	3.87 (2.83-5.28)	0.00001		1.53(1.05-2.22)	0.02505		1.53 (0.68-3.41)	0.30070		0.59(0.22-1.6)	0.29985	
College / University/ Post Graduate completed	4.24 (3.13-5.74)	0.00001		1.35(0.92-1.98)	0.12310		0.32(0.11-0.94)	0.03910		0.16(0.04-0.6)	0.00662	
Marital status												
Never married (Reference)	1.000		2	1.000			1.000		2	1.000		
Currently married	1.17 (1.03-1.34)	0.01966		0.84 (0.68-1.05)	0.13434		1.14 (0.64-2.02)	0.66400		1.15 (0.45-2.94)	0.76282	
Separated/divorced/widowed	0.64 (0.49-0.84)	0.00152		1.65 (1.14-2.39)	0.00809		1.02 (0.37-2.79)	0.97200		1.82 (0.49-6.78)	0.37012	

Continued

Table III (Continued). Logistic regression results of socio-demographic factors associated with tobacco.

Sociodemographic factors	Smoking tobacco currently						Having smokeless tobacco currently					
	Univariate model			Multivariable model			Univariate model			Multivariable model		
	cOR (95% CI)	p-value	df (model)	aOR (95% CI)	p-value	df (model)	cOR (95% CI)	p-value	df (model)	aOR (95% CI)	p-value	df (model)
Work status												
Government employee (Reference)	1.000		6	1.000			1.000		6	1.000		
Homemaker	0.06 (0.05-0.09)	0.00001		0.6 (0.4-0.91)	0.01680		0.33(0.13-0.83)	0.01830		1.08(0.27-4.21)	0.91720	
Non-government employee	1.5 (1.19-1.88)	0.00050		1.28 (1-1.63)	0.05116		1.31(0.45-3.84)	0.62040		0.89(0.29-2.68)	0.83125	
Retired	0.82 (0.67-1.01)	0.05927		1.05 (0.8-1.37)	0.73702		2.25 (1.1-4.59)	0.02620		1.99 (0.8-5)	0.14085	
Self-employed	1.66 (1.31-2.09)	0.00001		1.45 (1.12-1.87)	0.00416		1.84 (0.69-4.92)	0.22190		1.04 (0.37-2.88)	0.94424	
Student	0.29 (0.24-0.35)	0.00001		0.34 (0.25-0.45)	0.00000		0.78 (0.37-1.66)	0.51560		1.09 (0.34-3.52)	0.88455	
Unemployed	0.35 (0.28-0.43)	0.00001		0.94 (0.71-1.24)	0.66968		0.73 (0.31-1.71)	0.46560		0.97 (0.34-2.73)	0.95211	
Income estimate												
Less than 3,000 Riyals (Reference)	1.000		7	1.000			1.000		7	1.000		
3,000 Riyals to less than 5,000 Riyals	1.19 (0.96-1.49)	0.11750		0.81 (0.63-1.04)	0.09935		0.81 (0.39-1.67)	0.57054		0.7 (0.32-1.5)	0.35840	
5,000 Riyals to less than 7,000 Riyals	1.54 (1.24-1.91)	B		0.98 (0.75-1.27)	0.85255		1.12 (0.56-2.22)	0.75052		1.01 (0.47-2.2)	0.97001	
7,000 Riyals to less than 10,000 Riyals	1.69 (1.37-2.09)	0.00001		1.04 (0.8-1.34)	0.79046		0.51 (0.22-1.15)	0.10386		0.5 (0.2-1.26)	0.14000	
10,000 Riyals to less than 15,000 Riyals	1.53 (1.23-1.9)	0.00015		0.92 (0.7-1.21)	0.53567		0.13 (0.03-0.58)	0.00700		0.15 (0.03-0.69)	0.01475	
15,000 Riyals to less than 20,000 Riyals	1.46 (1.11-1.91)	0.00634		0.91 (0.65-1.26)	0.55768		0.42 (0.12-1.46)	0.17482		0.54 (0.14-2.07)	0.37126	
20,000 Riyals or more	1.4 (1.03-1.91)	0.03208		0.79 (0.56-1.13)	0.20365		0.41 (0.09-1.78)	0.23420		0.49 (0.11-2.28)	0.36415	

Note: cOR=crude Odds Ratio; aOR = adjusted Odds Ratio; df = degree of freedom; Though unknown income estimate is not compared, it was included in the analysis. Therefore df of the univariate income estimate model is 7, making the df of the multivariable model 24. The pseudo-R- square of the multivariable model for smoking tobacco is 0.278, and the pseudo-R-square of the multivariable model for smokeless tobacco is 0.278 and the pseudo-R-square of multivariable model for smokeless tobacco is 0.118.

1.12-1.87, $p=0.004$) more likely to smoke tobacco than government employees, whereas homemakers and students were 40% (aOR 0.60, 95% CI 0.40-0.91, $p=0.017$) and 66% (aOR 0.34, 95% CI 0.25-0.45, $p<0.001$) less likely to smoke tobacco as compared to a government employee.

From the adjusted analysis, men were at higher odds of using tobacco in smokeless form (aOR 8.03, 95% CI 2.77-23.27, $p<0.001$) as compared to females. Respondents in the 31 to 45 years age group were 5.84 times (aOR 5.84, 95% CI 1.87-18.25, $p=0.002$) more likely to use tobacco in the smokeless form than respondents from the >60 years group. Respondents who completed college/university/postgraduate were 84% (aOR 0.16, 95% CI 0.04-0.60, $p=0.007$) less likely to use tobacco in smokeless form when compared to respondents who can't read and write. Respondents whose income estimate was from 10,000 Riyals to less than 15,000 Riyals were 85% (aOR 0.15, 95% CI 0.03-0.69, $p=0.015$) less likely to use tobacco in smokeless form when compared with respondents whose income estimate was less than 3,000 Riyals.

Discussion

In the present study, 10195 respondents aged 15 to 101 were included for the final analysis. Tobacco smokers were 12.8% of the total study population, out of which 12% were daily tobacco smokers. Prevalence of smoked tobacco was found higher in male, age group 31 to 45 years, the high school completed respondents, currently married, self-employed, 7,000 Riyals to less than 10,000 Riyals income-earning respondents. The significant predictor of tobacco use in both univariate and multivariable models was sex, age group, education, marital status, and work status. From the multivariable model, males were 14.54 times more likely to smoke tobacco (aOR 14.54, 95% CI 11.07-19.11) compared to females and compared to respondents in >60 years of age group. In the adjusted analysis, men had higher odds of using smokeless tobacco (aOR 8.03, 95% CI 2.77-23.27) compared to women in the age group 31 to 45 years age group and respondents >60 years age group.

The present study's findings, which were based on colossal country-wide data, showed high rates of daily tobacco usage among men in Saudi. In the present study, tobacco smokers were 12.8% of the total study population, out of which

12% were daily tobacco smokers. This finding can be compared with results from a National Survey Health Promotion and Society, by Maziar et al¹⁰, where the tobacco smokers prevalence was 12.2%, and odds of smoking was high in men compared to women (21.5% vs. 1.1%). The finding was in dissimilarity with the Global Adult Tobacco Survey 2014 in Pakistan by Saqib et al¹¹, where the prevalence of tobacco usage was 19.1% among adults and out of which 12.4% used smoked, and 7.7% used smokeless tobacco.

In the present study, 25.5% of males use tobacco compared to 2% of females. According to the Global Adult Tobacco Survey of India 2016-17, the prevalence of smokeless tobacco was 28.6% (266.8 million), where 42% were men and 14.2% of women were currently using smokeless tobacco, which can be compared to present study observations¹². The finding contradicted Singh et al¹³, where she observed that females associated with higher age showed a high prevalence of tobacco usage. The less prevalence of tobacco use among females in the present study can be due to ethnic causes, since consuming tobacco is considered as inappropriate behaviour for women, and it is also possible that some females who are currently using tobacco in any form might have got panic of defaming and have given wrong information during the survey.

Homemakers and students were 40% (aOR 0.60, 95% CI 0.40-0.91) and 66% (aOR 0.34, 95% CI 0.25-0.45) less likely to smoke tobacco in comparison with a government employee, whereas self-employed were 1.45 times (aOR 1.45, 95% CI 1.12-1.87) more likely to smoke tobacco in contrast with a government employee where 22.9% of male migrant workers were current smokers. In the present study, the respondents with primary education were 5.72 times (aOR 1.72, 95% CI 1.13-2.62), more likely to smoke tobacco than respondents who could not read and write. The finding can be compared to a study by Fahed et al¹⁴, where 40.8% of male secondary school students were current smokers, and smoking cigarettes was the most common type (67.3%) accompanied by smoking Shish (22.4%). In the present study, respondents who completed college/university/postgraduate were 84% (aOR 0.16, 95% CI 0.04-0.60) less likely to consume smokeless tobacco than respondents who could not read and write. This finding is contrary to Abdalla et al¹⁵, where 17.6% of the medical students were current smokers, and 39.8% were past smokers.

Though KSA adopted the global FCTC in May 2005, data regarding illicit trading is not reported in the present study. In a worldwide adult tobacco survey in Brazil by Iglesias et al¹⁶, smoking prevalence increased to 31.1% from 16.6%, as observed during 2008 and 2013. Regardless of gender, age, educational level, area of residence, and number of cigarettes consumed, there was an increase in illegal consumption of tobacco and a decrease in the prevalence of smoking cigarette.

The Investment Case for Non-communicable Disease Prevention and Control in the Kingdom of Saudi Arabia concluded that increasing taxation on tobacco could contribute a significant supplementation of income to the government. Besides, relevant funds should be assigned for public health programs for NCD prevention and control activities in Saudi Arabia. The dedication of Vision 2030 will be at risk if the risk factors of NCD are not put to an end by acting rapidly to prevent the prevalence of NCD among the relatively increasing young population of Saudi Arabia. This approach would enhance enormous growth in the economy and regenerate lives¹⁷.

Awareness regarding social, environmental, economic, second-hand smoking and the adverse effects of tobacco usage should be implemented at all levels of prevention. The main focus of prevention should include tobacco counseling and cessation programs, nicotine replacement therapy, health education, communication, and promotion programs at the country and community levels. The burden can also be reduced by introducing 85% pictorial health warnings on all tobacco packaging, high taxation on tobacco products, implementing policy for smoke-free work zones, tobacco control education programs, and anti-tobacco media messages. Presently, at the Federal level, there is a tobacco control cell; implementing all the programs mentioned above may help control the prevalence of tobacco consumption. Potentially, increasing taxation on tobacco products can contribute a significant supplementation of income to the government, which can be utilized for preventive efforts and enforcement.

Novelties

The study findings were based on colossal country-wide data, and its wide-reaching sample size from household, that produced overall national estimates. Accurate methodology by train-

ing interviewers to avoid errors, quality of the data was monitored in real-time throughout the study. Advanced statistical approach was used in post-collection management of the data. Binary logistic regression and multivariable models were used applied to adjust for bias and to correct the estimates to be representative of the general population.

Limitations

The study is not without limitations. The study design is cross-sectional in nature, and hence temporal relation cannot be established from the findings. There can be recall and information bias due to participant responses in the questionnaire. Therefore we recommend further longitudinal prospective studies including other associated factors like comorbidities, second and third-hand smoking, other adverse habits, etc., which can help generalize the findings.

Conclusions

The study concluded that tobacco use is prevalent among both the male and female population of Saudi Arabia. Even though the Saudi Ministry of Health signed and ratified FCTC, there was an increase in tobacco use, especially in the 31-45 years of age group. These findings compel developing and implementing health education programs on quitting tobacco across Saudi Arabia with the knowledge and skills they need to intervene with tobacco consumption effectively. The Saudi Ministry of Health should increase taxation on tobacco and tobacco products in accomplishing the good health of the country.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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