

Original Article

Knowledge about the health risks of cigarette smoking in young adult smokers and nonsmokers university students: a comparative cross-sectional study

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Abstract

Tobacco use and related exposure in Pakistan are responsible for approximately 110,000 deaths. While previous studies have reported improved knowledge about the health risks of cigarette smoking among the general population due to ongoing tobacco control programs, fewer studies have investigated such knowledge in young adults. Thus, we conducted a comparative cross-sectional study of 220 young adult students aged 22 years (interquartile range (IQR) = 2) enrolled at a public university to assess their knowledge of the health risks of cigarette smoking and to compare this knowledge between smokers and nonsmokers. The self-administered semistructured questionnaire collected sociodemographic data, cigarette smoking status, and knowledge about the health risks of cigarette smoking. Data were analyzed using descriptive statistics, the chi-square test, and the Mann–Whitney U test. Overall, most young adults were nonsmokers (69.09%), and the remaining 30.91% of smokers smoked an average of 5.31 ± 2.40 cigarettes daily for 3.80 ± 1.33 years, primarily in rural areas ($p < 0.05$). Nearly half of the young adults showed good knowledge of the health risks of cigarette smoking, irrespective of smoking status (smokers = 54.41%, nonsmokers = 53.29%). Conversely, few young adults demonstrated poor knowledge (smokers = 10.29%, nonsmokers = 6.58%) about the health hazards of cigarette smoking. Our findings showed that smoking rates were higher among young adults in rural settings than in urban areas. In addition, knowledge of gender-specific health risks associated with cigarette smoking, such as pregnancy-related complications in female smokers and male impotence in male smokers, was low. Nonetheless, almost half of the young adults displayed good knowledge of most of the potential health risks of cigarette smoking, regardless of their smoking status.

Keywords

Health knowledge; Cigarette smoking; Young adult; Smokers; Nonsmokers; University students

1. Introduction

The tobacco epidemic is an enormous public health threat, killing over 8 million people annually, of which nearly 1.2 million deaths occur from secondhand smoke exposure [1]. All types of tobacco are detrimental to health, including pipe tobacco, water-pipe tobacco, roll-your-own tobacco, smokeless tobacco, bidis, cigarillos, kreteks, and cigars, but cigarette smoking is the most common form of tobacco used globally [2]. Tobacco smoke contains more than 4,000 chemicals with harmful exposure to human beings [3]. Moreover, it is one of the significant risk factors for noncommunicable diseases

(NCDs), such as chronic respiratory diseases, diabetes, cancer, and cardiovascular diseases [4].

Globally, there are 1.3 billion tobacco users, among whom over 80% live in low- and middle-income countries (LMICs), accumulating the highest burden of tobacco-related morbidity and mortality as reported by the World Health Organization (WHO) [2]. Although tobacco prevalence has declined over the last two decades across LMICs, the prospective prevalence is expected to surpass 12% in low- and 20% in middle-income countries [5]. The ultimate health consequences concerning tobacco can be a menace to the health systems of such countries due to the lack of preparedness to deal with the acute need for care of associated diseases [6].

In Pakistan, tobacco-related diseases are responsible for nearly 110,000 deaths. Tobacco use and exposure are responsible for the deaths of 15% of males and 1% of females, underscoring a notable gender disparity [7]. In Pakistan, 45.2% of rural households experience indoor tobacco smoke compared to 34.9% of urban households [8]. A recent report on the global tobacco epidemic revealed that among Pakistani males aged 15 to 49, the prevalence of cigarette smoking, tobacco smoking, tobacco use, and smokeless tobacco use was 21.9%, 22.6%, 34.6%, and 14.6%, respectively. On the other hand, the prevalence of cigarette smoking among females was considerably lower, with rates of 3.4%, 4.7%, 7.8%, and 3.4% for cigarette smoking, tobacco smoking, tobacco use, and smokeless tobacco use, respectively [9]. Additionally, 60% of smokers in Pakistan start using tobacco during their adolescent years. Of these, 47% initiate with smokeless tobacco products, and 45% begin with cigarettes. Water pipes account for only 8% of initial tobacco use, and 65% of users prefer cheaper brands [10]. Baluchistan Province has recorded a higher prevalence of smoking among middle-aged and older adults [11].

The WHO Framework Convention on Tobacco Control (FCTC) supports Pakistan as a member country in implementing complete tobacco control programs through its MPOWER initiative [12]. This initiative encompasses monitoring tobacco usage, suggesting interventions, protecting the public from tobacco smoke, offering assistance to those who wish to leave tobacco, cautioning about the hazards of tobacco, imposing prohibitions on the publicity, promotion, and sponsorship of tobacco products, increasing tobacco levies and developing sustainable alternatives to tobacco [13].

Strong evidence indicates that excessive use of health precautions increases public awareness about the health risks of tobacco use, elevates quit attempts, and lessens smoking uptake [14]. Furthermore, various studies have shown an improved level of knowledge regarding the health risks of cigarette smoking among the general population in consideration of micro- and macrolevel ongoing tobacco control programs [15, 16, 17]. Unfortunately, the literature lacks local studies focusing on the hazards of tobacco use in young adults. Therefore, this study was conducted to assess the knowledge about the health risks of cigarette smoking among young adults and to compare the knowledge level between smokers and nonsmokers.

2. Materials and methods

2.1. Study design and ethical approval

This comparative cross-sectional study involved human participants and was conducted in accordance with international ethical guidelines for research involving humans. The study received ethical and academic approval from the Departmental Academic Review Committee at COMSATS University Islamabad, Pakistan (No. DARC-CUI-LHR-19-021). By following these ethical standards, the study aimed to ensure the well-being and safety of the participants and to contribute to scientific knowledge in the field of public health.

2.2. Study setting

This study was carried out in a prominent public university in Lahore, comprising five operational campuses and 658 affiliated colleges [18]. The university has a student population of 49,520, enrolled in various degree programs and diploma courses. The study was conducted over a period of one month, from mid-October to mid-November 2019.

2.3. Participant recruitment

The study enrolled young adult participants between the ages of 18 and 24 who were currently enrolled in undergraduate degree programs or diploma courses and willing to share information about their smoking habits. The study primarily focused on cigarette smoking as a form of tobacco use. Participants who declined to participate or did not complete the survey questionnaire were excluded from the study.

2.4. Sample size and sampling technique

The sample size for this study was determined using the WHO calculator, with a significance level of 5% and test power of 95%. Anticipated population proportions were set at 0.30 and 0.06, and the proportion of male smokers (30%) and female smokers (6%) was derived from a previous study [19]. The final sample size was calculated to be 64, but to account for potential attrition, the sample size was increased to 80 for smokers and 80 for nonsmokers. Due to the relatively low prevalence of cigarette smoking among university students, efforts were made to ensure the representation of both smoker and nonsmoker participants. This was achieved through the use of a convenience sampling method and continued data collection until a minimum number of nonsmoker participants was reached.

2.5. Questionnaire construction

The semistructured questionnaire used in this study consisted of demographic information, cigarette smoking status, and knowledge about the health risks of cigarette smoking. The knowledge section of the questionnaire was adapted from previous studies with slight modifications [11, 12].

2.6. Data collection

Prior permission was obtained from the university and affiliated colleges' administration. Self-administered questionnaires in both English and Urdu were used to collect anonymous data. Before data collection, the research team explained the study's objectives to the young adults. The data enumerators comprised one trained medical graduate and two social sciences graduates who distributed questionnaires to eligible young adults. On average, respondents took between 8 and 12 minutes to complete the questionnaire.

2.7. Study measures

The study questionnaire collected demographic information of young adults, including age (in years), gender (male, female), area of residence (urban, rural), monthly household income [in Pakistani rupees (PKR)], family system (nuclear, joint), and field of study (social sciences, science and technology, and management sciences).

Additionally, current cigarette smoking status was assessed, along with supplemental questions regarding the duration of cigarette smoking and the number of ciga-

rettes smoked per day. The study instrument assessed participants' knowledge of the health risks associated with cigarette smoking, which covered the link between smoking and various diseases, such as ischemia, myocardial infarction, chronic obstructive lung diseases, and respiratory disorders, as well as the potential for smoking to cause various types of cancer. The questionnaire also included two gender-specific items that asked about the cause of male impotence and pregnancy-related complications. Participants were also asked about their knowledge of the harmful chemicals in cigarettes and their understanding of passive smoking and its potential risks.

Finally, young adults' knowledge regarding the health risks of cigarette smoking was assessed using a set of 14 questions, with each correct answer assigned one score. The overall knowledge of young adults was classified using the modified Bloom's cutoff point, with scores ranging between 11 and 13 (80 – 100%) classified as good, 7 – 10 (50 – 79%) as moderate, and less than 7 (< 50%) as poor [20].

Before the survey, the respondents who smoked cigarettes in the last 30 days (even a puff) were considered smokers. Moreover, to classify study participants as either rural or urban residents, we operationalized these categories as individuals who have resided predominantly in a rural or urban area for a significant duration of their lifetime and who have not relocated to an area with the opposite designation within the previous three-year period. This approach to classification aimed to capture a stable and enduring residency status for participants while accounting for potential fluctuations in residential location over time.

2.8. Statistical analysis

The collected data were entered into Statistical Package for Social Sciences (SPSS) [version 26.00 (IBM Corp., Armonk, NY, USA)]. Descriptive statistics were calculated using the frequencies, percentages, mean, standard deviation (SD), median, and interquartile range (IQR). To analyze the demographic characteristics of young adults by smoking status, including gender, area of residence, family system, and field of study, the chi-square test was used, with the Mann-Whitney U test used for age and monthly family income, based on the normality of data. The chi-square test compared the knowledge about specific and overall health risks of cigarette smoking in young adults by smoking status. A significance level of $p \leq 0.05$ was considered significant.

3. Results

Out of 220 respondents, the majority of young adults were nonsmokers (69.09%), while 30.91% were smokers. Table 1 reveals a significant difference in the number of nonsmokers between genders, with both male and female respondents having a significantly higher number of nonsmokers than smokers ($p < 0.003$). Additionally, a higher proportion of respondents residing in rural areas were smokers than those living in urban areas ($p = 0.007$). However, there was no significant difference in smoking prevalence among respondents when considering family system and field of study ($p = 0.123$ and 0.371).

Table 2 presents additional sociodemographic differences between respondents based on their cigarette smoking status. The results show no significant age or monthly household income differences between smokers and nonsmokers ($p = 0.412$ and 0.138). Smokers were also asked about the duration of their cigarette smoking and the average number of cigarettes smoked per day. On average, smokers reported smoking for 3.80 ± 1.33 years and consuming 5.31 ± 2.40 cigarettes per day.

Table 1. Young adults' characteristics by cigarette smoking status (n = 220).

Sociodemographic Factors		Smokers n = 68		Nonsmokers n = 152		p value *
		N	%	N	%	
Gender	Male	57	37.01	97	62.99	0.003 **
	Female	11	16.67	55	83.33	
Area of residence	Urban	33	24.26	103	75.74	0.007 **
	Rural	35	41.67	49	58.33	
Family system	Nuclear	51	34.29	98	65.77	0.123
	Joint	17	23.94	54	76.06	
Field of study	Social Sciences	15	35.71	27	64.29	0.371
	Science and Technology	39	27.66	102	72.34	
	Management Sciences	14	37.84	23	62.16	

* Variables were compared using the Chi-square test. ** Significant value ($p \leq 0.05$).

Table 2. Young adults' demographic attributes by cigarette smoking status (n = 220).

Sociodemographic Factors		Smokers n = 68		Nonsmokers n = 152		p value *
		Median	IQR	Median	IQR	
Age (in years)		22.00	2.00	22.00	2.00	0.412
Monthly family income (in PKR)		50,000.00	30,750.00	44,000.00	27,750.00	0.138

* Variables were compared using the Mann-Whitney U test.

Table 3 shows that overall knowledge of the health risks of cigarette smoking was high among smokers and nonsmokers, with no significant difference for myocardial ischemia and infarction ($p = 0.083$), chronic obstructive lung diseases ($p = 0.716$), respiratory disorders ($p = 0.246$), and six types of cancers.

Table 3. Health risks of cigarette smoking in young adults by smoking status (n = 220).

Health Risks of Cigarette Smoking	Smokers n = 68		Nonsmokers n = 152		p value *
	N	%	N	%	
Myocardial ischemia and infarction	50	73.53	127	83.55	0.083
Chronic obstructive lung diseases	56	82.35	122	80.26	0.716
Respiratory disorders	56	82.35	134	88.16	0.246
Esophagus cancer	55	80.89	117	76.97	0.598
Larynx cancer	54	79.41	116	76.32	0.613
Lung cancer	58	85.29	142	93.42	0.053
Pharynx cancer	59	86.76	125	82.24	0.402
Stomach cancer	51	75.00	110	72.37	0.684
Oral cavity cancer	57	83.82	130	85.53	0.744
Cause of male impotence	27	47.37	61	62.89	0.077
Pregnancy-related complications	7	63.64	41	74.55	0.259
Cigarette contains hazardous toxic substances	51	75.00	115	75.66	0.917
Cigarette contains hazardous chemical compounds	53	77.94	124	81.58	0.529
Passive smoking is as dangerous as active smoking	50	73.53	111	73.03	0.938

* All variables were compared using the chi-square test. ** Two variables are analyzed gender specific, including the 'cause of male impotence' (i.e., males: smokers = 57, nonsmokers = 97) and 'pregnancy-related complications' (i.e., female: smokers = 11, nonsmokers = 55)

Table 4 presents the overall level of knowledge in young adults based on the modified Bloom's cutoff point. Nearly half of the respondents demonstrated good knowledge

about the health risks of cigarette smoking, regardless of smoking status (smokers = 54.41%, nonsmokers = 53.29%), followed by moderate knowledge. However, a small number of respondents, whether smokers (10.29%) or nonsmokers (6.58%), had poor knowledge about the health risks of cigarette smoking. Nevertheless, the overall level of knowledge in young adults did not vary significantly by smoking status ($p = 0.567$).

Table 4. Overall knowledge of health risks of cigarette smoking in young adults (n = 220).

Health Risks of Cigarette Smoking	Smokers n = 68		Nonsmokers n = 152		p value *
	N	%	N	%	
Good	37	54.41	81	53.29	0.567
Moderate	24	35.29	61	40.13	
Poor	7	10.29	10	6.58	

* Variables were compared using the chi-square test.

4. Discussion

Our study revealed that many young male adults were smoking cigarettes, with a higher likelihood of smoking among those living in rural areas than in urban areas. Additionally, our findings indicated a long duration of addiction and significant daily cigarette consumption among young adults with a smoking history. While nearly half of the young adults had good knowledge about potential health risks associated with cigarette smoking, the other half had a moderate to low level of knowledge, irrespective of their smoking status.

Our results are consistent with the study performed to determine smoking patterns and risk awareness among young adults from twenty-three countries by recruiting students from the age of 17 to 30 years enrolled in courses unrelated to healthcare [21]. The study highlighted that smoking was more prevalent in developed and developing countries. Moreover, most respondents' overall level of smoking risk awareness was satisfactory. However, contrary to our study results, specific health risk awareness was low among youngsters from the developing world who were unaware of the specific health risk of tobacco smoking [21]. Another Polish study assessed awareness of the harmful effects of secondhand smoke among smokers and nonsmokers and reported that most respondents had good levels of awareness, except for cancer-related risk factors, which were low among smokers and males [22]. The improved knowledge of young adults may be due to mass media awareness campaigns, printed warning signs on smoking packs, and displayed banners over smoking shops and stalls [23, 24]. However, in contrast with our results, an Iraqi study found that the level of awareness regarding health risks and specific healthcare issues among smokers was comparatively lower than that among nonsmokers [25].

It is evident from the literature that smoking behavior is related to gender [26]. However, smoking was restricted to males in the earlier 19th century when the masculine smoking style was symbolized as 'aggressive' or 'rude' [27]. However, this trend gained popularity among females by the mid-20th century, ultimately reducing this gender gap significantly, especially in Western countries where females smoke just as much, if not more, than their male counterparts [28]. Various factors contribute to women's likelihood of smoking cigarettes, including age, media influence, social pressures, working environment, and social norms [29]. Furthermore, many female smokers reported pleasure as one of the main reasons for cigarette smoking. The upward trend of smoking among young females can also be attributed to marketing campaigns of the tobacco industry targeting women as potential customers [30].

Our results align with a US-based study reporting a higher prevalence of smoking among residents of rural areas (28%) than among those living in urban areas (22%) [31]. Another Chinese study reported a high prevalence of smoking among students from rural communities compared to those from urban communities, with an overall good level of awareness regarding the health risks of smoking [32]. Contrary to our study results, a German national survey assessed disparities among societies in smoking behaviors by including more than one million respondents above the age of 10 years and reported that people living in urban societies were likelier to be smokers than those living in rural societies [33]. However, the smoking status of people in rural areas was influenced by gender, socioeconomic status, and unemployment status [34, 35].

Generally, knowledge of the gender-specific health risks of cigarette smoking, such as pregnancy-related complications in female smokers and male impotence in male smokers, is low [25, 36]. For example, in our study, female smokers were comparatively less aware of pregnancy-related complications, consistent with another study performed in a healthcare facility to assess the health risks of smoking specifically to genders and reported that the majority of the respondents were well aware of the common health risks associated with smoking [37]. However, most respondents were unaware that smoking causes ectopic pregnancy, cervical cancer, and early menopause. This may be due to the dissemination of specific and limited warning signs regarding hazardous health risks of cigarette smoking, e.g., lung and mouth cancer, through print media, electronic media, warning labels on cigarette packs, and display of compulsory warning signs at the point of sale of tobacco products [38]. Moreover, age positively correlates with better knowledge of smoking health risks, suggesting lower health risks among young adults but higher knowledge among older adults [39].

This study recruited young male and female adults with reasonably educated profiles who can better comprehend the information requested belonging to diverse socio-demographic backgrounds. Moreover, the study provides baseline information on the knowledge-related health risks of cigarette smoking from the local context, which marks the potential strengths of the study. On the other hand, the study also bears some limitations. For example, the convenience sampling method may contribute to biases in the study. In addition, the study cannot be generalized to the community's young adults who have never been enrolled in university education. Therefore, we recommend that future large-scale surveys be conducted to explore knowledge about the health risks of cigarette smoking among young adults in the community.

5. Conclusions

The study findings showed that smoking rates were higher among students living in rural areas than among those living in urban areas. Moreover, knowledge of gender-specific health risks associated with cigarette smoking, such as pregnancy-related complications in female smokers and male impotence, was low. Despite this, almost half of the young adults showed good knowledge of the potential health risks of cigarette smoking, irrespective of their smoking status. Nonetheless, the study identified a research gap regarding the determinants that prevent young adults from quitting smoking, emphasizing further research to assess these determinants and propose policy implications.

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Ethics statement: The study received ethical and academic approval from the Departmental Academic Review Committee at COMSATS University Islamabad, Pakistan (No. DARC-CUI-LHR-19-021).

Consent to participate: Informed consent was obtained from all university students included in the study.

Data availability: The data supporting this study's findings are available from the corresponding author, Misrat, upon reasonable request.

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Conflicts of interest: The authors declare no conflicts of interest.

References

- [1] Institute of Health Metrics. About GBD. 2022 [cited 30 June 2022]. Available from: <https://www.healthdata.org/gbd/about>.
- [2] World Health Organization. Tobacco. 2022 [cited 30 June 2022]. Available from: <https://www.who.int/news-room/fact-sheets/detail/tobacco>.
- [3] Adeoye IA. Alcohol consumption and tobacco exposure among pregnant women in Ibadan, Nigeria. *BMC Psychiatry*. 2022;22:570. <https://doi.org/10.1186/s12888-022-04210-9>
- [4] Aryal UR, Bhatta DN. Perceived benefits and health risks of cigarette smoking among young adults: Insights from a cross-sectional study. *Tob Induc Dis*. 2015;13:22. <https://doi.org/10.1186/s12971-015-0044-9>
- [5] WHO global report on trends in prevalence of tobacco use 2000-2025. Final report. Geneva (GE): World Health Organization; 2021 Nov. Report No.: 9789240039322.
- [6] Theilmann M, Lemp JM, Winkler V, Manne-Goehler J, Marcus ME, Probst C, et al. Patterns of tobacco use in low and middle income countries by tobacco product and sociodemographic characteristics: Nationally representative survey data from 82 countries. *BMJ*. 2022;378:e067582. <https://doi.org/10.1136/bmj-2021-067582>
- [7] The Union. Tobacco control in Pakistan: The tobacco epidemic. 2022 [cited June 2022]. Available from: <https://theunion.org/our-work/tobacco-control/bloomberg-initiative-to-reduce-tobacco-use-grants-program/tobacco-control-in-pakistan#:~:text=15%25%20of%20male%20deaths%20and,tobacco%2Drelated%20diseases%20in%20Pakistan.>
- [8] Masud H, Oyebode O. Inequalities in smoking prevalence: A missed opportunity for tobacco control in Pakistan. *J Public Health*. 2018;40(2):271-8. <https://doi.org/10.1093/pubmed/fdx044>
- [9] World Health Organization. WHO report on the global tobacco epidemic, 2021: Addressing new and emerging products. 2021 [cited 30 June 2022]. Available from: https://www.drugsandalcohol.ie/34629/1/WHO_report_on_the_global_tobacco_epidemic_2021.pdf.
- [10] Pakistan Institute of Development Economics. How do smokers respond to tobacco tax increases in Pakistan?. 2021 [cited 30 June 2022]. Available from: <https://www.pide.org.pk/pdf/pideresearch/rr-042-switch-reduce-or-quit-how-do-smokers-respond-to-tobacco-tax-increases-in-pakistan.pdf>.
- [11] Bala MM, Strzeszynski L, Topor-Madry R. Mass media interventions for smoking cessation in adults. *Cochrane Database Syst Rev*. 2017;11:CD004704. <https://doi.org/10.1002/14651858.CD004704.pub4>
- [12] World Health Organization. Pakistan: Tobacco free initiative. 2022 [cited 30 June 2022]. Available from: <https://www.emro.who.int/pak/programmes/tobacco-free-initiative.html>.
- [13] Saqib MAN, Rafique I, Qureshi H, Munir MA, Bashir R, Arif BW, et al. Burden of tobacco in Pakistan: Findings from global adult tobacco survey 2014. *Nicotine Tob Res*. 2018;20(9):1138-43. <https://doi.org/10.1093/ntr/ntx179>
- [14] Trofor AC, Papadakis S, Lotrean LM, Radu-Loghin C, Eremia M, Mihaltan F, et al. Knowledge of the health risks of smoking and impact of cigarette warning labels among tobacco users in six European countries: Findings from the EUREST-PLUS ITC Europe Surveys. *Tob Induc Dis*. 2018;16(2):10. <https://doi.org/10.18332/tid/99542>
- [15] Hameed A, Malik D. Assessing the knowledge, attitude, and practices of cigarette smokers and use of alternative nicotine delivery systems in Pakistan: A cross-sectional study. *Adv Public Health*. 2021;2021:5555190. <https://doi.org/10.1155/2021/5555190>
- [16] Khan FM, Husain SJ, Laeeq A, Awais A, Hussain SF, Khan JA. Smoking prevalence, knowledge and attitudes among medical students in Karachi, Pakistan. *East Mediterr Health J*. 2005;11(5/6):952-58.
- [17] Naeem M, Khan S, Abbas SH, Khan A, Islam MZ. Knowledge, attitude and practice of tobacco smoking among medical students in Khyber Pakhtunkhwa. *J Med Sci*. 2018;26(1):3-8.
- [18] University of the Punjab. Introduction. 2022 [cited 30 June 2022]. Available from: <http://pu.edu.pk/page>.
- [19] Zubair F, Iftikhar ul Husnain M, Zhao T, Ahmad H, Khanam R. A gender-specific assessment of tobacco use risk factors: Evidence from the latest Pakistan demographic and health survey. *BMC Public Health*. 2022;22:1133. <https://doi.org/10.1186/s12889-022-13574-2>
- [20] Seid MA, Hussen MS. Knowledge and attitude towards antimicrobial resistance among final year undergraduate paramedical students at University of Gondar, Ethiopia. *BMC Infect Dis*. 2018;18:312. <https://doi.org/10.1186/s12879-018-3199-1>

- [21] Steptoe A, Wardle J, Cui W, Baban A, Glass K, Pelzer K, et al. An international comparison of tobacco smoking, beliefs and risk awareness in university students from 23 countries. *Addiction*. 2002;97(12):1561-71. <https://doi.org/10.1046/j.1360-0443.2002.00269.x>
- [22] Milcarz M, Polanska K, Bak-Romaniszyn L, Kaleta D. Tobacco health risk awareness among socially disadvantaged people—A crucial tool for smoking cessation. *Int J Environ Res Public Health*. 2018;15(10):2244. <https://doi.org/10.3390/ijerph15102244>
- [23] Carson-Chahhoud KV, Ameer F, Sayehmiri K, Hnin K, van Agteren JE, Sayehmiri F, et al. Mass media interventions for preventing smoking in young people. *Cochrane Database Syst Rev*. 2017;6:CD001006. <https://doi.org/10.1002/14651858.CD001006.pub3>
- [24] Parascandola M, Xiao L. Tobacco and the lung cancer epidemic in China. *Transl Lung Cancer Res*. 2019;8(Suppl 1):S21-S30. <https://doi.org/10.21037/tlcr.2019.03.12>
- [25] Dawood OT, Rashan MA, Hassali MA, Saleem F. Knowledge and perception about health risks of cigarette smoking among Iraqi smokers. *J Pharm Bioallied Sci*. 2016;8(2):146-51. <https://doi.org/10.4103/0975-7406.171738>
- [26] Chinwong D, Mookmanee N, Chongpornchai J, Chinwong S. A comparison of gender differences in smoking behaviors, intention to quit, and nicotine dependence among Thai university students. *J Addict*. 2018;2018:8081670. <https://doi.org/10.1155/2018/8081670>
- [27] Triandafilidis Z, Ussher JM, Perz J, Huppatz K. Doing and undoing femininities: An intersectional analysis of young women's smoking. *Fem Psychol*. 2017;27(4):465-88. <https://doi.org/10.1177/0959353517693030>
- [28] Linhart C, Naseri T, Lin S, Taylor R, Morrell S, McGarvey ST, et al. Tobacco smoking trends in Samoa over four decades: Can continued globalization rectify that which it has wrought?. *Global Health*. 2017;13:31. <https://doi.org/10.1186/s12992-017-0256-2>
- [29] Heris CL, Chamberlain C, Gubhaju L, Thomas DP, Eades SJ. Factors influencing smoking among indigenous adolescents aged 10–24 years living in Australia, New Zealand, Canada, and the United States: A systematic review. *Nicotine Tob Res*. 2020;22(11):1946-56. <https://doi.org/10.1093/ntr/ntz219>
- [30] Kong G, Kuguru KE, Krishnan-Sarin S. Gender differences in US adolescent e-cigarette use. *Curr Addict Rep*. 2017;4:422-30. <https://doi.org/10.1007/s40429-017-0176-5>
- [31] Doescher MP, Jackson JE, Jerant A, Gary Hart L. Prevalence and trends in smoking: A national rural study. *J Rural Health*. 2006;22(2):112-8. <https://doi.org/10.1111/j.1748-0361.2006.00018.x>
- [32] Ho MG, Ma S, Chai W, Xia W, Yang G, Novotny TE. Smoking among rural and urban young women in China. *Tob Control*. 2010;19(1):13-8. <https://doi.org/10.1136/tc.2009.030981>
- [33] Völzke H, Neuhauser H, Moebus S, Baumert J, Berger K, Stang A, et al. Urban-rural disparities in smoking behaviour in Germany. *BMC Public Health*. 2006;6:146. <https://doi.org/10.1186/1471-2458-6-146>
- [34] Efendi F, Aidah FN, Has EM, Lindayani L, Reisenhofer S. Determinants of smoking behavior among young males in rural Indonesia. *Int J Adolesc Med Health*. 2019;33(5):20190040. <https://doi.org/10.1515/ijamh-2019-0040>
- [35] Pham T, Nguyen NTT, ChieuTo SB, Pham TL, Nguyen TX, Nguyen HTT, et al. Gender differences in quality of life and health services utilization among elderly people in rural Vietnam. *Int J Environ Res Public Health*. 2019;16(1):69. <https://doi.org/10.3390/ijerph16010069>
- [36] Levis DM, Stone-Wiggins B, O'Hegarty M, Tong VT, Polen KN, Cassell CH, et al. Women's perspectives on smoking and pregnancy and graphic warning labels. *Am J Health Behav*. 2014;38(5):755-64. <https://doi.org/10.5993/AJHB.38.5.13>
- [37] Oechsle A, Wensing M, Ullrich C, Bombana M. Health knowledge of lifestyle-related risks during pregnancy: A cross-sectional study of pregnant women in Germany. *Int J Environ Res Public Health*. 2020;17(22):8626. <https://doi.org/10.3390/ijerph17228626>
- [38] Lundborg P, Andersson H. Gender, risk perceptions, and smoking behavior. *J Health Econ*. 2008;27(5):1299-311. <https://doi.org/10.1016/j.jhealeco.2008.03.003>
- [39] Minh An DT, Van Minh H, Huong LT, Giang KB, Xuan LTT, Hai PT, et al. Knowledge of the health consequences of tobacco smoking: A cross-sectional survey of Vietnamese adults. *Glob Health Action*. 2013;6:18707. <https://doi.org/10.3402/gha.v6i0.18707>