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**Original Research Article**

# Population awareness of modifiable risk factors for coronary artery disease: a cross-sectional study in Islamabad, Pakistan

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## ABSTRACT

**Background:** Coronary artery disease (CAD) is a leading global cause of morbidity and mortality, with rising prevalence and risk in developing countries like Pakistan. Despite the high burden, awareness of these risk factors remains limited in many populations. This study evaluates the knowledge and prevalence of modifiable CAD risk factors among adults in Islamabad and Rawalpindi. The findings aim to inform targeted public health strategies to reduce CAD-related morbidity and mortality.

**Methods:** A six-month cross-sectional study from May 2025 to October 2025 was conducted in Islamabad and Rawalpindi involving 322 adults including diagnosed CAD patients and at-risk individuals. Participants were recruited using non-random convenience sampling and completed an interview-based online questionnaire that assessed their knowledge of modifiable risk factors for cardiovascular disease. Data was analyzed with statistical package for the social sciences (SPSS) using Chi-square tests to explore associations. Ethical approval and informed consent were obtained with confidentiality maintained throughout the study.

**Results:** This study assessed awareness of modifiable risk factors for CAD among 322 adults in Pakistan, revealing that only 24.2% demonstrated good knowledge by identifying four or more key risk factors. Hypertension was the most recognized risk factor 51.6%, while awareness of smoking, diabetes, obesity, and high cholesterol ranged between 32% and 37%. Comparisons with regional and international studies highlight a significant knowledge gap in the Pakistani population.

**Conclusions:** This study reveals substantial gaps in public awareness of modifiable risk factors for coronary artery disease in Pakistan. Targeted educational interventions are urgently needed to improve knowledge, promote preventive measures and reduce disease burden.

**Keywords:** Coronary artery disease, Hypertension, Diabetes mellitus, Health knowledge, Awareness, Cross-sectional study, Pakistan

## INTRODUCTION

Coronary artery disease (CAD) remains the foremost cause of death and disability worldwide, imposing an immense and rising burden on both developed and developing nations.[1] Recent projections estimate that in 2025, cardiovascular diseases (CVDs) will account for 20.5 million deaths globally, with this number expected to surge to 35.6 million by 2050—a dramatic 73% increase in crude mortality over a single generation.[2]

Globally, CAD prevalence reached 315 million cases in 2022, and age-standardized rates remain highest in Central Europe, Eastern Europe, and Central Asia; however, the absolute numbers are increasing in South Asia due to demographic and lifestyle transitions.[3] In Pakistan, CAD affects up to 34.9% of adults in clinical cohorts, with urban residents (37.2%) bearing a higher burden than their rural counterparts (28.5%).[4] The Pakistani population also faces elevated risk due to genetic predisposition and the tendency to develop acute coronary events nearly a decade earlier than Western populations.[5]

Extensive international research, including the Global Burden of Disease Study and systematic reviews sponsored by leading cardiovascular organizations, has established the central role of modifiable risk factors in the pathogenesis and progression of CAD.[6] The Framingham heart study and subsequent global investigations identify hypertension, diabetes mellitus, tobacco use, physical inactivity, obesity, and diets rich in saturated fat as the most influential contributors to disease prevalence.

For instance, high systolic blood pressure drives 18.9 million CVD deaths worldwide annually, and substantial national studies in Pakistan highlight hypertension (odds ratio, OR=1.86), diabetes (OR=2.14), smoking (OR=1.52), and obesity (OR=1.42) as leading independent risk factors for CAD.[7] Early onset, late presentation (47.3% of cases), and significant regional and gender disparities intensify the healthcare challenge in Pakistan.[8]

National and international studies consistently demonstrate that improved awareness and control of modifiable risk factors significantly reduce CAD morbidity and mortality; yet, significant gaps remain in public knowledge, especially in lower- and middle-income countries.[6,9] In Pakistan, misunderstanding or lack of awareness concerning risk factors are exacerbated by socioeconomic constraints, limited access to healthcare, and disparities in education.[9]

Research efforts have increasingly focused on addressing these deficits, with multicenter studies, cohort analyses, and targeted surveys evaluating the impact of educational attainment, healthcare access, and gender on risk factor recognition and management.[10]

This research-oriented, cross-sectional study aims to address these critical knowledge gaps by systematically evaluating the awareness and understanding of modifiable risk factors for CAD among the adult population in Islamabad and Rawalpindi. Our study aims to quantify the prevalence of key risk factors, determine their association with demographic and socioeconomic variables, and benchmark local trends against international data. By analyzing barriers to risk factor management and examining differences based on education, socioeconomic status, gender, and urban-rural residence, our findings intend to inform the development of effective, evidence-based public health interventions tailored to the unique challenges facing the Pakistani population and other high-burden regions.

## METHODS

This cross-sectional study was conducted over 4-week period from May to June 2025 in teaching hospitals in Islamabad and Rawalpindi, with ethical approval obtained from the affiliated university's Ethics Review Board. The study population consisted of adults aged 18 and above, including both patients diagnosed with CAD and at-risk individuals without a diagnosis, who were able to communicate in English or Urdu and provided informed consent. Participants represented varying levels of knowledge regarding CAD and its associated risk factors, allowing for comparative analysis. Individuals under 18, those with language barriers and uncooperative participants were excluded from the study. A total sample size of 322 was determined using the RaoSoft calculator, employing non-random convenience sampling from the general population of the two cities.

Data collection involved administering an interview-based questionnaire that consisted of socio-demographics and an assessment of knowledge related to modifiable risk factors for CAD. Patients and the public participated in the data collection process with verbal consent obtained after the study's aims were explained and confidentiality ensured. Forms with incomplete information were excluded from analysis to maintain data quality.

Statistical analysis was performed using statistical package for the social sciences (SPSS) version 28, with chi-square tests applied to examine associations between categorical variables. Throughout the study, confidentiality and participant privacy were maintained in accordance with the STROCSS 2025 guidelines. The research was self-funded, and no monetary incentives were provided to participants.

## RESULTS

### *Demographic variables*

The study enrolled 322 participants with a nearly even age distribution, with 53.4% under 35 years and 46.6% over 35 years. The gender distribution comprised 54.0% males and 46.0% females, with the majority (61.5%) residing in urban areas (Table 1).

***Participants' knowledge of CAD risk factors***

Participants were evaluated on their ability to identify established risk factors for CAD including smoking, obesity, diabetes mellitus, hypertension, and high cholesterol, alongside non-related factors such as depression and sleep problems. Knowledge assessment categorized participants as having good awareness if they correctly identified four or more key risk factors, while those recognizing three or fewer were classified as having poor knowledge. Results indicated that hypertension was the most commonly identified risk factor (51.6%), followed by diabetes mellitus (37.3%), high cholesterol (36.0%), obesity (35.4%), and smoking (32.3%) (Figure 1).

**Table 1: Baseline demographic characteristics of the included participants in cross survey.**

| Variable | Frequency (N) | Percentage |
|---|---|---|
| **Age <35 years** | 172 | 53.4 |
| **Age >35 years** | 150 | 46.6 |
| **Female** | 148 | 46.0 |
| **Male** | 174 | 54.0 |
| **Rural** | 124 | 38.5 |
| **Urban** | 198 | 61.5 |
| **Married** | 142 | 44.1 |
| **Widowed** | 12 | 3.7 |
| **Divorced** | 2 | 0.6 |
| **Never married** | 166 | 51.6 |
| **Nuclear family** | 211 | 65.5 |
| **Extended family** | 111 | 34.5 |
| **No exercise** | 141 | 43.8 |
| **Conditional exercise** | 125 | 38.8 |
| **Regular exercise** | 56 | 17.4 |
| **6–10 years education** | 20 | 6.2 |
| **Bachelor** | 158 | 49.1 |
| **Graduate** | 78 | 24.2 |
| **≤5 years education** | 66 | 20.5 |
| **Never smoked** | 247 | 76.7 |
| **Former smoker** | 34 | 10.6 |
| **Current smoker** | 41 | 12.7 |

Despite the high burden of disease, only 24.2% (n=78) of participants demonstrated good knowledge of CAD risk factors. In contrast, the majority (75.8%, n=244) exhibited poor awareness, underscoring a significant gap in public understanding of critical, modifiable risks. The detailed participant's knowledge of the CAD risk factors has been provided in Table 2.

***Participants' knowledge and practices related to coronary heart disease prevention***

When asked about the preventability of coronary artery disease (CAD), 70.8% (n=228) of participants recognized that the condition is preventable, whereas 9.9% (n=32) believed it was not, and 19.3% (n=62) were uncertain. Regarding health monitoring behaviors, only 46.3% (n=149) reported conducting monthly blood pressure checks, while 20.5% (n=66) had never monitored their blood pressure. Blood sugar monitoring was more common, with 59.6% (n=192) having checked their blood sugar at least once; however, 40.4% (n=130) had never undergone such an assessment. Cholesterol screening was notably less frequent, with 54.3% (n=175) never having their cholesterol levels tested. Preventive lifestyle practices were suboptimal: only 19.3% (n=62) reported dietary salt restriction, 25.8% (n=83) engaged in regular exercise, and a majority, 55.0% (n=177), reported no engagement in any specific preventive measures. The details of the participants knowledge and practices are detailed in Table 3. These findings highlight critical gaps in both awareness and adoption of preventive strategies crucial for mitigating CAD risk.

**Table 2: CAD knowledge score.**

| Knowledge category | Frequency (N) | Percentage |
|---|---|---|
| **Good knowledge (≥4 factors)** | 78 | 24.2 |
| **Poor knowledge (≤3 factors)** | 244 | 75.8 |

**Table 3: Knowledge and practices of the study participants regarding coronary artery disease prevention.**

| Practice | Frequency (N) | Percentage |
|---|---|---|
| **Believes CAD is Preventable** | 228 | 70.8 |
| **Does not believe** | 32 | 9.9 |
| **Don't know** | 62 | 19.3 |
| **Checks BP monthly** | 149 | 46.3 |
| **Checks BP every 2 years** | 69 | 21.4 |
| **Checks BP >2 years** | 38 | 11.8 |
| **Never checked BP** | 66 | 20.5 |
| **Checked blood sugar** | 192 | 59.6 |
| **Never checked blood sugar** | 130 | 40.4 |
| **Checked cholesterol** | 147 | 45.7 |
| **Never checked cholesterol** | 175 | 54.3 |
| **Restricts salt** | 62 | 19.3 |
| **Exercises regularly** | 83 | 25.8 |
| **No preventive practices** | 177 | 55.0 |

***Significant associations between variables***

Statistical analysis revealed several significant associations between key cardiovascular risk factors and disease awareness among the study participants. Awareness of hypertension was strongly correlated with a known diagnosis of hypertension ($\chi^2$ (2, n=322) =99.609,

p<0.001), indicating that individuals with a diagnosed condition were markedly more aware of their condition. Additionally, hypertension was significantly associated with elevated blood cholesterol levels ($\chi^2$ (2, n=322) =20.486, p<0.001) and the presence of diabetes mellitus ($\chi^2$ (2, n=322) =33.440, p<0.001), underscoring a high prevalence of comorbid metabolic disorders among hypertensive patients. However, no significant correlation was observed between hypertension and behavioral factors such as smoking or obesity. Similarly, diabetes mellitus demonstrated strong associations with hypertension ($\chi^2$ (2, n=322) =39.487, p<0.001) and high cholesterol levels ($\chi^2$ (2, n=322) =22.089, p<0.001). Awareness of diabetes was significantly higher among individuals with a confirmed diagnosis compared to those without ($\chi^2$ (2, n=322) =98.507, p<0.001), reflecting disease recognition improvements post-diagnosis. Moreover, smoking history was significantly associated with obesity status ($\chi^2$ (4, n=322) =10.357, p=0.035), with current and former smokers exhibiting a higher prevalence of obesity compared to non-smokers. A history of myocardial infarction (MI) was significantly linked with hypertension ($\chi^2$ (2, n=322) =25.851, p<0.001), elevated cholesterol levels ($\chi^2$ (2, n=322) =17.805, p<0.001), and diabetes mellitus ($\chi^2$ (2, n=322) =43.167, p<0.001). These findings highlight the interconnected nature of major cardiovascular risk factors and underscore the importance of comprehensive risk management in patients with a history of cardiac events.

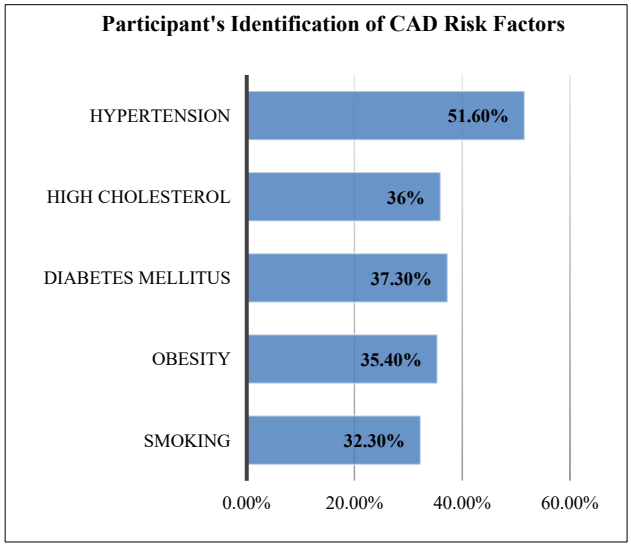


**Figure 1: Frequency of study participants with identified cad risk factors.**

## DISCUSSION

This study reveals a concerning deficit in public awareness regarding modifiable risk factors for CAD in Pakistan. Among 322 participants, only 24.2% demonstrated good knowledge by correctly identifying four or more established risk factors hypertension, smoking, diabetes mellitus, obesity, and high cholesterol while a substantial 75.8% exhibited poor knowledge, recognizing three or fewer.[11] Notably, hypertension was identified by just over half (51.6%) of participants, with lower recognition rates for diabetes mellitus (37.3%), high cholesterol (36.0%), obesity (35.4%), and smoking (32.3%).[12] These findings align with regional studies yet reveal gaps when compared internationally.

For instance, a study by the All-India Institute of Medical Sciences (AIIMS), New Delhi, reported markedly higher awareness, with 41% of participants displaying excellent knowledge, and risk factor recognition rates ranging from 57% for cholesterol to 73% for hypertension and 72% for obesity.[13] Similarly, research from Kathmandu demonstrated awareness of obesity (70.8%) and diabetes (55%), which exceeded the levels observed in our cohort, although awareness of salt restriction remained low (19.3%), paralleling our findings.[14] Moreover, a survey in Kathmandu highlighted that only 22% had a strong understanding of modifiable CAD risk factors, with recognition of hypertension being higher (85.2%). Still, other factors, such as obesity and smoking, were substantially better identified compared to our study, underscoring the comparatively limited knowledge in the Pakistani context.[15]

Additional comparisons include a study in Gujarat, India, where family members of CAD patients demonstrated high awareness of hypertension (91.8%) and stress (92.8%) as risk factors, contrasting with our finding of 51.6% hypertension awareness.[16] Furthermore, a Kuwaiti study reflected moderate knowledge levels regarding cardiovascular diseases. At the same time, smoking, obesity, poor diet, and physical inactivity were cited by more than 80% as major contributors; awareness of symptomatology remained low.[17,18] Our results similarly illustrate substantial gaps in public knowledge despite the significant burden of disease. These disparities underscore the urgent need for culturally tailored educational interventions in Pakistan to increase public awareness of CAD risk factors. Given that coronary artery disease remains a leading cause of mortality worldwide responsible for an estimated 17.3 million deaths annually and considering Pakistan's rising prevalence of diabetes, hypertension, and lifestyle-related risk factors, improving awareness is a pivotal first step in effective prevention.[19,20] The interrelated nature of risk factors such as hypertension, diabetes, and dyslipidemia further necessitates comprehensive public health strategies rather than isolated risk factor targeting.[21,22] This study's strengths include addressing a critical knowledge gap within an understudied population in Pakistan, offering updated insights crucial for informing public health policies. The reproducibility of findings enhances their reliability, while the documented associations between multiple risk factors underscore the complex interplay driving CAD prevalence. These elements provide a robust foundation for developing focused awareness and preventive programs among the Pakistani sociocultural environment.

### *Limitations*

However, limitations must be acknowledged. The use of non-random convenience sampling restricts generalizability due to potential selection bias. The setting a single hospital in one city and a relatively small sample size further limit applicability to broader regional or national populations. Gender imbalance, with male predominance among participants, may skew findings given literacy and education disparities in Pakistan, reducing insight into female and less-educated groups. Future research should aim for randomized, multi-center sampling to enhance external validity and provide a more comprehensive understanding of public knowledge on CAD risk factors in Pakistan.

## CONCLUSION

In conclusion, this study reveals critical gaps in awareness of modifiable risk factors for CAD among adults in Islamabad and Rawalpindi. Although hypertension was relatively well recognized, knowledge of other key factors such as elevated cholesterol, diabetes, obesity, and smoking remains limited. The association between awareness levels and demographic characteristics, including education, gender, and socioeconomic status, highlights the need for tailored, culturally sensitive public health interventions. Addressing these knowledge deficits through targeted educational campaigns, coupled with improved prevention and screening strategies, is essential to mitigate the growing burden of CAD in Pakistan. Future research should seek to identify barriers to effective risk factor control and evaluate intervention outcomes to guide comprehensive cardiovascular disease prevention efforts in high-risk populations.

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