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A Study on the Evaluation of the Prevalence of Coronary Artery Disease and its Associated Risk Factors Among Rural and Urban Population

Sahil Bashir[1], Dr. Aejaz Ahmed Shah[2], Abhishek Gupta[3], Dr. Pankaj Kaul[4]

[1]Post-Graduate Student, Department of Cardiovascular Technology, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.
[2]Consultant Department of Cardiology, Kiran Heart Centre, Saharanpur, Utter Pardesh, India.
[3]Assistant Professor, Department of Operation Theatre and Anesthesia Technology, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.
[4]Dean, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.

Abstract
Coronary artery disease (CAD) is a major global health concern, with varying prevalence and risk factors between rural and urban populations. Urban areas face a higher burden due to sedentary lifestyles, unhealthy diets, obesity, diabetes, and stress, despite better healthcare access. Rural populations, though traditionally at lower risk, are experiencing rising CAD rates due to increasing tobacco use, untreated hypertension, and limited access to healthcare. Addressing these disparities through lifestyle interventions in urban areas and improved healthcare infrastructure and awareness in rural regions is critical for reducing the CAD burden.

Keywords: Rural, Urban, Global

Introduction

Coronary artery disease (CAD) continues to be one of the leading causes of morbidity and mortality worldwide. Traditionally considered as a disease affecting older individuals, there is alarming evidence suggesting a rising prevalence of CAD among rural and urban populations. This emerging trend has significant implications for individuals, healthcare systems, and public health strategies. Acute coronary syndrome (ACS) is defined as any form of symptoms compatible with acute myocardial ischemia. Ischemic heart disease remains the leading cause of death in both men and women worldwide and cardiovascular death exceeds the number of deaths from all the cancers combined. The incidence of myocardial infarction has shown an upward trend in Indians in the last decade.

In India the incidence of cardiovascular diseases was about 7% in 1970 and increased up to 32% in 2011(**Yousuf, *et al*, 2001).**

The high burden of CAD in the Indian subcontinent is the consequence of large population and high prevalence of CAD risk factors like smoking, tobacco abuse, lack of physical activity, obesity, high BP, abnormal lipids and diabetes mellitus. Coronary risk factors such as hypertension, diabetes mellitus,

alcohol intake hypercholesterolemia, obesity and sedentary lifestyle were highly prevalent in the urban subjects and they were 2 or 3 times less common among rural subjects **(Reddy *et al* 1994)**.

Understanding social and economic indicators including income, education, employment and social class play an undoubted role in improving health and quality of life, thus several studies in developing countries suggest that coronary risk factors may be related to socioeconomic status and urbanization (**Singh, *et al* 1997) (Kaplan, *et al* 1973)**.

A higher prevalence of coronary artery disease (CAD), smoking and hypertension have been reported among the illiterate in the rural population (**Reddy *et al* 1998).**

Uneducated and less educated people in the rural India have higher prevalence of coronary artery disease and of the coronary risk factors smoking and hypertention **(Gupta *et al.*, 1994).**The prevalence of coronary artery disease (CAD) increased from 1.05% in 1960 to 9.67% in 1995 in the urban populations. In the rural areas, the prevalence increased from 2.03% in 1974 to 3.7% in 1995 **(Gupta and Gupta, 1996).** Developing countries, with previous low rates are now seeing increased rates as economies develop, infectious diseases are conquered and life expectancy improves **(Beegom, 1995).** Therefore, understanding the etiology origins, distribution and trends of cardiovascular disease (CVD) is essential to improving public health in all countries. The decreased consumption of total and saturated fat and increased physical activity may be useful for the prevention of the coronary artery disease among the urban population as well as immigrants **(Singh *et al.*, 1995**).

Cardiovascular diseases are present in many forms and have differing etiologies. However, among chronic cardiovascular diseases, those related to atherosclerosis, rheumatic fever, and hypertension comprise the greatest burden **(Russell *et al.*, 1982).** Conventional risk factors such as smoking, low high-density lipoprotein (HDL) levels and abdominal obesity play a major role in the causation of premature CAD among the rural youth **(Patil *et al.*, 2020).** Efficient prevention and management strategies are the key in reducing the burden of CAD in the rural and urban populations. The knowledge in the general population about the risk factors causing CHD is poor (**Wander *et al.*, 1994)**.

The purpose of the study was to highlight the critical need for a comprehensive evaluation of CAD prevalence and its risk factors in both rural and urban populations, emphasizing the importance of targeted, data-driven public health interventions and policies.

Aim of the Study

To evaluate the prevalence of coronary artery disease and its associated risk factors among rural and urban population.

Objectives of the Study

1. To evaluate ECG changes of all the patients presenting in the cardiology Outpatient Department (OPD).
2. To compare the changes in Lipid Profile among all the patients.
3. To differentiate the incidence of risk factors in the concerned inhabitants.

Materials And Methods

Materials

The present study entitled "To study the evaluation of the prevalence of CAD and its associated risk factors among rural and urban populations" was conducted in the Department of Cardiology in Kiran Heart Centre, Saharanpur, UP, from 01/02/2024 to 31/08/2024 after approval taken from the ethical

committee of hospital.

One hundred fifty-four (154) patients of age between 20-60 years with weight 50-70 kg's of both genders were included as subjects.

Written explained informed consent of all the patients was taken.

Exclusion Criteria:

1. Pregnancy.
2. Pediatric patients.
3. Patients with age more than 60 years.
4. Patients with obesity (BMI>30 kg/m2).
5. Patients with uncontrolled hypertention.
6. Patients with uncontrolled Diabeties.
7. Patients with deranged Thyroid function test.
8. Patients with pre-existing CAD on medication.
9. Patients with deranged serum creatinine.
10. Patients with deranged lipid Profile.

Methods

The evaluation of the subjects was done as following!

Detailed clinical history was noted as under

- Blood Pressure
- Diabetes
- Depression
- Functional Capacity
- Hypothyroidism
- Pre-existing CAD
- History of chest pain
- Drug History
- Diet History

Physical Examination was done to check vitals

- Pulse (bpm)
- Systolic Blood Pressure (SBP) mmhg
- Diastolic Blood Pressure (DBP) mmhg
- Mean Arterial Pressure (MAP) mmhg
- SpO2. (%) Cardiovascular Examination
- Murmur

Criteria for the diagnosis depended on:

- Electrocardiography
- Lipid Profile
- Rose Angina Questionnaire

Following Parameters were also taken into consideration

1. **Demographic variables;**

- Age
- BMI
- Residence
- Rural
- Urban
- Gender
- Occupation
- Marital Status

2. **Study Variables**

- History of pre-existing cormoblities
- Diet History
- Vitals
- Pulse
- Systolic Blood Pressure (SBP) mmhg
- Diastolic Blood Pressure (DBP) mmhg
- Mean Arterial Pressure (MAP) mmhg
- SpO2 (%)
- Respiratory Rate (cpm)
- Investigation
- Electrocardiography (ECG)
- Lipid Profile
- RAQ

3. **Criteria for Rose angina questionnaire**

1. Have you ever had any pain or discomfort in your chest?
2. Do you get it when you walk uphill or hurry?
3. Do you get it when you walk at an ordinary pace on the level?
4. What do you do if you get it while you are walking?
5. If you are standing still, what happens to it?
6. How soon?
7. Will you show me where it is?

All participants gave their informed consent before to the collection of data. The relevant authority granted ethical clearance. To gather data on CAD risk factors and demographics, a standardized questionnaire was created. The survey had questions about age, gender, food preferences, physical activity, alcohol and tobacco use, family history of CAD, and medical history. Clinical examinations were performed by qualified medical specialists to evaluate the subjects' anthropometric measures (BMI) and vital signs (blood pressure, heart rate, etc.). In accordance with the standard laboratory procedures, blood samples were taken from participants to evaluate their lipid profiles (total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides). Each participant's resting 12-lead ECG was obtained in order to check for indications of CAD. Quality control measures were implemented during data collection, entry, and analysis to ensure data accuracy and reliability.

Results

The total number of people was 154, of which 91 (59%) were male and 63 (41%) were female. The percentage of males was higher than the percentage of females in all age groups.

In the age group 56-60, there is a significant difference in gender distribution, with 22.73% males and 11.69% females, totaling 34.4% of participants. The P-value (0.0104) indicates this disparity is statistically significant. For the other age groups, no statistically significant differences in gender distribution were observed, as all P-values exceed 0.05.

Table. 1 shows the distribution of population according to the type of residence and marital status of the study population:

Residence	Male	Percentage	Female	Percentage	P value
Rural	30	19%	20	13%	0.124
Urban	61	39.61%	43	27.92%	0.03
Married	88	57.14%	63	41%	0.0048
Unmarried	3	1.94%	0	0.0	

Table 1 showed the distribution of the research population by area and gender in this study.

There were two categories of people in the research population: urban residents which comprised of 61 (39.61%) males and 43 (27.92%) of females (p= 0.03) and rural residents which comprised of 30 (19%) of male and 20 (13%) of females (p=0.124). The urban residents comprised the bulk of the participants in the study, with 68% of the sum. The minority of the population resided in rural areas, representing 32% of the overall study population.

The majority of individuals were married, with 88 (57.14%) males and 63 (41%) females, the p value was 0.0048 which indicates that the difference between the two groups is statistically significant. There were only 3 unmarried males and no unmarried females among the study population.

Table 2 shows the distribution of study population as per pre-existing cormoblities

Pre-existing Disease	Male	Percentage	Female	Percentage	P value
HTN	80	51.9%	49	31.8%	0.0257
DM	67	43.5%	38	26.6%	0.0049
Hypothyroidism	40	25.9%	30	30%	0.215

Table 2 suggested that among the study population, hypertension was the most common comorbidity, affecting 80 (51.9%) males and 49 (31.8%) females, the p value was 0.0257 which indicates which indicates that the difference between the two groups is statistically significant. Diabetes Mellitus was also prevalent, with 67 (43.5%) males and 38 (26.6%) females having this condition, the p value was 0.0049 which indicates that the difference between the two groups is statistically significant. Hypothyroidism was reported in 40 (25.9%) males and 30 (30%) females, the p value was 0.215 which indicates that the difference between the two groups is not statistically significant.

Table 3 shows Electrocardiographic findings in the study population:

ECG abnormality	Male	Percentage	Female	Percentage	P value
ST elevation	20	12.9%	12	7.7%	0.1164

ST depression	18	11.6%	9	5.8%	0.075
T wave inversion	21	13.6%	15	9.7%	0.2502
LVH	22	14.2%	19	12.3%	0.6100
QS complexes	10	6.49%	8	5.1%	0.6170

The table 3 compares ECG abnormalities between males and females. None of the abnormalities, including ST elevation, ST depression, T wave inversion, LVH, and QS complexes, show statistically significant gender differences. Although ST depression shows a near-significant trend (P = 0.075), it remains nonsignificant. Overall, ECG findings are similar across genders in this study population.

Table 4 shows the Lipid Profile of the study population

Cholesterol	Raised levels	Percentage	Raised levels	Percentage	P value
TC mg/dl	67	43.5%	57	37%	0.02340
LDL mg/dl	59	38.3%	40	25.9%	0.0198
TG mg/dl	48	31.1%	38	24.6%	0.001

- Tc raised levels was > 200 mg/dL
- LDL raised levels was >129 mg/dL
- TG raised levels was > 170 mg/dL

Table 4 showed the lipid profile the study population, in which there were 67 males and 57 females with raised levels of TC, p value was 0.02340 which indicates that the difference between the two groups is statistically significant.

The raised levels of LDL were seen in 59 males and 40 females, p value was 0.0198 which indicates that the difference between the two groups is statistically significant.

Raised levels of TG was seen in 48 males and 38 females, p value was 0.001 which indicates that the difference between the two groups is statistically significant.

Table 5 shows RAQ of the Study population

RAQ	Male	Percentage	Female	Percentage	P value
Angina Definite	5	3.24%	3	1.94%	0.4654
Angina probable	26	16.8%	18	11.6%	0.1498
No Angina	60	48.7%	42	34.41%	0.0286.

The table 5 showed that here was a statistically significant difference in the "No Angina" category (P = 0.0286), with more males (48.7%) than females (34.41%) falling into this group. However, for "Angina Definite" (P = 0.4654) and "Angina Probable" (P = 0.1498), there were no significant differences between males and females.

Discussion

The present study aimed to evaluate the prevalence of coronary artery disease (CAD) and its associated

risk factors in rural and urban populations.

The findings revealed significant gender-based, demographic, and clinical differences in CAD prevalence and associated parameters. These observations are crucial for understanding the risk factor distribution and designing targeted interventions. The majority of the study participants were aged 56–60 years, with a significantly higher proportion of males (22.73%) compared to females (11.69%) in this age group (P = 0.0104). This suggests that CAD may be more prevalent in older males, aligning with existing literature that identifies advanced age and male gender as key risk factors for CAD, which was in line with the previous studies. (**Akhtar, *et al* 2023) and (Cheong *et al* 2014)**. Urban participants comprised the majority (68%) of the study population, with a statistically significant higher proportion of males in urban areas (P = 0.03). The urban predominance could reflect lifestyle factors, such as higher levels of stress, sedentary habits, and dietary patterns, which are known contributors to CAD. Conversely, rural participants represented only 32% of the study population, and the gender distribution in this group was not statistically significant. These finding underscores the need to assess urban lifestyles as a major driver of CAD risk which was in line with the previous studies. **(Sing *et al* 1997) and (Akhtar, *et al* 2023)** . The analysis revealed that the majority of participants were married, with a significant difference between males (57.14%) and females (41%) (P = 0.0048). Marital status is known to influence health behaviours, psychological well-being, and social support. However, the lack of unmarried females in the study population limits the interpretation of this aspect also seen by previous studies (**Schultz*, et al* 2017) and Park *et al* (2023)**. Hypertension was the most common comorbidity, affecting 51.9% of males and 31.8% of females (P = 0.0257). Similarly, diabetes mellitus (DM) was more prevalent in males (43.5%) than in females (26.6%; P = 0.0049). These findings align with the established role of hypertension and diabetes as major CAD risk factors, with males showing a higher burden. Interestingly, hypothyroidism did not show significant gender differences (P = 0.215), suggesting it may be a less critical factor for gender-specific risk stratification in this population also reported by the previous studies (**Akhtar, *et al* 2023).** The findings from this table highlight that there are no statistically significant differences in the prevalence of various electrocardiographic (ECG) abnormalities between males and females in the study population. While some differences in percentages are observed, such as slightly higher rates of ST elevation, ST depression, and T wave inversion in males, these variations did not reach the threshold for statistical significance as also seen by (**Mahmoodzadeh*, et al* 2011).** Dyslipidemia was a significant finding, with raised total cholesterol (TC), low-density lipoprotein (LDL), and triglyceride (TG) levels being more prevalent in males than females. Elevated TC was observed in 43.5% of males and 37% of females (P = 0.0234). Raised LDL levels were present in 38.3% of males and 25.9% of females (P = 0.0198), while elevated TG levels were detected in 31.1% of males and 24.6% of females (P = 0.001). These results highlight a higher burden of dyslipidemia in males, emphasizing the need for lipid management as a priority in male populations also seen by previous studies. (**Mohan *et al* 2001**). There was a significant gender difference in the no angina category, with a higher percentage of males (48.7%) classified as normal compared to females (34.41%). This difference (P = 0.0286) suggests that males in the study population are more likely to have no angina symptoms, which could be attributed to various factors such as gender differences in symptom reporting, cardiovascular risk factors, or disease presentation. It is well known that women may experience atypical or non-classical symptoms of heart disease, which may not always be recognized as angina. This could explain why a larger proportion of females fall outside the no angina category and may be classified under other angina-related categories also seen by (**Wilcosky**

***et al* 1987).**

CONCLUSION

This study reveals gender-specific differences in coronary artery disease (CAD) prevalence and risk factors. Males aged 56–60 showed higher CAD prevalence, with urban residency, hypertension, diabetes, and dyslipidemia being significant contributors. Males also exhibited higher cholesterol, LDL, and triglyceride levels, emphasizing the need for lipid management. Gender disparities in symptom reporting and disease presentation, especially among women, highlight the need for targeted public health strategies, including metabolic risk management, lifestyle interventions, and improved diagnostic accuracy for atypical symptoms.

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