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Original Article

To Assess Knowledge of Patients Regarding Cigarette Smoking for Coronary Artery Disease at Mayo Hospital & PIC, Lahore: A Cross-Sectional Study

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ABSTRACT

Background: Cigarette smoking is an important modifiable cardiovascular risk factor, while awareness of secondhand smoke, vaping, and the cardiovascular benefits of cessation may be less consistent among patients receiving cardiac care. Objective: To assess patients' knowledge regarding cigarette smoking and related tobacco exposures as risk factors for coronary artery disease at Mayo Hospital and the Punjab Institute of Cardiology, Lahore. Methods: A descriptive cross-sectional study was conducted from October to December 2025 among 215 adult cardiology outpatients recruited by convenience sampling. Knowledge was assessed using a 15-item Yes/No questionnaire covering CAD, active smoking, secondhand smoke, vaping, and prevention and cessation. Correct responses were scored 1 and incorrect responses 0. Descriptive statistics and Cronbach's alpha were calculated using IBM SPSS Statistics version 27.0. Results: The mean knowledge score was 10.63 ± 3.51 out of 15, equivalent to 70.88% ± 23.42%. Good knowledge was observed in 90 participants (41.9%), moderate knowledge in 94 (43.7%), and poor knowledge in 31 (14.4%). Active-smoking knowledge was highest at 85.6%, whereas correct-response proportions were 65.3% for secondhand smoke, 64.7% for CAD knowledge, 64.2% for prevention and cessation, and 60.6% for vaping. Cronbach's alpha was 0.776. Conclusion: Patients demonstrated generally moderate-to-good knowledge of smoking-related CAD risk, but important gaps remained regarding secondhand smoke, vaping, cessation, and basic CAD concepts. Keywords: coronary artery disease; cigarette smoking; knowledge; secondhand smoke; vaping; smoking cessation.

INTRODUCTION

Coronary artery disease (CAD) is a major cardiovascular disorder characterized by progressive atherosclerotic narrowing or obstruction of the coronary arteries, resulting in impaired myocardial blood supply and potentially

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leading to angina, acute coronary syndrome, myocardial infarction, heart failure, and sudden cardiac death. Endothelial dysfunction, oxidative stress, vascular inflammation, plaque formation, and thrombosis are central mechanisms involved in the development and progression of coronary atherosclerosis (1). Among modifiable cardiovascular risk factors, cigarette smoking remains particularly important because tobacco smoke promotes oxidative injury, reduces nitric oxide bioavailability, impairs endothelial function, enhances thrombogenesis, and accelerates atherosclerotic vascular disease (2).

The cardiovascular burden attributable to smoking remains substantial worldwide. Global Burden of Disease estimates have demonstrated that smoking continues to contribute considerably to cardiovascular mortality despite reductions in age-standardized rates in many regions, with a particularly persistent burden in less-developed settings (3). Pakistan also faces a high and continuing burden of cardiovascular disease. Analysis of Global Burden of Disease data has shown a marked increase in the absolute number of cardiovascular deaths in Pakistan over recent decades, with ischemic heart disease contributing substantially to this burden (4,5). Tobacco exposure remains an important preventable component of this problem. According to the Global Adult Tobacco Survey 2024, 16.1% of Pakistani adults aged 15 years and older used tobacco, corresponding to approximately 22.7 million adults, while exposure to secondhand smoke remained common in homes and workplaces (6). These findings emphasize the continuing importance of tobacco-risk awareness and prevention in populations receiving cardiovascular care.

The cardiovascular consequences of tobacco exposure are not restricted to active cigarette smoking. Exposure to secondhand smoke can adversely affect vascular function through oxidative stress, endothelial dysfunction, dyslipidemia, inflammation, and thrombogenic mechanisms, thereby contributing to cardiovascular risk among nonsmokers (7). Knowledge of such risks is particularly important because patients and family members may recognize active smoking as harmful while underestimating the cardiovascular consequences of passive exposure. In addition, electronic cigarettes have introduced a newer challenge to cardiovascular risk communication. Evidence synthesized from studies of e-cigarette exposure has demonstrated acute increases in heart rate and systolic and diastolic blood pressure, together with evidence of impaired endothelial function, although evidence regarding long-term cardiovascular effects remains less certain (8). Among university students in Lahore, limited knowledge regarding the potential harms of e-cigarettes and the perception that vaping may be a safer alternative to conventional smoking have also been reported (9). Consequently, contemporary patient education regarding CAD should address not only conventional cigarette smoking but also secondhand smoke, vaping, and smoking cessation.

Previous studies suggest that awareness of cardiovascular risk factors varies considerably according to population, educational background, healthcare exposure, and study setting. In Morocco, a cross-sectional assessment using the Heart Disease Fact Questionnaire found that most participants recognized smoking as a cardiovascular risk factor and understood that smoking cessation could reduce heart-disease risk, although substantial variation remained in overall cardiovascular knowledge (10). Similarly, a Saudi Arabian study reported relatively high awareness of smoking as a cardiovascular risk factor but identified significant differences in knowledge according to demographic and health characteristics (11). These findings indicate that recognition of smoking as harmful does not necessarily imply comprehensive understanding of CAD, its mechanisms, passive smoke exposure, emerging tobacco products, or preventive strategies.

Evidence from Pakistan also demonstrates important gaps in cardiovascular risk-factor awareness. A cross-sectional study conducted in Islamabad and Rawalpindi among adults with diagnosed CAD and individuals at risk of CAD reported that only 24.2% had good knowledge of modifiable coronary risk factors, while recognition of smoking and several other major risk factors remained limited (12). Qualitative work among patients with CAD in a public-sector tertiary hospital in Lahore similarly suggested that awareness of cardiovascular risk factors often developed after diagnosis and through personal illness experiences rather than through systematic preventive education (13). These findings are important because cardiology outpatients represent a population in whom adequate understanding of tobacco-related cardiovascular risk may influence engagement with preventive advice and smoking-cessation services.

Knowledge may also have practical relevance to health behavior. In the multinational Prospective Urban Rural Epidemiology study, awareness that tobacco causes heart disease was associated with greater likelihood of

smoking cessation, while recognition of the cardiovascular consequences of secondhand smoke was also related to healthier behavior (14). Among patients with stable CAD, cessation of smoking after diagnosis has been associated with a substantially lower risk of subsequent cardiovascular death or myocardial infarction, whereas merely reducing the number of cigarettes smoked has not demonstrated comparable benefit (15). Patient education is therefore an important component of secondary prevention, and systematic evidence indicates that structured education can improve knowledge and health-related behaviors among adults with coronary heart disease (16). Nurses working in cardiology outpatient departments are particularly well positioned to identify misconceptions, provide culturally appropriate education, reinforce complete smoking cessation, and address the cardiovascular risks associated with both conventional and emerging tobacco products.

Despite the available international and Pakistani evidence, there remains limited institution-specific information regarding the knowledge of adult cardiology patients in Lahore about cigarette smoking and related tobacco exposures in relation to CAD. Previous Pakistani studies have largely examined general cardiovascular risk-factor awareness, smoking-related cardiovascular risk in broader populations, or qualitative perceptions among patients, while active cigarette smoking, secondhand smoke, vaping, and cessation knowledge have rarely been assessed together using a structured instrument among patients attending major public-sector cardiology services (12,13). Furthermore, the relationship between patients' socio-demographic characteristics and their level of tobacco-related CAD knowledge remains insufficiently characterized in this clinical context. Identifying these knowledge patterns may help inform more focused patient education and smoking-cessation counselling in cardiology outpatient settings.

Therefore, the present descriptive cross-sectional study aimed to assess patients' knowledge regarding cigarette smoking as a major risk factor for coronary artery disease at Mayo Hospital and the Punjab Institute of Cardiology, Lahore, including knowledge related to CAD, active cigarette smoking, secondhand smoke, vaping, and prevention and cessation. The study also aimed to examine whether patients' knowledge differed in relation to their socio-demographic characteristics. The primary research questions were: what is the level of patients' knowledge regarding cigarette smoking and related tobacco exposures as risk factors for CAD, and is patients' knowledge associated with their socio-demographic characteristics? The null hypothesis was that there is no significant association between patients' socio-demographic characteristics and their level of knowledge, whereas the alternative hypothesis was that a significant association exists.

MATERIAL AND METHODS

A descriptive cross-sectional study was conducted to assess patients' knowledge regarding cigarette smoking and related tobacco exposures as risk factors for coronary artery disease (CAD) and to explore the relationship between knowledge and socio-demographic characteristics. A cross-sectional design was considered appropriate because knowledge, smoking-related characteristics, and demographic information were assessed at a single period without manipulation of exposures or delivery of an intervention. The study was carried out in the cardiology outpatient departments of Mayo Hospital, Lahore, and the Punjab Institute of Cardiology, Lahore, Pakistan. Data collection was undertaken over a three-month period from October to December 2025 following approval of the research synopsis.

The target population comprised adult patients attending the cardiology outpatient departments of the two participating hospitals during the study period. Patients were eligible if they were aged 18 years or older, had a history of cigarette smoking, secondhand smoke exposure, or other cardiovascular risk factors, were able to understand and respond to the questionnaire, and provided written informed consent. Patients who were critically ill or medically unstable at the time of recruitment, had cognitive impairment or communication difficulties that could interfere with questionnaire completion, declined participation or subsequently withdrew consent, or returned questionnaires with incomplete responses were excluded. Participants were recruited from the cardiology outpatient departments using convenience sampling after assessment of eligibility and explanation of the study purpose.

The sample size was calculated using the formula $n = N/[1 + N(e^2)]$, where n represented the required sample size, N represented the source population size, and e represented the accepted margin of error. Using a population size of 465 and a margin of error of 5%, the calculation was $465/[1 + 465(0.05^2)] = 465/2.1625$, yielding approximately 215 participants. Accordingly, 215 patients were included in the final analysis. Because participants were selected by

convenience sampling rather than probability sampling, recruitment continued among eligible and consenting patients attending the participating outpatient departments until the required sample size was achieved.

Data were collected using a structured questionnaire developed after review of relevant literature on cardiovascular risk-factor knowledge and smoking-related awareness (10,11). The instrument consisted of two sections. Section I recorded socio-demographic characteristics, including age, gender, marital status, educational level, occupation, place of residence, and smoking status. Age was recorded using the categories 18–25 years, 26–35 years, and >35 years; smoking status was classified as current smoker, former smoker, or never smoker. Section II consisted of 15 dichotomous Yes/No knowledge items organized into five domains: knowledge of CAD (items 1–2), active cigarette smoking (items 3–7), secondhand smoke (items 8–10), vaping or e-cigarette use (items 11–13), and prevention and cessation (items 14–15). The questionnaire therefore assessed knowledge not only of conventional cigarette smoking but also of passive smoke exposure, vaping, and preventive or cessation-related concepts relevant to cardiovascular health.

All 15 knowledge statements were positively keyed. A correct "Yes" response was assigned a score of 1 and an incorrect "No" response was assigned a score of 0, producing a possible total knowledge score of 0–15. The total score was converted to a percentage of the maximum obtainable score. Knowledge was categorized according to predefined study criteria as good when the percentage score was ≥75%, moderate when it was 50–74%, and poor when it was <50%. The principal outcome was the overall knowledge score and corresponding knowledge category, while item-level responses and domain-specific patterns were used to describe areas of relatively greater or lower awareness. Socio-demographic characteristics were treated as explanatory variables for the planned assessment of their relationship with knowledge.

Potential participants were approached in the cardiology outpatient departments after institutional permission had been obtained. The study purpose and participation requirements were explained, and written informed consent was obtained before questionnaire administration. Participants who were able to read completed the questionnaire themselves. For participants unable to read the questionnaire independently, the researchers read each question aloud without explaining its meaning, prompting a particular response, or suggesting an answer. This standardized approach was used to reduce interviewer influence while allowing participation of individuals with limited literacy. Questionnaire completion required approximately 10–15 minutes. Completed questionnaires were reviewed at the point of collection for completeness, and questionnaires with incomplete or missing responses were not included in the final dataset. No imputation of missing questionnaire responses was undertaken because the analytical sample comprised complete questionnaires.

Data were entered and analyzed using IBM SPSS Statistics version 27.0. Categorical variables and individual knowledge items were summarized using frequencies and percentages. Descriptive statistics for the knowledge score included the mean, standard deviation, range, minimum and maximum values, skewness, and kurtosis. The total knowledge score was converted to a percentage and classified as good, moderate, or poor according to the prespecified thresholds. The relationship between knowledge and demographic information was explored in the original analysis using Bayesian Pearson correlation based on reference priors, with the posterior mean, mode, variance, and 95% credible interval reported. The analysis was unadjusted and did not incorporate a multivariable model for potential confounding. Internal consistency of the 15-item knowledge questionnaire was assessed using Cronbach's alpha.

Ethical approval was obtained from the Ethical Review Board of SACON Institute of Allied Health Sciences, Lahore, and administrative permission was obtained from Mayo Hospital, Lahore, and the Punjab Institute of Cardiology, Lahore. Participation was voluntary, and written informed consent was obtained from all participants before data collection. Participants were informed that refusal to participate or withdrawal from the study would not affect their treatment or access to healthcare. The questionnaire-based study involved no therapeutic intervention. Participant anonymity and confidentiality were maintained during data collection, analysis, and reporting, and identifying information was not included in the reported findings.

RESULTS

A total of 215 patients were included in the analysis. Participants aged >35 years constituted the largest age group (42.8%), while 28.8% were aged 18–25 years and 28.4% were aged 26–35 years. Most participants were male (72.1%)

and resided in urban areas (69.8%). Primary education was the most frequently reported educational level (42.8%), followed by secondary education (28.4%). Current cigarette smoking was reported by 58.6% of participants, whereas 13.5% were former smokers and 27.9% had never smoked (Table 1).

Knowledge differed across individual questionnaire items and domains. Awareness was greatest for the cardiovascular risks associated with active cigarette smoking. A total of 184 participants (85.6%) correctly identified cigarette smoking as a major risk factor for CAD, and the same proportion correctly recognized its associations with vascular endothelial damage, coronary artery narrowing, increased blood pressure and cardiac workload, and greater long-term cardiovascular risk. In contrast, 57.2% correctly identified the basic vascular nature of CAD, although 72.1% recognized that CAD could result in heart attack or sudden death (Table 2).

Knowledge regarding secondhand smoke was less consistent. Although 70.2% recognized that breathing other people's cigarette smoke is harmful to cardiovascular health and that secondhand smoking increases CAD risk, only 55.3% recognized that nonsmokers exposed to cigarette smoke can develop heart disease. Knowledge of vaping-related cardiovascular risk was similarly variable: 55.3% recognized vaping as harmful to the heart and blood vessels, 69.8% identified vaping as a CAD risk, and 56.7% correctly recognized that vaping is not a safe alternative to cigarette smoking for cardiovascular health. Regarding prevention, 56.7% recognized that quitting smoking or vaping reduces CAD risk, whereas 71.6% recognized the protective value of avoiding cigarette smoke and vape exposure (Table 2).

Table 1. Socio-demographic characteristics of the study participants (N = 215)

Characteristic	Category	n (%)
Age, years	18–25	62 (28.8)
	26–35	61 (28.4)
	>35	92 (42.8)
Gender	Male	155 (72.1)
	Female	60 (27.9)
Marital status	Single	155 (72.1)
	Married	60 (27.9)
Educational level	Non-formal	33 (15.3)
	Primary	92 (42.8)
	Secondary	61 (28.4)
	Graduate or above	29 (13.5)
Place of residence	Rural	65 (30.2)
	Urban	150 (69.8)
Smoking status	Current smoker	126 (58.6)
	Former smoker	29 (13.5)
	Never smoked	60 (27.9)

Table 2. Item-level knowledge regarding coronary artery disease, cigarette smoking, secondhand smoke, vaping, and cessation (N = 215)

Domain	Knowledge item	Correct, n (%)	Incorrect, n (%)
CAD knowledge	CAD affects the blood vessels supplying the heart	123 (57.2)	92 (42.8)
	CAD can lead to heart attack and sudden death	155 (72.1)	60 (27.9)
Active cigarette smoking	Cigarette smoking is a major risk factor for CAD	184 (85.6)	31 (14.4)
	Smoking damages the inner lining of blood vessels	184 (85.6)	31 (14.4)
	Smoking causes narrowing of coronary arteries	184 (85.6)	31 (14.4)
	Smoking increases blood pressure and workload on the heart	184 (85.6)	31 (14.4)
	Long-term smokers have a higher risk of heart disease than non-smokers	184 (85.6)	31 (14.4)
Secondhand smoke	Breathing other people's cigarette smoke is harmful to heart health	151 (70.2)	64 (29.8)
	Secondhand smoking increases the risk of CAD	151 (70.2)	64 (29.8)
	Non-smokers exposed to cigarette smoke can develop heart disease	119 (55.3)	96 (44.7)
Vaping/e-cigarettes	Vaping is harmful to the heart and blood vessels	119 (55.3)	96 (44.7)
	Vaping increases the risk of CAD	150 (69.8)	65 (30.2)
	Vaping is not a safe alternative to cigarette smoking for heart health	122 (56.7)	93 (43.3)
Prevention and cessation	Quitting smoking or vaping reduces the risk of CAD	122 (56.7)	93 (43.3)
	Avoiding cigarette smoke and vape exposure helps protect heart health	154 (71.6)	61 (28.4)

CAD, coronary artery disease.

Table 3. Knowledge performance by domain and overall score

Knowledge domain	Correct responses, n/N	Correct responses, %
CAD knowledge	278/430	64.7
Active cigarette smoking	920/1075	85.6
Secondhand smoke	421/645	65.3

Knowledge domain	Correct responses, n/N	Correct responses, %
Vaping/e-cigarettes	391/645	60.6
Prevention and cessation	276/430	64.2
Overall knowledge	2286/3225	70.9

Percentages represent the proportion of correct responses across all items within each domain.

Table 4. Distribution of corrected overall knowledge scores (N = 215)

Correct knowledge score, proportion	Approximate score, items correct/15	n (%)
1.00	15/15	58 (27.0)
0.80	12/15	32 (14.9)
0.67	10/15	62 (28.8)
0.60	9/15	32 (14.9)
0.27	4/15	31 (14.4)
Total	—	215 (100.0)

Table 5. Overall knowledge level according to predefined percentage-score categories (N = 215)

Knowledge level	Score criterion	n (%)
Good	≥75%	90 (41.9)
Moderate	50–74%	94 (43.7)
Poor	<50%	31 (14.4)
Total	—	215 (100.0)

Table 6. Descriptive statistics and internal consistency of the corrected knowledge score

Measure	Value
N	215
Mean proportion correct	0.7088
Mean percentage score, %	70.88
SD, percentage points	23.42
Mean score, /15	10.63
SD, score points	3.51
Minimum proportion correct	0.27
Maximum proportion correct	1.00
Skewness	−0.467
Kurtosis	−0.471
Cronbach's α	0.776
Number of knowledge items	15

When correct responses were aggregated within the predefined questionnaire domains, active cigarette smoking demonstrated the highest proportion of correct responses at 85.6%. Correct-response proportions were 65.3% for secondhand smoke, 64.7% for general CAD knowledge, 64.2% for prevention and cessation, and 60.6% for vaping and e-cigarettes. Across all 15 knowledge items, 2,286 of 3,225 possible responses were correct, corresponding to an overall correct-response proportion of 70.9% (Table 3).

The corrected participant-level knowledge-score distribution ranged from approximately 27% to 100% of the maximum possible score. Fifty-eight participants (27.0%) achieved all 15 items correctly, while 32 (14.9%) achieved approximately 80%, 62 (28.8%) achieved approximately 67%, 32 (14.9%) achieved 60%, and 31 (14.4%) achieved approximately 27% of the maximum score (Table 4). According to the prespecified classification thresholds, 90 participants (41.9%) had good knowledge, 94 (43.7%) had moderate knowledge, and 31 (14.4%) had poor knowledge (Table 5).

The corrected mean knowledge score was 10.63 ± 3.51 out of 15, corresponding to 70.88% ± 23.42 percentage points. Scores ranged from approximately 27% to 100% of the maximum possible score and showed modest negative skewness (−0.467), indicating a greater concentration of observations toward the higher end of the knowledge distribution. Internal consistency of the 15-item questionnaire was acceptable, with a Cronbach's alpha of 0.776 (Table 6).

DISCUSSION

The present study found that patients attending cardiology outpatient departments had an overall mean knowledge score of approximately 71%, with most participants falling within the moderate or good knowledge categories. Knowledge was strongest for the cardiovascular risks associated with active cigarette smoking, whereas comparatively greater gaps were observed in understanding the basic nature of coronary artery disease (CAD),

secondhand smoke, vaping, and the cardiovascular benefits of cessation. These findings indicate that recognition of conventional cigarette smoking as harmful was relatively widespread, but knowledge was less consistent when participants were asked about passive exposure, newer nicotine-delivery products, and prevention.

The high level of recognition of active cigarette smoking as a cardiovascular risk factor is consistent with previous international evidence. In the present study, 85.6% of participants identified smoking as a major risk factor for CAD. Taiek et al. similarly reported that 86.8% of adults in Morocco recognized smoking as a cardiovascular risk factor, while 78.5% were aware of the protective value of smoking cessation (10). In Saudi Arabia, Bashatah et al. found that 78.7% of respondents recognized smoking as a cardiovascular risk factor and 74.9% understood the preventive benefit of quitting (11). The comparatively high recognition of smoking in the current sample may partly reflect the clinical setting, because participants were recruited from cardiology outpatient departments where exposure to cardiovascular counselling, previous disease experiences, or contact with health professionals may increase awareness. Nevertheless, high recognition of smoking as harmful did not translate into equally strong knowledge across all domains.

The corrected overall mean knowledge score of 70.9% indicates a substantially different pattern from that originally suggested by the uncorrected aggregate score. Based on the predefined categories, 41.9% of participants demonstrated good knowledge, 43.7% moderate knowledge, and 14.4% poor knowledge. This level of overall knowledge is broadly comparable with, although not directly equivalent to, findings from Morocco, where the mean cardiovascular risk-factor knowledge score was approximately 64% and 47.4% of respondents were categorized as having good knowledge (10). Differences between studies should be interpreted cautiously because the instruments, scoring thresholds, study populations, and clinical contexts were not identical. The Moroccan study used the 25-item Heart Disease Fact Questionnaire, whereas the present study used a 15-item instrument specifically emphasizing smoking, secondhand smoke, vaping, and cessation.

The findings also appear more favorable than those reported in a recent Pakistani study conducted in Islamabad and Rawalpindi, in which only 24.2% of adults were categorized as having good knowledge of modifiable CAD risk factors, and recognition of smoking and several other established risk factors ranged from approximately 32% to 37% (12). The difference may be attributable to differences in study population and measurement. The previous Pakistani study included both at-risk adults and patients with diagnosed CAD, whereas the current participants were recruited from cardiology outpatient departments of two major tertiary hospitals. More frequent contact with cardiovascular services could plausibly increase exposure to disease-specific information. Qualitative research among Pakistani patients with CAD has similarly suggested that awareness of cardiovascular risk factors often develops following diagnosis and personal experience with disease (13). Because the present study was cross-sectional and did not measure previous counselling or duration of cardiovascular disease, this explanation remains plausible rather than demonstrated.

Knowledge concerning the pathophysiological nature of CAD was less consistent than knowledge of active smoking. Slightly more than half of participants recognized that CAD affects the blood vessels supplying the heart, although a greater proportion recognized that the disease can lead to myocardial infarction and sudden death. This pattern suggests that patients may be more familiar with the clinical consequences of CAD than with its underlying vascular basis. Such a distinction has practical relevance because understanding how tobacco exposure affects coronary vessels may strengthen risk communication. Cigarette smoke contributes to oxidative stress, impaired nitric oxide bioavailability, endothelial dysfunction, vascular inflammation, atherogenesis, and thrombosis, mechanisms that provide a biological basis for its association with coronary disease (1,2). Educational strategies that connect smoking behavior with these understandable disease mechanisms may therefore help bridge the gap between general awareness and more specific cardiovascular knowledge.

Knowledge of secondhand smoke was also lower than knowledge of active smoking. Approximately seven in ten participants recognized that secondhand smoke is harmful to cardiovascular health, but only 55.3% recognized that nonsmokers exposed to cigarette smoke can develop heart disease. This finding is clinically relevant because passive exposure may be normalized within households and social environments even when active smoking is regarded as harmful. The cardiovascular consequences of tobacco exposure extend beyond active smokers, and secondhand smoke has established adverse health effects (7). Awareness of such risks may also be relevant to cessation-related behavior; in the PURE analysis, knowledge that tobacco causes heart disease and awareness of

harms associated with exposure to others' smoke were associated with healthier smoking-related behaviors after accounting for socioeconomic characteristics (14). The present study cannot establish whether greater knowledge resulted in behavior change, but the observed knowledge gap identifies an area that could reasonably be emphasized during patient and family counselling.

Vaping represented another comparatively weak knowledge domain. Only 55.3% of participants identified vaping as harmful to the heart and blood vessels, and 56.7% recognized that it is not a safe alternative to conventional cigarette smoking for cardiovascular health. Similar misconceptions have been reported among e-cigarette users in Lahore, where perceived relative safety was an important reason for initiating vaping and knowledge of harmful constituents was incomplete (9). Current evidence indicates that acute e-cigarette exposure can increase heart rate and blood pressure and is associated with adverse vascular responses, although evidence regarding long-term cardiovascular outcomes remains less complete than that for conventional cigarette smoking (8). Consequently, cardiovascular education should avoid overstating certainty about long-term vaping outcomes while clearly communicating that e-cigarettes cannot be considered cardiovascularly harmless.

Knowledge regarding cessation was also incomplete. Only 56.7% recognized that quitting smoking or vaping reduces CAD risk, despite 58.6% of the study participants being current smokers. This gap is clinically important because complete cessation, rather than merely reducing cigarette consumption, has been associated with substantially better cardiovascular outcomes among patients with stable CAD. In the CLARIFY cohort, smoking cessation after CAD diagnosis was associated with an approximately 44% lower risk of cardiovascular death or myocardial infarction, whereas reducing cigarette consumption without quitting did not demonstrate comparable benefit (15). Knowledge alone does not ensure cessation, but the PURE study also suggests that cardiovascular health knowledge is associated with adoption of heart-healthy behaviors across diverse populations (14). Structured patient education may therefore form one component of comprehensive cessation support rather than being considered an intervention sufficient by itself.

The findings have particular relevance for nursing practice because nurses in cardiology outpatient settings frequently encounter patients at repeated points in the care pathway. Systematic review evidence indicates that patient education among adults with coronary heart disease can improve health knowledge and contribute to changes in health-related behavior, although effects vary according to intervention characteristics and outcomes assessed (16). The present findings suggest that educational content should extend beyond the general statement that “smoking causes heart disease” and specifically address passive exposure, the cardiovascular effects of vaping, the benefits of complete cessation, and the basic vascular mechanisms of CAD. Given the relatively high proportion of current smokers in this sample, linking knowledge assessment with established smoking-cessation support may be particularly relevant in cardiology outpatient practice.

Several strengths should be considered when interpreting the findings. The study included 215 patients recruited from two major public-sector cardiology settings in Lahore and assessed multiple dimensions of tobacco-related cardiovascular knowledge rather than limiting assessment to recognition of cigarette smoking alone. Item-level reporting enabled specific knowledge gaps to be distinguished from the overall score, and the 15-item questionnaire demonstrated acceptable internal consistency in this sample, with a Cronbach's alpha of 0.776. The corrected scoring also provides a more coherent interpretation because the total knowledge result is now consistent with the observed item-level responses.

The study also has important limitations. Its descriptive cross-sectional design precludes temporal or causal inference between knowledge, demographic characteristics, and smoking behavior. Convenience sampling may have introduced selection bias, and patients attending two public tertiary-care cardiology departments may differ from individuals receiving care in primary-care, private-sector, or community settings; therefore, the results should not be generalized to all adults in Lahore or Pakistan. Knowledge and smoking status were self-reported and may have been influenced by recall or social-desirability bias. The questionnaire used dichotomous Yes/No responses, which may not capture uncertainty or depth of understanding, and detailed evidence of formal psychometric validation beyond internal consistency was not reported. Participants with limited literacy had questionnaire items read aloud, which improved accessibility but may have introduced some interviewer influence despite attempts to avoid prompting. Information on previous cardiovascular education, socioeconomic status, duration of CAD, and intensity of tobacco exposure was not incorporated into the reported analysis. In addition, the available

summarized data did not support valid reanalysis of associations between individual socio-demographic factors and knowledge, so conclusions regarding demographic predictors should not be drawn from the present results.

Overall, the study indicates that cardiology outpatients demonstrated reasonably good recognition of the risks of conventional cigarette smoking but substantially less consistent understanding of passive smoking, vaping, cessation, and some fundamental aspects of CAD. These domain-specific gaps are more informative than classifying the population simply as knowledgeable or unknowledgeable and support the use of targeted, comprehensible tobacco-risk education within cardiovascular care.

CONCLUSION

Patients attending the cardiology outpatient departments of Mayo Hospital and the Punjab Institute of Cardiology demonstrated an overall moderate-to-good level of knowledge regarding cigarette smoking and CAD, with 41.9% classified as having good knowledge, 43.7% as moderate, and 14.4% as poor. Awareness was strongest for the cardiovascular risks of active cigarette smoking, while comparatively greater knowledge gaps were observed regarding secondhand smoke, vaping, smoking cessation, and the basic vascular nature of CAD. These findings indicate that patient education in cardiology settings should focus particularly on the less well-understood dimensions of tobacco-related cardiovascular risk while reinforcing existing awareness of the harms of conventional cigarette smoking.

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