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Prevalence and Association of Risk Factors in Premature Coronary Artery Disease among Patients of Abbottabad

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Abstract

To determine the frequency and analyze the association of various risk factors, such as hypertension, hyperlipidemia, smoking, diabetes, and stress—with premature coronary artery disease (PCAD) among patients of Abbottabad. This cross-sectional study was conducted to identify common risk factors associated with premature coronary artery disease (PCAD) among 246 patients in Abbottabad. Participants were selected through Purposive non-probability sampling from individuals either admitted or attending the outpatient departments (OPD) of District Headquarters Hospital (DHQ) and Ayub Teaching Hospital (ATH) between 1st January to 30th June 2024. The sample size of 246 was calculated using the OpenEpi calculator with a 95% confidence interval and 5% absolute precision. Data was collected using a self-structured questionnaire covering demographic details and clinical risk factors, including hypertension, diabetes mellitus, hyperlipidemia, and smoking. To assess psychosocial and lifestyle factors, the Perceived Stress Scale and Rapid Assessment of Physical Activity Scale were used. Data were analyzed using SPSS version 22.0, and associations between categorical variables were evaluated using the chi-square test. In our study, PCAD males were 125 whereas PCAD females were 119. The frequency of risk factors was cholesterol (33.3%), Family history (56.5%), Hypertension (69.5%), Diabetes (33.3%) and Smoking (32.1%). Hypertension, mental stress, and smoking were the significant risk factors with p-value 0.001,0.001 and 0.000 respectively with a notable gender disparity. The physical inactivity and poor dietary habits also contributed being unconventional risk factors. This study offers significant understanding about the prevalence of risk factors associated with premature coronary artery disease (PCAD) among patients in Abbottabad, Pakistan. We identified hypertension, smoking, and stress as significant contributors to PCAD. The findings underscore the necessity for targeted interventions and public health strategies to address these risk factors, especially considering the gender discrepancies observed. Furthermore, the study highlights the often-overlooked roles of stress and physical activity in the development of PCAD, suggesting that comprehensive lifestyle modifications could play a fundamental role in prevention.

Keywords Premature coronary artery disease, risk factors, prevalence, stress

1. Introduction

Globally, coronary artery disease (CAD) is a leading cause of morbidity and death. CAD is a condition that typically affects the elderly. However, young adults now frequently confront it. It is estimated that about 4–10 % of individuals with documented CAD are less than 45 years (Shemirani H 2007). Premature coronary artery disease (PCAD) is defined as CAD occurring in men and women younger than 45 and 55 years respectively, but these cut-offs tend to vary from 45 to 65 years of age, as evident in different studies(Mendis S 2011).

The first MI attack occurs in 4.4% of Asian women and 9.7% of men at age less than 40 years, which is 2- to 3.5-fold higher than in the West European population and is third highest of all the regions studied worldwide (Yusuf 2004)

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The Global Burden of Diseases study has reported that among the young, ischemic heart disease (IHD) is one of the important causes of morbidity and mortality, especially in developing countries(G.A. Roth 2017). Studies from India have reported a significant proportion of patients with premature CAD among hospital admission in both government and non-government hospitals(J. Prajapati 2014) Adverse lifestyles among the young with earlier onset of major coronary risk factors are considered important(P.P. Joshi 2007). Small case–control and registry-based studies have reported that traditional factors like smoking, hypercholesterolemia, low density lipoprotein (LDL) cholesterol, hypertension, unhealthy lifestyles to be important (M.D. Gupta 2020) The known modifiable risk factors for PCAD include, but are not limited to, smoking, high blood pressure, diabetes mellitus, physical inactivity, obesity, dyslipidemia, and psychosocial stress(Vikulova DN 2019). Non-modifiable risk factors include, but are not limited to, age, gender, ethnicity, family history of heart disease, and homocystinuria (Malakar AK 2019)

2. Methodology

This cross-sectional study was conducted from 1st January to 30th June 2024 in Department of cardiology of District Headquarter Hospital and Ayub Teaching Hospital Abbottabad after obtaining ethical approval from Institutional Ethical Review Committee and informed consents from the patients. The purpose of this cross-sectional study was to identify the common risk factors for premature coronary artery disease (PCAD) in Abbottabad among 246 patients who were either admitted or visiting the outpatient department (OPD) of DHQ and ATH for recent health concerns between this study duration. The OpenEpi calculator was used to determine the sample size for this study, which yielded 246 participants with a 95% confidence interval and 5% absolute precision. Purposive non-probability sampling was employed, and participants were selected presenting with symptoms of PCAD. Data was collected using a self-constructed questionnaire, which included the patient's demographic profile and assessments of risk factors such as hypertension, diabetes mellitus, smoking, and cholesterol levels which were administered through direct interviews with the patients after taking informed consent. Additionally, the Perceived Stress Scale and Rapid Assessment Activity Scale were used to evaluate the roles of stress and physical activity in the development of PCAD across both genders. SPSS version 22.0 was used for data analysis. Descriptive statistics for continuous variables e.g. age were presented as mean ± standard deviation. For categorical variables e.g. residence, education, occupation, socio-economic status, comorbidities, and risk factors for PCAD, frequencies and percentages were calculated. To assess associations between variables, the Chi-square test was applied, and a p-value of ≤ 0.05 was considered statistically significant.

Inclusion Criteria

- Male patients aged ≤45 years and female patients ≤55 years
- Presenting with stable or unstable angina or with a history of STEMI or NSTEMI
- Patients visiting cardiac outpatient department (OPD) or admitted to the hospital
- Patients with a family history of premature CAD, especially in first degree relatives

Exclusion criteria

- Male patients > 45 and females > 55
- Non-atherosclerotic CAD, or patient presenting with severe comorbidities e.g. end stage renal disease, liver cirrhosis, cancer
- Patients unwilling to participate in the study

Operational Definitions

Premature Coronary Artery Disease

Premature Coronary Artery Disease is a condition in which coronary artery disease occurs in males younger than 45 years or females younger than 55 (Mendis S, 2011).

Hypertension

Hypertension (high blood pressure) is blood pressure greater than 140/90 (Frąk, 2022).

Hypercholesterolemia

Cholesterol levels less than 200mg/dL are taken as normal and above 240mg/dL are taken as high (Su-Min Jeong, 2025).

Diabetes Mellitus

Diabetes Mellitus is a chronic medical condition characterized by high levels of glucose (sugar) in the blood. Fasting Blood Sugar of 126 mg/dL or above and Random Blood Sugar of 200 mg/dL or higher along with symptoms of diabetes (De Rosa Salvatore, 2018).

Perceived stress scale

The Perceived Stress Scale (PSS) is a classic stress assessment instrument (Mujaddid Mudassir, 2021)

- Scores ranging from 0-13 would be considered low stress.
- Scores ranging from 14-26 would be considered moderate stress.
- Scores ranging from 27-40 would be considered high perceived stress

Rapid assessment of physical activity

Physical Activities are activities where you move and increase your heart rate above its resting rate, whether you do them for pleasure, work, or transportation (Hannah McGowan, 2025)

- Light activities include Walking, Stretching or doing yard work
- Moderate activities include brisk walking, aerobics, gym and swimming
- Vigorous activities include jogging, running, playing sports or any other strenuous exercise

3. Results

We enrolled 246 successive PCAD patients (Male 125, female 119) who presented with stable or unstable angina or with a history of STEMI OR NSTEMI visiting cardiac outpatient department or admitted to the hospitals. Mean age was 46.6 ± 6.35 years. Almost all the population belonged to rural areas (n=192, 70.8%) with most of them being illiterate (n=113, 41. 7%).Most of the patients had a previous hospitalization history related to heart problems (n=188,69.4%).

Table 1: Shows frequencies of Risk factors

Variables	PCAD risk in percent
Family medical history	
• **Yes, immediate family (parents, siblings)**	139(56.5%)
• **No**	101(41.1%)
Blood pressure	
• **Normal (120/80 mm Hg)**	75(30.5%)
• **Hypertensive (≥140/90 mm Hg)**	171(69.5%)
Cholesterol	
• **Normal (Cholesterol < 200mg/dL)(LDL < 100 mg/dL, HDL > 60 mg/dL)**	164(66.7%)
• **High (Cholesterol level ≥ 240mg/dL)(LDL ≥ 160 mg/dL , HDL < 40 mg/dL**	82(33.3%)
Diabetic status	
• **Normal (FBS: ≤ 99mg/dl , RBS: ≤ 139 mg/dl)**	164(66.7%)
• **Diabetic(FBS: ≥ 126 mg/dL ,RBS: ≥ 200 mg/dL, along with symptoms of diabetes**	82(33.3%)
Dietary habits	
• **Unhealthy (high in processed foods, sugary drinks, and fats)**	10(4.1%)
• **Healthy (high in whole grains, lean meats, fruits and veggies)**	236(95.9)
Smoking	
• **Smoker**	79(32.1%)
• **Non-smoker**	167(67.9%)
Stress	
• **Low Stress**	18(7.3%)
• **Moderate stress**	140(56.9%)
• **High stress**	88(35.8%)
Physical activity	
• **Sedentary**	111(45.1%)
• **Under active**	87(35.4)
• **Underactive regular light Activities**	29(11.8%)

• **Under active regular**	17(6.8%)
• **Active**	2(0.8%)

Data on risk profile in Table 1 revealed several key findings regarding the population's health status. A significant portion of individuals (n=139, 56.5%) reported a family medical history of PCAD, indicating a notable genetic predisposition, while (n=101,41.1%) reported no such history. Hypertension emerged as a critical concern, with (n=171, 69.5%), leaving only 30.5% maintaining normal blood pressure. Cholesterol levels showed that (n=75,33.3%) of individuals had elevated cholesterol, while the majority 66.7% had cholesterol levels within the normal range. Diabetic status also contributed significantly to PCAD risk, with 33.3% diagnosed as diabetic. In contrast, 66.7% displayed normal glucose levels, reflecting some degree of glycemic control in the population. Encouragingly, dietary habits showed a positive trend, with (n=236, 95.9%), adhering to healthy diets high in whole grains, lean meats, fruits, and veggies while only 4.1% reported unhealthy dietary practices.

Smoking was observed in 79 participants (32.1%), indicating it as a notable behavioral risk factor. Additionally, 35.8% of the participants reported experiencing high perceived stress, while a smaller proportion reported low stress levels. Physical activity levels revealed a predominantly sedentary population, with 45.1% leading sedentary lifestyles and 35.4% categorized as underactive. Only a small fraction (0.8%) engaged in regular active routines.

Table 2: Comparison of PCAD Men and Women and p-values

Risk factor	**PCAD Male**	**PCAD Female**	**X^2**	**P value**
Blood pressure			10.85	.001
• **Normal (120/80 mm Hg)**	50	25		
• **Hypertensive (≥ 140/90 mm Hg)**	75	96		
Diabetes			0.20	.65
• **Normal (FBS: ≤ 99mg/dl , RBS: ≤ 139 mg/dl)**	85	79		
• **Diabetic(FBS: ≥ 126 mg/dL ,RBS: ≥ 200 mg/dL, along with symptoms of diabetes**	40	42		
Smoking			106.92	.000
• **Smoker**	78	1		
• **Non-smoker**	47	120		
Cholesterol	79	66	1.903	.16
• **Normal (Cholesterol < 200mg/dL) (LDL < 100 mg/dL, HDL > 60 mg/dL)**	46	55		
• **High (Cholesterol ≥ 240mg/dL) (LDL ≥ 160 mg/dL, HDL < 40 mg/dL)**				
Family history			.031	.981
• **Yes, immediate family (parents, siblings)**	73	72		
• **No**	52	49		
Dietary Habits			.003	.958
• **Unhealthy (high in processed foods, sugary drinks, and fats)**	5	5		
	120	116		

• **Healthy (rich in fruits, vegetables, lean proteins, whole grains)**				
Stress			14.83	.001
• **Low stress**	15	3		
• **Moderate stress**	77	63		
• **High perceived stress**	33	55		
Physical activity			5.69	.33
• **Sedentary**	45	59		
• **Under active**	46	41		
• **Under active regular-light activities**	19	10		
• **Under active regular**	10	7		
• **Active**	1	1		

The review of male and female risk factors for premature coronary artery disease revealed both similarities and significant differences, as shown in Table 2. Blood pressure levels showed a notable gender disparity, with men (n=75) and women (n=96) differing significantly (p = 0.001). This highlights that women are more likely to present with hypertension in the PCAD group. Cholesterol levels, however, did not demonstrate a statistically significant difference between men (n=46) and women (n=55) (p = 0.1). This suggests that cholesterol as a risk factor is equally prevalent across both genders Family history of PCAD was nearly identical among men (n=70) and women (n=69), showing no significant difference (p = 0.984). This indicates that genetic predisposition to PCAD is consistent across genders.

Likewise, the prevalence of diabetes was marginally greater in women (n = 42) than in men (n = 40), although the difference was not of statistical importance (p = 0.376).. Both male and females, did not considerably differ in their dietary habits with 120 men and 116 women reporting healthy dietary patterns (p = 0.958). This finding reflects that dietary behaviors in the PCAD population are similar in both males and females. A stark gender difference was observed in smoking behavior, with significantly more men (n=78) reporting smoking compared to just one woman (n=1) (p < 0.001). This highlights smoking as a predominantly male-associated risk factor. Physical activity levels were slightly better in women (n=58) than men (n=46), but this difference was not highly significant (p = 0.294).

Stress levels showed a significant gender difference, with women (n=35) slightly more likely to report high perceived stress compared to men (n=33) (p = 0.001). In summary, while some risk factors like cholesterol levels, family history, diabetes, dietary habits, and physical activity did not differ significantly between genders, blood pressure, smoking, and stress showed notable gender disparities. Women exhibited higher rates of hypertension and stress, while men demonstrated a strikingly higher prevalence of smoking.

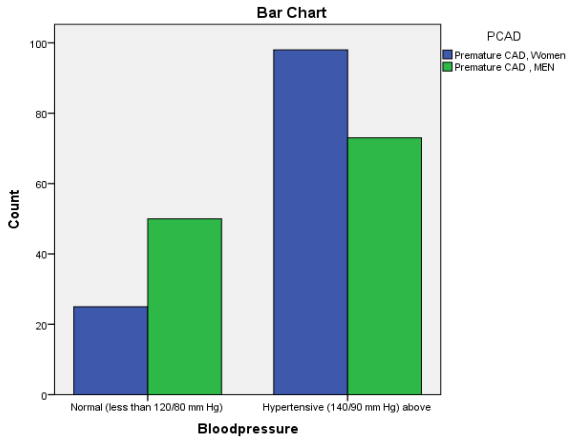

Figure 1: Prevalence of BP in PCAD Men and Women

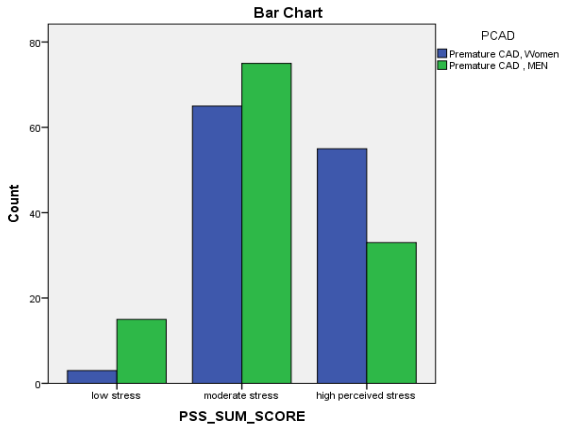

Figure 2: Prevalence of PSS Score in PCAD Men and Women

4. Discussion

Our research conducted at Ayub teaching hospital and District headquarters Abbottabad contained a total of 246 PCAD patients, among them several risk factors were high risk while others had no effect on the majority of patients. Such as discussed below:

Our study evaluated that stress (using PSS) was the leading risk factor in the progression of PCAD patients. The notion is supported by another study in which it was found that adulthood stress acts a disease trigger in the patients at high risk of cardiovascular diseases(Kivimäki 2018). A study from Pakistan signified that stress was the important risk factor in development of PCAD as evidenced by the PSS(Mujaddid Mudassir 2021). Another study also supported that cognitive and emotional aspect of patients had an effect on early onset of PCAD. Both the mental and emotive components of illness perception were strongly correlated in individuals with early-onset CAD. Higher perceptions were associated with higher scores of stress as supported by the study(Lotfi-Tokaldany 2019). Our study was further strengthen by another literature review that stated that Patients with chronic illnesses like CAD frequently experience emotional stress that exacerbates their symptoms of anxiety, sadness, and/or perceived mental stress. It is a newly recognized risk and prognosticator for several CVDs (Manolis, Manolis et al. 2024). This underscores stress as a critical factor in the development of PCAD and highlights the need for gender-specific stress management strategies.

Accordingly, in our study, smoking was the statically significant risk factor among PCAD patients mostly men. Smoking was rare among females in this study likely because yet it is not popular among women in the Asian society. The notion is supported by a prospective registry of Michel et al,(Michel Zeitouni, Robert M. Clare et al. 2020). Another study also stated that current smokers have features of premature cardiovascular aging similar to those of people two decades older(Rastogi 2022). Another study from India as well supported that smoking was the most common risk factor in PCAD population(Sharma 2022). Furthermore, in another article a study concluded that smoking was found to be related to CAD severity and location of damaged artery in the heart , this also reviewed five studies and showed that severity of coronary artery disease was related to smoking (Salehi N 2021). It underscores the critical need for targeted smoking cessation programs for men to reduce PCAD risk.

Furthermore, our research showed a significant difference in the prevalence of hypertension among PCAD patients especially women. Mujaddid et al , found a similar trend in hypertension in his descriptive cross sectional study(Mujaddid Mudassir 2021). This is supported by a meta-analysis done in Iran that deduced that hypertension was significantly and positively associated with CAD in young adults(Hoorak Poorzand 2019). Another study from Iraq deduced that majority of PCAD patients were hypertensive (Mohammad 2015). This finding underlines the importance of blood pressure management, especially among women, to reduce the burden of PCAD

Consequently, in our study 82 patients (33.3%) were diabetic, but it was not found to be significant risk factor among the PCAD patients. Recent reviews on premature coronary artery disease in India also focused on the fact that diabetes was not common in premature coronary artery disease patients(Sharma 2022). However, some studies from Iraq were in contrast to our findings in which diabetes emerged to be a major risk factor(Mohammad 2015).

5. Conclusion

This study concludes that PCAD is due to clustering of modifiable risk factors in both men and women. The significance of gender-dependent therapies to reduce risk factors like stress, smoking, and hypertension is highlighted by these findings. To minimize the effects, it is important to control these risk factors, screen the population and initiate treatment early. The study also highlights the universal importance of managing shared risk factors like cholesterol, diabetes, and physical activity. Public health initiatives should focus on creating comprehensive prevention and management programs that address both gender-specific and shared risk factors to lessen the load of PCAD effectively.

6. Limitations

As it is a cross-sectional design, capturing data at a single point in time. This does not establish causality and limits the ability to observe changes over time or the progression of risk factors. Relying on self-reported data can introduce recall bias and inaccuracies. Potential confounding factors such as environmental influences, and socio-economic status may not be fully accounted, affecting the study findings. Additionally, findings from Abbottabad may not be generalizable to other regions of Pakistan or different demographic and cultural contexts.

Identifying which young, healthy adults are at risk for CAD remains challenging due to limitations in risk calculators, the limited sensitivity of established screening modalities, and insufficient observational data for this age group.

Conflict of interest The author declares no conflict of interest.

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