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SCOPING REVIEW

Prevalence, Risk Factors, and Intervention Approaches Related to Adolescent Smoking in Pakistan: A Scoping Review

Fahad Ali Mangrio,[1] Penpaktr Uthis,[1] Suwimon Rojnawee,[1] Alicia K Matthews[2]

1. Faculty of Nursing, Chulalongkorn University Bangkok, Thailand.
2. Columbia University School of Nursing, New York, United States.

Correspondence to: Penpaktr Uthis, Email: penpaktr_uthis@yahoo.com, ORCiD: 0000-0001-9169-0542

ABSTRACT

The study aimed to explore prevalence, risk factors, and intervention approaches related to adolescent smoking in Pakistan. Databases included PubMed, Scopus, Embase, Google Scholar, and ProQuest. Studies were selected on Pakistani adolescents aged 10-21 years, original or secondary articles published in English, and the use of qualitative and quantitative methods. Out of 1300 articles, 300 duplicates were removed. After reviewing titles and abstracts, 980 records were excluded. The full text of the 18 remaining studies was reviewed based on inclusion criteria, with 13 eligible studies included. Data extraction included author, age, setting, design, sample, theory, prevalence, risk factors, findings, and appraisal. Ten eligible studies reported varying prevalence rates of adolescent smoking in Pakistan, ranging from 09% to 61.14%. Individual risk factors associated with smoking included disposition, mood, and substance abuse. Social risk factors included family and peer influences, including father's smoking status, family members' tobacco use, and peer pressure. Environmental risk factors, including attendance at a public school, school-related pressure, exposure to tobacco use on social media, and lower socioeconomic status, significantly increased the likelihood of smoking among adolescents. Three studies evaluating prevention and intervention approaches demonstrated positive outcomes, including increased awareness of smoking harms, attitude shifts, and increased intention to quit smoking. This scoping review identified the influence of individual, social, and environmental risk factors on adolescent smoking. Educational interventions showed positive results on knowledge and attitude; however, none specifically focused on smoking cessation. Future research should focus on addressing these risk factors and implementing theory-guided interventions.

Keywords: Adolescents, Prevalence, Prevention Approaches, Risk Factors, Smoking Behavior.

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INTRODUCTION

Cigarette smoking is the most common form of tobacco consumption worldwide,[1] and represents a leading preventable cause of premature morbidity and mortality.[2] According to the World Health Organization, 1.3 billion people worldwide are current tobacco users, with about 80% of these individuals living in low- and middle-income countries.[3] A significant and consistent body of research has found that smoking has a detrimental impact on nearly every organ in the body,[4] and is associated with a ten-year reduction in life expectancy compared to non-smokers.[2] However, quitting smoking before the age of 40 years can reduce smoking-related mortality risk by approximately 90%.[5,6] Globally, adult smoking prevalence in 2020 was 32.6%.[7] Data from a recent household survey conducted in Pakistan found that the prevalence of tobacco smoking among adults was 21.2%.[8] In addition, research data suggests that tobacco kills over 163,600 individuals annually in Pakistan, and almost 31,000 of these deaths are due to exposure to secondhand smoke.[9]

Research suggests that most adults who smoke begin smoking during adolescence, which is a developmental period characterized by experimentation with a range of risky behaviors.[10] Adolescents are more susceptible to individual, social, and environmental factors that encourage smoking, including peer pressure, parental smoking, exposure to media, and tobacco advertising.[11] The extant literature suggests that individuals who start smoking at an early age are more likely to become regular smokers and have difficulty quitting in adulthood.[12] Further, tobacco abuse among adolescents is associated with various mental and physical health

problems, including increases in depression, stress, disturbances in sleeping patterns, sleep apnea, and a range of oral health problems, including periodontal disease.[13-16]

The Pakistan Global Youth Tobacco survey suggests that 13.7% of adolescents between the ages of 13 and 15 years reported ever smoking cigarettes, with 3.3% reporting regular smoking.[17] However, the prevalence of cigarette smoking among adolescents in Pakistan varies significantly based on age (range 1.8% to 48.7%), with the highest levels reported among those in their late teens and early twenties.[18-21] In addition, a substantial percentage of adolescents are exposed to secondhand smoke in a variety of settings, including public places (38%), at home (21%), and on school premises (20.3%).[22] These data, combined, suggest that adolescents and young adults in Pakistan are at elevated risk for smoking-related illnesses due to direct and indirect exposures, warranting additional research to understand and intervene on risk factors associated with smoking initiation.

Several studies have been conducted to examine risk factors associated with adolescent smoking in low- and middle-income countries. For example, a study conducted in Nepal [23] identified several factors related to adolescent smoking including having friends who smoke, a family history of tobacco, being separated from one's family, and ethnicity. Furthermore, research conducted in Bosnia and Herzegovina found that having more disposable income and exposure to secondhand smoke at home were associated with increased cigarette smoking behavior among adolescents.[24] In Brazil, factors linked to adolescent smoking included not living at home, participation in student parties, and poor study habits .[25]

The existing literature suggests that the prevalence of adolescent smoking in Pakistan is elevated, with notable variations in smoking rates across different age groups.[18,26] The international literature related to adolescent smoking suggests a complex web of determinants that affect smoking behavior, including peer influence, family history, socioeconomic status, and culture, to name a few.[27,28] However, factors associated with smoking among adolescents in Pakistan are poorly understood, contributing to barriers to the development of effective tobacco prevention and control initiatives in this population.

The overall goal of this scoping review was to systematically review the available literature on cigarette smoking among adolescents in Pakistan. Specific objectives were to 1) describe smoking prevalence rates, 2) explore the risk factors of cigarette smoking among adolescents in Pakistan, 3) evaluate the prevention approaches and interventions used in Pakistan for adolescent cigarette smoking behavior, and 4) evaluate the quality of the research related to risk factors that contribute to adolescent smoking behavior. Study findings have implications for researchers, policymakers, and public health practitioners aimed at improving the prevention and control of tobacco use among adolescents in Pakistan.

METHODS

This scoping review was reported following the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR).[29] The PRISMA-ScR comprises a 27-item checklist and a four-phase flow diagram to increase the completeness and overall rigor of reporting methodological procedures associated with scoping reviews.

Ethical Considerations:

This study included no human participants, and no ethical review was performed for it.

Eligibility Criteria:

Eligibility criteria for this scoping review included the following criteria: (1) adolescents living in Pakistan, (2) age 10 to 21 years old, (3) studies based on original research or secondary data analyses, (4) English language publication, and (5) qualitative or quantitative study designs.

Information Sources:

We conducted an extensive search for research articles using PubMed, Scopus, Embase, Google Scholar, and ProQuest. The initial step involved developing search terms using PubMed Mesh terms and keywords and using Boolean terms and operators. Keywords included "Adolescents cigarette smoking Pakistan" OR "Youth smoking behavior Pakistan" OR "Tobacco use adolescents Pakistan" OR "Smoking risk factors adolescents Pakistan" OR "Adolescent tobacco consumption Pakistan" OR "Teen smoking Pakistan" OR "Smoking initiation predictors Pakistan" OR "Pakistani youth smoking determinants" OR "Tobacco prevalence among adolescents Pakistan" OR "Smoking habits teenage Pakistan" AND "Adolescents prevention OR awareness program OR interventions on smoking behavior in Pakistan"

Selection of Evidence:

The database search yielded 1300 articles. (Figure 1) Two independent reviewers screened the titles and abstracts of potential articles to determine eligibility. If an article potentially met the inclusion criteria, we

obtained and reviewed the complete articles to confirm eligibility and inclusion in the review. Disagreements between reviewers were resolved through discussion or involving a third reviewer when necessary.

Three hundred duplicate articles were removed using the EndNote "find duplicate" library feature and manual inspection. During the title and abstract screening process, 980 records were excluded based on failure to meet study eligibility criteria. Of these, 250 articles were not focused on risk factors associated with adolescent smoking, and the remaining 730 articles were not specific to Pakistan. Next, full-text versions were obtained for the remaining 18 articles. Two authors (F.A.M and S.R) independently reviewed these articles based on study inclusion and exclusion criteria. After the full-text review, a final sample of 13 articles was determined eligible and included in this scoping review (Figure 1).

Data Charting Process:

Data were charted using a data extraction form developed by the research team. When reviewing the research findings associated with smoking risk behaviors, each author conducted data charting independently, collecting the following information: author and year, age of study participants, setting, study design, sample size, theory used, statistical analysis, prevalence of cigarette smoking, identified risk factors, key findings, and quality appraisal score. A secondary goal was to review the research on prevention interventions. The following information was extracted and charted in Tables 1 and 2: study author(s), aims, design, the age of study participants, the sample size and sampling strategies, intervention setting, procedures and duration, the inclusion of a guiding theory, primary outcomes, and quality scores.

Quality Appraisal:

A quality appraisal is typically not conducted in a scoping review because the primary goal of such a review is to explore the breadth and extent of existing evidence.[30] However, conclusions and recommendations for addressing gaps in the available literature are contingent on the methodological rigor of the data reviewed. As such, the Joanna Briggs Institute,[31] Critical Appraisal tools for cross-sectional studies were used to evaluate the methodological quality of eligible studies. This tool covers eight components: the study objectives, inclusion criteria, information about study participants and setting, measurement quality, identification and management of potential confounding variables, and statistical analyses. First, the eight components were rated on a three-point scale (1=strong, 2=moderate, 3=weak) based on the quality rating criteria defined.[32] An overall "strong" rating was described as having no weak and at least six strong ratings. An overall "moderate" rating was described as one weak rating and less than six strong ratings. A "weak" rating was warranted if two or more weak ratings were across the eight evaluation components.[33]

A second Joanna Briggs Institute,[32] Critical Appraisal tool was used to evaluate the methodological quality of quasi-experimental studies included in the review. It consists of nine components: identifying cause and effect, comparison group, control group, multiple measurement outcomes, follow-up process, outcomes control group, outcomes measured, and statistical analysis used. First, the nine components were rated on a three-point scale (1=strong, 2=moderate, 3=weak). An overall " strong " rating was defined as having no weak or at least seven strong ratings. An overall "moderate" rating was described as one weak rating and less than seven strong ratings. Finally, a "weak" rating was warranted if there were two or more weak ratings across the nine evaluation components.

RESULTS

Description of Eligible Studies:

Study designs: Out of the 1300 articles identified, 13 met the study eligibility criteria. Twelve of the 13 studies included in the review used a cross-sectional design. The remaining article used a quasi-experimental study design (Tables 1 and 2). Ten studies investigated factors influencing adolescent smoking behavior in Pakistan, with sample sizes ranging from 90 to 8723. Three additional studies evaluated the impact of prevention programs targeting adolescent cigarette smoking on awareness of smoking harms, attitudes, and intention to quit smoking, with sample sizes ranging from 200 to 650. Various sampling strategies were reported, including random sampling,[26,34-36] convenience sampling,[37] and cluster sampling.[19, 38, 39] Most studies[18, 19, 26, 35-38, 40, 41] were conducted in school and college settings, while three studies[34,39,42] were community-based. The recruitment strategies utilized varied and were based on the study setting. Gender representation varied considerably across the studies. Most studies focused exclusively on male adolescents.[19,26,34,36,43] In contrast, only one study recruited an exclusively female study sample,[38] and three included a balanced mix of male and female participants.[35,37,39] The age ranges within the adolescent spectrum varied from study to study. However, all studies included ages ranging from 10 to 21 years.[18,19,34-37,39,43]

Quality Appraisal: The methodological rigor of the

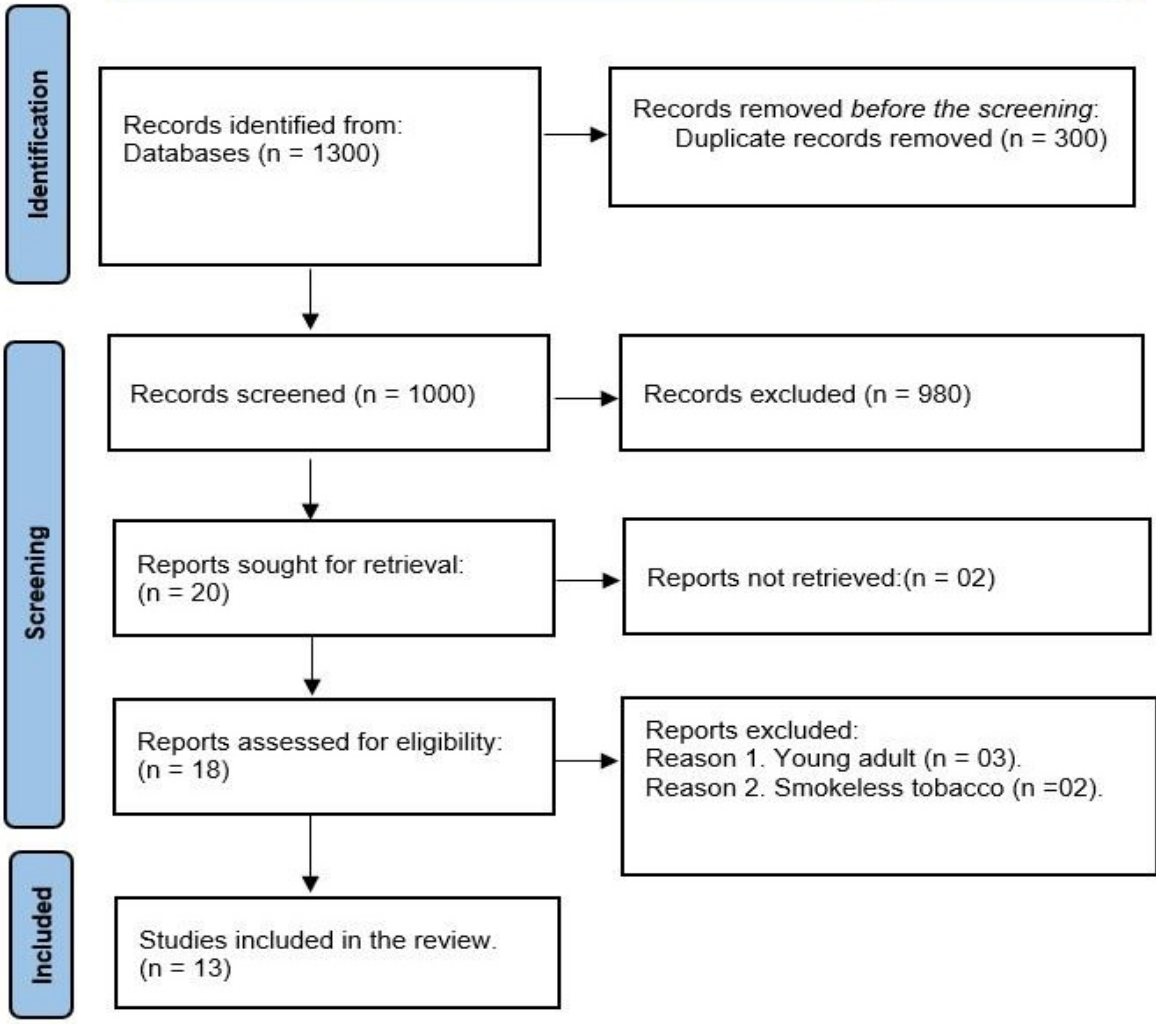

Figure 1: PRISMA flow diagram showing identification of studies via databases and registers

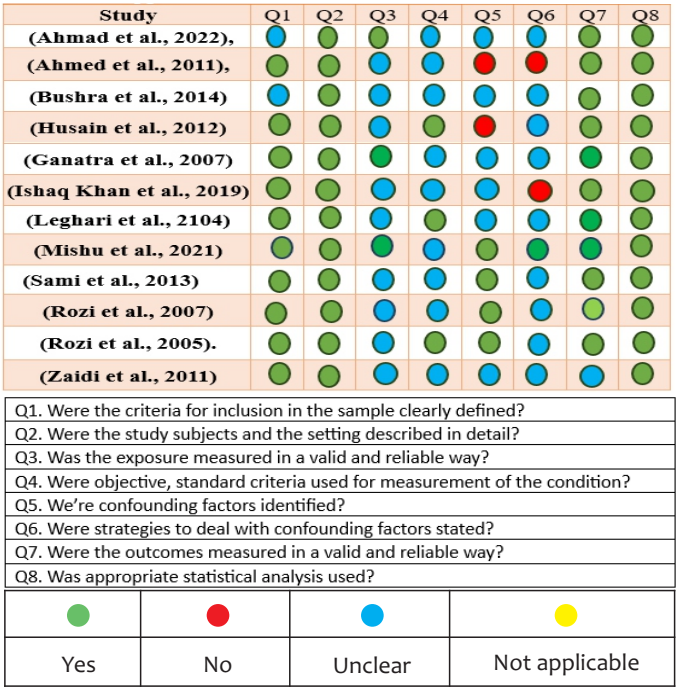

Figure 2: Quality assessment of included cross sectional studies

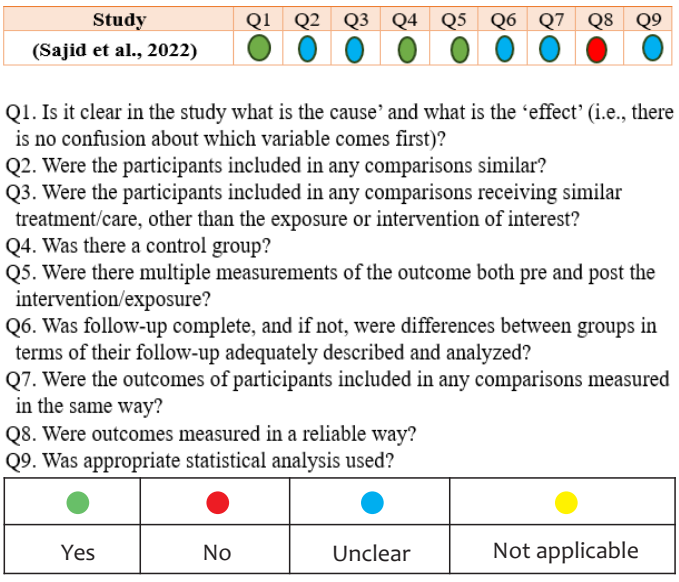

Figure 3: Quality assessment of Quasi Experimental study

eligible studies was limited with all but one of these studies[19,26,34,38,42,43] were determined to be of weak quality based on the JBI quality indicator scores.[31,32] The most common factor negatively impacting the quality of cross-sectional studies was the failure to identify and control potential confounding variables. Another source of potential bias was the absence of an objective measure of smoking status.[32] The quality appraisal score for the quasi-experimental trial was 3 out of 9 due to 'unclear ratings' on seven components with limited information on study procedures and intervention delivery. In addition, a consistent problem identified for each of the studies reviewed was the lack of a theoretical framework that guided the selection of study variables (Figure 2-3).

Measurement and Prevalence of Smoking Behavior: Current smoking status was measured using self-reported methods in all studies. Four studies[18,19,35,43] used a single item to measure smoking behavior, for example, whether participants currently smoke or not (yes/no), while seven studies[26,34,36,38,39,43] used multiple measures, for example, frequency, and duration. Nicotine dependency was measured in two studies, with the first using the Fagerstrom test for nicotine dependency[39] and the second using a measure that was developed and validated by the research team (α= 0.805).[26] The prevalence of current smoking varied across the studies, ranging from 9.0% to 61.1%.

Risk Factors Associated with Cigarette Smoking:

We synthesized findings from the included studies and identified common themes and categories related to adolescent smoking, including individual, social, and environmental risk factors. The findings associated with each of these three categories are summarized below.

*Individual risk factors***:** Five studies reported individual-level risk factors that were positively associated with cigarette smoking among adolescents.[18,26,34,37,38] The individual risk factors included self-reported measures of personal disposition (e.g., pleasure-seeking and curiosity),[34] psychosocial factors (e.g., mood elevation, failures in life, coping stress),[26] and substance abuse (e.g., craving, use of other drugs, and thoughts cigarette is an addiction).[18,37,38] One study found that elevated scores on measures of pleasure-seeking and curiosity were significantly associated with adolescents' smoking behavior.[34] The study by Bushra *et al.* (2014) observed that psychosocial factors, including elevated mood and the experience of perceived failures in life, significantly increased the likelihood of adolescent smoking. The authors hypothesized that smoking was used as a coping mechanism for stress.[26] Three studies observed that factors associated with substance abuse, including cigarette cravings, use of other drugs, and thoughts about cigarette addiction, were all significantly associated with cigarette smoking.[18,37,38] These studies underscore the need to consider multiple individual risk factors, including dispositions, psychosocial factors, and substance abuse, in understanding and addressing adolescent cigarette smoking.

*Social Risk Factors***:** Eight studies measured social factors, including family (e.g., father smoking, family members tobacco use, father education, mother employment status)[19,36,38,39,43] and peer-related predictors of smoking status (e.g., peer pressure, friends smoking).[19,34-37,39,43] Of the eight studies, three reported a positive and statistically significant association between a father's smoking and adolescent smoking behavior.[19,36,39] Another three studies measured family members' tobacco use and found that family smoking also significantly increased the likelihood of adolescent smoking behavior.[19,36,38] One study by Rozi et al. revealed that mothers' employment status influences smoking behavior among adolescents compared to non-working mothers.[43] Furthermore, three studies found that peer pressure played a significant role in adolescent smoking behavior.[34,36,37] In addition, five studies found that reporting friends who smoke was positively associated with adolescent smoking.[19,35,36,39,43] These findings suggested that both family and peer factors play a significant role in shaping adolescents' smoking behavior.

*Environmental Factors***:** Multiple environmental factors were examined about cigarette smoking among adolescents. Three studies revealed that smoking behavior among adolescents was significantly associated with their educational setting, such that students attending a public school were more likely to smoke than those at a private school.[18,19,43] One study by Bushra et al., showed that academic pressure/ burden increased the likelihood of adolescent smoking.[26] Moreover, two studies found that exposure to tobacco use in electronic media or advertisements was positively associated with adolescent smoking behavior.[18,38] In addition, a study,[38] also found that under age sale of tobacco at shops increased the likelihood of cigarette smoking among adolescents. Further, one study found that socio-economic status was associated with an increased risk of smoking among adolescent males.[26]

Prevention and Intervention Approaches in Pakistan:

Three studies were identified that focused on the prevention of adolescent smoking; however, these studies[40-42] received weak quality ratings. The first study

was conducted by Khan and colleagues (2019) to educate adolescents on smoking risks and provide strategies for quitting. The study employed a cross-sectional, pre/post-test design. Moreover, the study targeted adolescents aged 14-19 years and included a sample of 650 current smokers selected through random sampling. The intervention was delivered in a school-based environment for 14 months.[41] The intervention consisted of six 90-minute sessions that emphasized the health hazards associated with smoking, explored factors influencing smoking initiation, and provided guidance on quitting.[41] Statistically significant changes were observed from the pretest to the posttest, including perceptions that smoking is a bad habit (90.7% vs. 96.9%), intention to quit smoking (35.2% vs 72.2%), and the percentage of adolescents who reported smoking an entire cigarette (83.5% to 65%).

The second study, conducted by Sajid *et al*. (2022), focused on evaluating the effectiveness of a smoking prevention program among adolescents aged 13-16 years. The study comprised 200 participants, divided into the intervention and control groups. Consecutive sampling was employed, and the research was conducted in a community-based setting.[42] The intervention lasted eight weeks, and participants received health-based smoking prevention knowledge and skills through lectures, demonstrations, role-playing, sports, and storytelling. These daily two-hour sessions took place during school hours. Immediate posttest measures were collected fifteen days after the completion of the intervention and at six months to assess the impact of the intervention on participants' knowledge and skills related to smoking prevention.[42] The intervention group had a more significant change in smoking-related attitudes at the first post-test assessment (fifteen days after intervention completion). For example, the mean score in the pre-intervention phase was 23.78 ±6.88; in the post-intervention phase, it decreased to 20.29 ± 4.48. However, the study found no significant difference in exposure to smoking-related knowledge between the intervention and control groups at six months.[42]

The final study was conducted by Zaidi and colleagues (2011) and sought to understand the impact of various health warnings, including pictorial/multimedia messages, on smoking behavior among adolescents aged 15-18 years. The study included 388 participants, consisting of both current smokers and non-smokers, with 245 male participants and 142 females. The research did not explicitly mention the sampling method employed, and the study was conducted in private schools (English as a medium of language).[40] The two-month intervention used a PowerPoint presentation to describe warnings about smoking-related diseases and incorporated visual elements (e.g., images and videos) to illustrate potential health problems. Following the presentation, students were asked to complete a questionnaire to rate which messages and risk factors they found most effective in deterring adolescent smoking.[40] Study results suggested that participants found images of oral cancer and videos of cancer patients with an electronic voice box and on a ventilator to be the most potent anti-smoking messages. Conversely, messages about addiction, passive smoking, and the financial impact of smoking were less effective in deterring smoking behavior. Additionally, smokers perceived health warnings as less effective than non-smokers.[40]

DISCUSSION

This scoping review examined the available research on the risk factors associated with adolescent smoking behavior in Pakistan and the prevention interventions implemented within the country. The review identified a relatively small number of eligible articles, with only 13 studies meeting the inclusion criteria out of an initial pool of 1300 articles, highlighting the limited research in this area in Pakistan. Ten of the 13 studies employed a cross-sectional design to explore risk factors for cigarette smoking among adolescents in Pakistan. Three studies used different study designs, with two using a cross-sectional design and one using a quasi-experimental design, to assess prevention approaches and interventions for cigarette smoking among adolescents in Pakistan. The studies employed various recruitment strategies and were conducted in diverse settings, such as school-based, community-based, and rural districts. However, except for one study rated as moderate, the overall quality scores of the studies were rated as weak. Most of the studies displayed limitations in addressing confounding factors and reporting objectives.

In terms of smoking prevalence, rates varied across the studies, ranging from 9% to 61.1%. According to a systematic review of 182 studies from 70 countries, the global median prevalence of current smoking among adolescents aged 13 to 15 years was 10.6% for males and 7.0% for females in 2015.[44] Furthermore, the global youth tobacco survey also showed that Pakistan had higher smoking rates than most of its neighboring countries, such as India (3.8%), Bangladesh (4.7%), Nepal (5.0%), and Sri Lanka (5.9%).[45] However, some countries

Table 1: Risk factors of cigarette smoking behavior among adolescents in Pakistan

Author & Year	Age	Setting	Study Design	City / Province	Sample Size / Sample Technique	Statistical Analysis	Smoking Prevalence	Identified Risk Factors	Statistical Findings	Quality Score Appraisal
(Ahmad et al., 2022)	10-18 years	Community - Based	Cross-sectional	Lahore	n=90. Random Sampling	Descriptive	30.1%	Pleasure seeking Stress Peers pressure Curiosity	5.5% smoke due to stress 4.1% smoke because of peers' pressure, and 2.7% smoke due to curiosity.	4/8 weak
(Ahmed et al., 2011)	10-16 Years	Private & Public high schools	Cross-Sectional	Sindh	n=501. Random Sampling	Logistic regression analysis	9%	Age smoke if friends ofer Might be smoking in next year	(OR:1.53,95%Cl:1.26 -1.9) (OR:19.7,95%Cl:9.5-41) (OR:15.9,95% Cl:7.49 - 34.0)	4/8 weak
(Bushra et al., 2014)	13-19 years	Schools & colleges	Cross-Sectional	Karachi	n=1000. Random sampling	Descriptive	61.14%	Fun/Adventure Mood Elevation Ignorance from family and teachers Academic pressures Socio-economic crises Habitual to smoke	9.7% 10.1% 8.9% 3.6% 5.3% 8.6%	3/8 weak
(Husain et al., 2012)	14-17 years	High Schools	Cross-sectional	Karachi	n=350. Convenience sampling	Descriptive	17%	Peer pressure Craving thoughts smoking is addictive Stress smoke for recreation	35% 24% 78% 55% 24%	5/8 weak
(Ganatra et al., 2007)	13-19 years	Public private High schools	Cross-sectional,	Karachi	n=644. Two-stage cluster sampling	Logistic regression	16.3%	Family members use tobacco Cigarettes advertisement illegal drugs abuse Underage sale at shops	(OR:2.04,95%Cl:1.15–3.63) (OR:2.47,95% Cl:1.32–4.60) (OR:28.26,95%Cl:6.10-13.1) (OR:1.74,95% Cl: 0.84–3.63)	5/8 weak
(Leghari et al.,2014	16-21 years	Private and public colleges	Cross-sectional,	Hyderabad	n=1338. Random sampling	Logistic regression	11.9%	Father smoker Academic failure Peer Pressure Sibling smoking Friends smoking	(OR: 1.8,95% Cl: 1.20-2.80) (OR:1.62,95% Cl: 1.13-2.32) (OR: 2.17,95% Cl:1.81-4.54) (OR:7.46,95%Cl:5.24-10.61)	5/8 weak
(Mishu et al., 2021)	11-17 years	Schools	Secondary Analysis GYTS, 2013	Not reported	n=8723.	Multinomial	29.85%	Smokeless tobacco use Exposure in public places Exposed to tobacco use in electronic media	(RRR:2.07,95%Cl:1.84-2.3) (RRR:5.59,95%Cl:4.28-7.2) (RRR:2.62,95%Cl:1.31,5.26)	7/8 Moderate

Table 1: Risk factors of cigarette smoking behavior among adolescents in Pakistan (Cont..)

Author & Year	Age	Setting	Study Design	City/ Province	Sample Size / Sample Technique	Statistical Analysis	Smoking Prevalence	Identified Risk Factors	Statistical Findings	Quality Score
(Sami et al., 2013)	12-18 years	Two rural districts of Sindh and Punjab	Cross-sectional	Sindh, Punjab	n=1014. Multistage cluster sampling	univariate logistic regression analysis	15.2%. (7.9% girls versus 20.2% among boys).	Father's illiteracy	(AOR: 8.2,95%Cl;3.9-10.2)	5/8 Weak
								Father's smoking	(AOR: 5.4,95% Cl: 3.2-7.0)	
								Friend's smoking	(AOR: 6.8,95% Cl: 4.6-8.8)	
								Nuclear family	(AOR:3.2,95% Cl:1.6-4.4)	
(**Rozi et al., 2007**)	15- 20 years	Colleges	Cross-sectional	Karachi	n=576 Random sampling	Univariate logistic regression	24%. Out of this, 19.2% in 15–17 years. 26.5% in 18–20 years	Public schools vs private	(AOR: 2.3,95% CI: 1.3–4.2)	5/8 Weak
								Friends' smoker	(AOR:4.8,95% CI: 3.1 – 7.4)	
								Fathers' education	(AOR:2.2,95% CI: 1.1–4.2)	
								having non-working mothers	(AOR:2.8, 95% CI: 0.9–9.1)	
(Rozi et al., 2005)	13-15 years	School-based	Cross-sectional	Karachi	n=772. Two-stage cluster sampling stratiied.	Multiple logistic regression	13.7% (30 days)	Parental smoking	(OR:1.7,95%CI:1.1-2.8)	6/8 Weak
								uncle smoking	(OR:1.7,95% CI: 1.2-2.8)	
								Peer smoking	(OR:6.2; 95% CI: 3.9-9.9)	
								spending leisure time outside the home	(OR=3.9; 95%CI 1.2-13.2)	
								Ethnicity and place of residence, being a student at a government school	(OR:1.6, 95%CI: 1.0-2.7)	

-OR: Odds Ratio, RRR: Relative Risk Ratio, AOR: Adjusted Odd Ratio

Table 2: Prevention programs done on smoking behavior among adolescents in Pakistan

Author / Year	Setting	Aims	Study Design	Age / Sample Size / Sampling Technique	City	Intervention & Duration	Procedure for Intervention	Main Outcomes	Quality Appraisal Score
(Ishaq Khan et al., 2019)	School-based	Impact of Educational Intervention On Smoking Knowledge, Attitude & Behavior of Adolescents	Cross-sectional	14-19 years. n= 650. Random sampling.	Rawalpindi	Education intervention June 2017 to August 2018. 14 months	The educational intervention comprised six 90-minute sessions that used various teaching methods, including video clips, lectures, and brainstorming sessions. These sessions emphasized the health risks associated with smoking, factors inluencing cigarette initiation, and strategies for quitting.	Pre-intervention, 90.7% of adolescents viewed smoking as a bad habit. After educational intervention, this perception signiicantly increased to 96.9%. Intending to quit smoking rose from 35.2% to 72.2% following the educational intervention. The percentage of adolescents using a complete stick of cigarette smoking at one time decreased from 83.5% to 65%.	4/8 weak
(Sajid et al., 2022)	Community-based school	Evaluate the effectiveness of prevention program smoking at community-based	Quasi-experimental	13-16 years. n= 200. consecutive sampling	Karachi	Health-based lecture on smoking prevention knowledge and skills. Six months, June to December 2018.	Pre-intervention, intervention, and post-intervention. In the phase (pretest), participants were selected based on inclusion criteria and assessed using a questionnaire. Intervention phase: received health-based smoking prevention knowledge and skills through lectures, demonstrations, and activities like role play, sports, and storytelling. Daily two-hour classes were held during school hours for eight weeks. The post-intervention phase (posttest) occurred ifteen days after the intervention using the same questionnaire.	There was no signiicant diference in exposure to smoking-related information between the intervention and control groups (p-value 0.396). There was a signiicant diference in the mean number of respondents with a smoking-related mindset (p-value <0.05). The incidence of smoking-related conditions decreased after the intervention program. The mean score in the pre-intervention program was 23.78 ± 6.88, while in the post-intervention program, it was 20.29 ± 4.48.	3/9 weak

Table 2: Prevention programs done on smoking behavior among adolescents in Pakistan (Cont..)

Author / Year	Setting	Aims	Study Design	Age / Sample Size / Sampling Technique	City	Intervention & Duration	Procedure for Intervention	Primary Outcomes	Quality Appraisal Score
(Zaidi et al., 2011)	Private School	Assess the impact of pictorial/multimedia messages compared with written health warnings.	Cross-sectional	Age 15 – 18 years. n=388. convenient sampling	Islamabad, Rawalpindi, Faisal Abad,Lahore, Karachi	Microsoft PowerPoint presentation regarding smoking harms. From January - February 2010, two months	The presentation was delivered with warnings about smoking-related diseases and used images and videos to illustrate these health problems. Afterward, students illed out a questionnaire to rate which messages and risk factors they found most efective in preventing smoking.	Students found visuals of oral cancer and videos of a cancer patient with an electronic voice box and someone on a ventilator to be the most potent anti-smoking messages. Messages about addiction, passive smoking, and inancial impact were less efective. Visual and multimedia messages carried more impact than written warnings, and smokers perceived health warnings as less efective tha n non-smokers.	3/8 weak

in the Eastern Mediterranean region had higher or similar smoking rates than Pakistan, such as Lebanon (23.1%), Jordan (19.0%), Egypt (16.7%), Iran (14.6%), and Iraq (13.7%).[22] These comparisons support this review's findings and indicate that Pakistan faces a severe challenge of tobacco use among its young population, which poses a significant threat to their future health.

Ten studies included in the review examined risk factors for smoking. Risk factors were associated with three domains, including individual, social, and environmental. One individual-level risk factor included pleasure-seeking and curiosity.[34] This suggests that adolescents may be drawn to smoking due to the allure of trying something new or exciting. Psychological-related factors were highlighted, particularly by Bushra *et al.*[26] Adolescents may turn to smoking to elevate their mood or relieve stress, indicating that smoking is a coping mechanism for emotional challenges and fluctuations.[26] Substance abuse, cravings for cigarettes, and the use of other tobacco and even illegal drugs were identified as intertwined factors linked to adolescent smoking.[18,38] Moreover, the personal thoughts held by adolescents, mainly that smoking is an addictive activity, were significantly associated with cigarette smoking behavior.[37]

Social factors were also identified as a significant driver of adolescent smoking, with familial dynamics shown to play a pivotal role in adolescent smoking behavior. Notably, three separate studies reported the significance of a father's smoking as a substantial contributing factor to adolescent smoking.[19,36,39] Moreover, studies have shown that the likelihood of adolescent smoking increases when family members, such as parents, uncles, and siblings, smoke.[19,36,38,39] In addition, a father's education level and the mother's employment status also influence adolescent smoking.[39,43] These findings underscore the importance of considering family dynamics and parental influence in any comprehensive prevention and intervention strategy. Peer influences play a substantial role in shaping the smoking behavior of adolescents, as evidenced by numerous studies highlighting the significance of peer pressure and the influence of friends who smoke.[19,34-36,39,43]

Environmental factors further complicate the picture, with adolescents' settings influencing smoking behaviors. School environments, characterized by academic pressures and exposure to smoking, can be critical drivers of smoking among adolescents, as highlighted by three studies.[18,19,26] Exposure to tobacco use in electronic media and advertisements was linked to adolescent smoking.[18,38] These findings further highlight the role of media in shaping perceptions and behaviors related to smoking. Further, socioeconomic crises such as belonging to low-income areas and failure to maintain a daily standard of living life were identified as environmental factors contributing to adolescent smoking.[26] This suggests that economic difficulties and challenges can drive adolescents toward smoking as a coping mechanism. Therefore, these findings have significant implications for preventive strategies and interventions.

Prevention and Intervention Approaches:

This scoping review also identified three studies that evaluated the effectiveness of smoking prevention interventions among adolescents in Pakistan.[41-43] The studies varied in design, intervention approaches, and outcomes assessed. The study by Ishaq Khan et al,[41] included in this review focused on a school-based smoking prevention program. The intervention involved interactive sessions, educational materials, and peer support. The study reported a significant increase in knowledge about the harmful effects of smoking, a positive shift in attitudes toward smoking, and a decrease in smoking initiation among the participants.[41] These findings emphasize the importance of school-based interventions in providing adolescents with accurate information and fostering a negative attitude towards smoking. The second study examined a community-based smoking prevention intervention targeting adolescents in low-income areas. The intervention involved community mobilization, awareness campaigns, and counseling sessions. The study reported a significant reduction in smoking prevalence among the intervention group compared to the control group.[42] This highlights the potential of community-based interventions in creating a supportive environment that discourages smoking initiation and promotes healthy behaviors among adolescents. The third study evaluated the impact of a multimedia campaign on smoking prevention. The campaign utilized various media channels, including television, radio, and social media, to disseminate anti-smoking messages. The study reported a significant increase in knowledge about the harmful effects of smoking, a decrease in positive attitudes toward smoking, and a reduction in smoking initiation among the targeted adolescents. These findings suggest that multimedia campaigns can effectively reach a broad audience and influence smoking-related knowledge and behaviors.

Implications for Future Research:

The scoping review suggests the need for more rigorous studies with theory incorporation. Standardi-

zation of smoking status measurement is required. Additional intervention approaches must be developed to target the identified risk factors among Pakistani adolescents. Moreover, interventions should consider the diverse motivational factors that drive adolescents to smoke and the collective influence of peer networks on smoking behaviors. Future research and interventions should comprehensively target these multifaceted influences to reduce adolescent smoking prevalence in Pakistan.

Study Limitations:

Several limitations should be considered when interpreting the results of this systematic review. This scoping review included a small number of studies focused on the identification of risk factors for smoking and fewer that focused on tobacco prevention and control. After applying an established appraisal tool to examine the quality of the studies, we found that a moderate to high risk of bias compromised the studies' methodological quality. Further, studies included in this review utilized different outcome measures across interventions, leading to the inability to draw firm conclusions about the prevention and intervention studies. In addition, studies focused on changes in knowledge and attitudes, and none specifically focused on smoking cessation.

CONCLUSION

This scoping review identified multiple risk factors associated with adolescent smoking in Pakistan, encompassing individual, social, and environmental factors. The included studies utilized diverse recruitment strategies and were conducted in various settings. Educational interventions positively affected participants' attitudes, intentions to quit smoking, and knowledge of smoking-related health issues. Consequently, future research should address these risk factors and implement tailored interventions based on theoretical frameworks.

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REFERENCES

1. World Health Organization. The global tobacco epidemic 2019: offer help to quit tobacco use. Geneva: WHO [Internet]. 2019 Available from https://www.who.int/publications/i/item/9789241516204
2. World Health Organization. Global report on trends in prevalence of tobacco use 2000-2025. Geneva: WHO [Internet]. 2021. Cited 16 November 2021. Available from https://www.who.int/publications/ i/item/9789240039322
3. World Health Organization. Tobacco [Internet] Ge-neva: World health organization; 2023.Updated 31 July 2023; cited 2023 Septmber 15. Available from: https://www.who.int/news-room/fact-sheets/detail/ tobacco.
4. National Heart L, & Blood Institute. Smoking and Your Heart - How Smoking Affects the Heart and Blood Vessels. United States: National Heart,Lung & Blood Institute; 2022. Updated March 24, 2022; cited 2023 Nov 1. Available from: https://www.nhlb i.nih.gov/health/heart/smoking.
5. Jha P, Ramasundarahettige C, Landsman V, Rostron B, Thun M, Anderson RN, et al. 21st-Century hazards of smoking and benefits of cessation in the United States. N Engl J Med 2023; 368:341-50. doi:10.1056/NEJM SA1211128
6. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. The Health Consequences of Smoking-50 Years of Progress: A Report of the Surgeon General. Atlanta (GA): Centers for Disease Control and Prevention (US); 2014. Available from https://www.ncbi.nlm.nih.gov/books/NBK179276/
7. Dai X, Gakidou E, Lopez AD. Evolution of the global smoking epidemic over the past half century: strengthening the evidence base for policy action. Tob Control 2022; 31:129-37. doi:10.1136/tobaccocontrol-2021-056535
8. Datta BK, Husain MJ, Nargis N. An Intertemporal Analysis of Post-FCTC Era Household Tobacco Consumption in Pakistan. Int J Environ Res Public Health 2019; 16:2532. doi:10.3390/ijerph161425322
9. Institute for Health Metrics and Evaluation. Global Burden of Disease USA: University of Washington; 2019.Cited 2023 October 25. Available from: https://vizhub.healthdata.org/gbd-compare/.
10. Zhang Q, Yu B, Chen X, Varma DS, Li J, Zhao J, et al. Patterns of smoking initiation during adolescence and young adulthood in South-West China: findings of the National Nutrition and Health Survey (2010–2012). BMJ Open 2018; 8:e019424. doi:10.1136/bmjopen-2017-019424
11. Nawi AM, Ismail R, Ibrahim F, Hassan MR, Manaf MR, et al. Risk and protective factors of drug abuse among adolescents: a systematic review. BMC Public Health 2021; 21:2088. doi:10.1186/s12889-021-11906-2
12. American Lung Association. Tobacco use among children and teens Chicago, Illinois, United States: American lung association; 2023. Updated May 31, 2023; cited 2023 September 15. Available from: https://www.lung.org/quit-smoking/smoking-facts/tobacco-use-among-

children.
13. Nazir MA, Al-Ansari A, Abbasi N, Almas K. Global prevalence of tobacco use in adolescents and its adverse oral health consequences. Open Access Maced J Med Sci 2019; 7:3659-66. doi:10.3889/oamjms.2019.542
14. Mangrio FA, Mangrio SA, Fatima M. Health Consequences of Smokeless Tobacco Substance Abuse among High School Adolescents. J Fatima Jinnah Med Univ 2022; 16:185-8. doi:10.37018/PIUK9961
15. Dolah S, Mohd AM, Abd-ur-Rahman N. Towards healthy adolescents: a review of smoking impact according to dental perspectives. Mal J Med Health Sci 2023; 19:316-24. doi:10.47836/mjmhs19.1.40
16. Rohmi F, Nurbadriyah WD. The association between stress level and smoking behavior in gondanglegi junior high school boys. J Nurs Sci Upd 2022; 10:186-92.
17. Pakistan Global Youth Tobacco Survey. Global Youth Tobacco Survey (GYTS) Fact Sheet Pakistan. Genava: World Health Organization, 2013. Updated July 31, 2015; Available from https://extranet.who.int/ ncdsmicrodata/index.php/catalog/?page=1&ps=15
18. Mishu MP, Siddiqui F, Shukla R, Kanaan M, Dogar O, Siddiqi K. Predictors of cigarette smoking, smokeless tobacco consumption, and use of both forms in adolescents in South Asia: A secondary analysis of the global youth tobacco surveys. Nicotine Tob Res 2021; 23:956-65. doi:10.1093/ntr/ntaa202
19. Rozi S, Akhtar S, Ali S, Khan J. Prevalence and factors associated with current smoking among high school adolescents in Karachi, Pakistan. Southeast Asian J Trop Med Public Health 2005; 36:498-504.
20. National Institute of Population Studies (NIPS) [Pakistan] and ICF. 2019. Pakistan Demographic and Health Survey 2017-18. Islamabad, Pakistan, and Rockville, Maryland, USA: NIPS and ICF. Available from https://dhsprogram.com/pubs/pdf/FR354/FR354
21. Latif Z, Jamshed J, Khan MM. Knowledge, attitude and practice of cigarette smoking among university students in Muzaffarabad, Pakistan: a cross-sectional study. Int J Sci Rep 2017; 3:240. doi:10.18203/issn.2454-2156.intjscirep20174089
22. The Toll of Tobacco in Pakistan. Tobacco Consumption. Washington, DC, United States of America.: Campaign for Tobacco-Free Kids; 2021. Updated Aug 3, 2021; cited 2023 Septmeber 30. Available from: https://www.tobaccofreekids.org/problem/toll-global/asia/pakistan
23. Chand B, Bhusal S, Pradhan PM, Paudel K, Adhikari N, Adhikari TB, et al. Tobacco use and its associated factors among undergraduate public health students in Kathmandu Valley, Nepal. J Environ Public Health 2022; 2022:1495779. doi:10.1155/2022/1495779
24. Todorovic I, Cheng F, Stojisavljevic S, Marinkovic S, Kremenovic S, Savic P, et al. Prevalence of cigarette smoking and influence of associated factors among students of the university of Banja Luka: A cross-sectional study. Medicina (Kaunas) 2022; 58:502. doi:10.3390/medicina58040502
25. Simplicio MP, Silva LB, Juvanho LL, Priore SE, Franceschini SD. Factors associated with alcohol, tobacco and illicit drug use among Brazilian undergraduate students. Rev Bras Enferm 2021; 74:e20201244. doi: 10.1590/0034-7167-2020-1244
26. Bushra R, Aslam N, Bano UK, Jamal A, Baig AA, Sherwani SK. Prevalence of smoking in teenagers male undergraduate students a study of Karachi, Pakistan. Int J Basic Med Sci Pharm 2013;3: 49-51.
27. Lalithambigai G, Rao A, Rajesh G, Ramya S, Pai BH. Predictors of Cigarette Smoking among Young Adults in Mangalore, India. Asian Pac J Cancer Prev 2016; 17:45-50. doi:10.7314/apjcp.2016.17.1.45
28. Baheiraei A, Soltani F, Ebadi A, Foroushani AR, Cheraghi MA. Risk and protective profile of tobacco and alcohol use among Iranian adolescents: a population- based study. Int J Adolesc Med Health 2016;29. doi:10.1515/ijamh-2015-0089
29. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (prisma-scr): checklist and explanation. Ann Intern Med 2018;169:467-73. doi:10.7326/m18-0850
30. Munn Z, Peters MD, Stern C, Tufanaru C, McArthur A, Aromataris E. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. BMC Med Res Methodol 2018; 18:143. doi: 10.1186/s12874-018-0611-x
31. Joanna Briggs Institute. Checklist for Analytical Cross Sectional Studies Critical Appraisal Australia: Joanna Briggs Institute 2017; Updated 2020. Available from: http://joannabriggs.org/research/critical-appraisal-tools.htmlwww.joannabriggs.org
32. Joanna briggs institute. Checklist for quasi-experimental studies Australia: Joanna briggs institute 2020; Updated 2020; cited 2023 Nov 11. Available from: http://joannabriggs.org/research/critical-appraisal-tools.htmlwww.joannabriggs.org
33. Tufanaru C, Munn Z, Aromataris E, Campbell J, Hopp L. Systematic reviews of effectiveness (2020). Aromataris E, Lockwood C, Porritt K, Pilla B, Jordan Z, editors. JBI Manual for Evidence Synthesis. JBI; 2024. Available from:https://synthesismanual.jbi.global.https://doi.org/10.46658/JBIMES-24-03
34. Ahmad A, Jafar K, Saddiqa A, Firdos U, Qadeer A. Prevalence and Determinants of Smoking among School Students at Rural Community, Lahore. Saudi J Nurs Health Care 2022; 5:308-20. doi:10.36348/sjnhc.2022.v05i12.002
35. Ahmed J, Taj T, Shaikh S, Ali S. Factors associated with tobacco smoking among 6-10 grade school students in an urban Taluka of Sindh. J Coll Physicians Surg Pak 2011; 21:662-5.
36. Laghari ZA, Halepota J, Palh ZA, Lashari KH, Baig NM, Menghwar SM, et al. Factors associated with cigarette smoking among male students of colleges of district, Hyderabad, Pakistan. Int J Adv Res Technol 2014; 3:80-3.

37. Husain MO, Duddu V, Husain M, Drury A, Chaudhry N, Husain N. Smoking behavior among 14-17 year old students: a comparison between Pakistan and the UK. Southeast Asian J Trop Med Public Health 2012; 43:219-28.
38. Ganatra HA, Kalia S, Haque AS, Khan JA. Cigarette smoking among adolescent females in Pakistan. Int J Tuberc Lung Dis 2007; 11:1366-71.
39. Sami N, Noorani SS, Lakhani LS, Ghouse A, Valliani S. Smoking practices and nicotine dependence among adolescents in Pakistan. J Pak Med Assoc 2013; 63:1260-5.
40. Zaidi SM, Bikak AL, Shaheryar A, Imam SH, Khan JA. Perceptions of anti-smoking messages amongst high school students in Pakistan. BMC Public Health 2011;11: 117. doi:10.1186/1471-2458-11-117
41. Khan I, Shams G, Khan SF, Ahmed SI, Khan JI. Impact of educational intervention on smoking knowledge, attitude and behavior of adolescents in schools of developing country, Rawalpindi Pakistan. Int J Med Biomed Stud 2019;3: 35-41. doi:10.32553/ijmbs.v3i3.142
42. Sajid S, Arif S, Nasir A, Bashir S, Arooj K, Amin I. Effectiveness of anti-smoking program among adolescence at community-based school Karachi-Pakistan. Int J Curr Res Rev 2022; 14:26-30. doi:10.31782/IJCRR.2022.142004
43. Rozi S, Butt ZA, Akhtar S. Correlates of cigarette smoking among male college students in Karachi, Pakistan. BMC Public Health 2007; 7:312. doi:10.1186/1471-2458-7-312
44. Ma C, Xi B, Li Z, Wu H, Zhao M, Liang Y, et al. Preval-ence and trends in tobacco use among adolescents aged13-15 years in 143 countries, 1999 To 2018: findings from the global youth tobacco surveys. Lancet Child Adolesc Health 2021; 5:245-55. doi:10.1016/S2352-4642(20)30390-4
45. The Toll of Tobacco in Bangladesh. Tobacco Consumption. Washington DC, United States of America: Campaign for Tobacco-Free Kids 2021; Updated Sept 14, 2021; cited 2023 October 28. Available from: https://www.tobaccofreekids. org/problem/toll-global/asia/bangladesh.