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# Rural-Urban and Gender Differences in Risk Factors for Acute Coronary Syndrome

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**ABSTRACT**
*An emic approach in the identification of risk factors for Acute Coronary Syndrome (ACS) is important as their relative importance may vary between genders and across different backgrounds. The current study was undertaken with the aim to determine the rural –urban and gender difference among these risk factors, if any. It was a cross sectional study conducted on 100 patients of ACS aged above 40 years. The selected participants were interviewed using a pre-designed questionnaire which included socio-demographic factors, behavioural / life –style factors, significant past and family history and self-reported conditions that are risk factors for ACS. The male to female ratio of 1.08 in the study indicated rising trends of ACS in women. Female patients (mean age 62.65 ± 11.93) were significantly older than their male counterparts (mean age 56.38 ±11.68). Hypertension (44%) was the most common risk factor followed by hypercholesterolemia (37%), while obesity was the least common risk factor (11%).Compared with male patients females had greater prevalence of hypertension, diabetes, low HDL-C and central obesity. Males outnumbered females only for smoking as risk factor. There was no significant urban –rural difference in the prevalence of any of the risk factors. The current study brings out that Coronary artery disease is no longer a disease limited to men or urban population. Since most of the risk factors for ACS are modifiable, therefore early identification is vital to set the strategy for prevention.*
**Key words:** *Acute Coronary Syndrome, Coronary Artery Disease, risk factors, gender, background*

## 1. INTRODUCTION

In the era of epidemiological transition from infective to non communicable disease, India is also undergoing rapid health transition characterized by rising burden of Coronary Heart disease.[1] Following the landmark studies like Framingham Heart Study and the Seven Countries' Study, several studies have attempted

to explore coronary risk factors. The relative importance of modifiable risk factors may vary between genders and across different population groups as well as regions. Studies have demonstrated two or three times higher prevalence of coronary artery disease and coronary risk factors in urban population compared with the rural subjects.[2] Gender differences have also been reported in the prevalence of coronary risk factors in many previous studies.

Despite certain risk factors being well established one needs to analyze these risk factors in light of regional variations in their pattern. These risk factors if identified at an early stage can be extremely useful in planning primary and secondary preventive strategies for Acute Coronary Syndrome and its complications.

**Objectives**

The present study aims at estimating the prevalence of various modifiable and non-modifiable cardiovascular risk factors associated with Acute Coronary Syndrome and analyzing rural –urban and gender difference among these risk factors, if any.

## 2. MATERIAL AND METHODS

### 2.1 Study design and setting

This was a hospital based cross sectional study conducted on 100 clinically diagnosed Acute Coronary Syndrome patients admitted in the medicine ward or Intensive Coronary Care Unit of Rajindra hospital, Patiala. The study was approved by Institutional Ethics Committee. Study subjects were selected as per the following inclusion and exclusion criteria

**Inclusion criteria**

1. Consecutive adult patients of either sex aged more than 40 years with diagnosis of Acute Coronary Syndrome.
2. Those giving written informed consent for the study.

**Exclusion criteria**

The following exclusion criteria were adhered to in the study:-

1. All patients having deranged renal functions.
2. Unconscious patients.
3. Patients who refuse to give informed written consent.

### 2.2 Procedure

All the patients of Acute Coronary Syndrome presenting to Rajindra Hospital Patiala were verified for fulfilling inclusion criteria and ruled out for presence of exclusion criteria. Informed consent was taken from patients after briefing them about the study in their vernacular language. The selected participants were interviewed using a structured questionnaire which included presenting complaints, socio-demographic factors, behavioural / life –style factors, significant past and family history, self-reported conditions that are risk factors for acute coronary syndrome. It was followed by thorough physical examination of the study participants. After an overnight fasting, blood samples were taken from all participants and appropriate biochemical investigations (that included Serum Lipid profile and fasting plasma glucose (FPG) were sent for every participant.

### 2.3 Risk factors evaluated in the study were:-

**a) Hypertension[3]: -** The patients were considered hypertensive if they followed any of the two criteria:-

1. The patient already on antihypertensive medications.
2. According to the JNC VII classification if the patient had Systolic B.P $\geq$ 140 mm hg and Diastolic B.P $\geq$ 90 mm Hg as an average of two readings taken 5 minutes apart.

**b) Obesity [4]:-**Evidence of obesity was obtained on the basis of BMI $\geq$ 30 Kg/m$^2$.

Body weight was measured by a digital scale with an accuracy of ± 100 g. The Participants were weighed shoeless, in light clothing. Standing height was measured shoeless to the nearest 0.5 cm with a measuring tape, with the shoulder in

relaxed position and arms hanging freely.[5]

**c) Central Obesity[6]:** Central obesity was measured as waist circumference. Waist measurement was taken at the level of mid- point between the inferior margin of the rib and crest of the ileum in the mid-axillary plane, using a non-stretchable tape, without clothing, that is, directly over the skin (or over light clothing). Waist circumference ≥ 40 inches in men, ≥ 35 inches in women was considered as diagnostic of central obesity.

**d) Hyperglycaemia (Impaired Fasting Glucose and Diabetes Mellitus)[7,8]:-**

Hyperglycaemia was defined on the basis of fasting plasma glucose/random plasma glucose/2 h plasma glucose as follows:-

1. Fasting plasma glucose 100-125 was considered as impaired fasting plasma glucose and F.P.G ≥126 was diagnostic of diabetes mellitus.

2. Random plasma glucose ≥ 200 along with the symptoms of diabetes mellitus (polyuria, polydipsia, and polyphagia) was defined as diabetes mellitus.

3.2 h-plasma glucose 140-199 was considered as impaired glucose tolerance; and value ≥ 200 was diagnostic of diabetes mellitus.

**e) Dyslipidemia[6]:-** Dyslipidemia was defined on the basis of ATP III guidelines as follows:-

**LDL Cholesterol** ≥ 130 mg/dl was considered abnormal.

**HDL Cholesterol** ≤ 40 mg/dl in males and ≤ 50 in females was considered abnormal

**Triglyceride** ≥ 150 was diagnosed as hypertriglyceridemia.

**Total cholesterol** ≥ 200 mg/dl was considered abnormal.

**f) Smoking[9]:** -The patient was defined as a smoker if he had been smoking at least one cigarette daily or had left smoking with in past one year.

**g) Age:-**as per the history given by the patient

**h) Gender**

**i) Family history of coronary artery disease** was assessed by a series of questions recording the history of coronary heart disease(angina, myocardial infarction or sudden cardiac death without obvious cause) among participant's direct blood relatives (parents , siblings and children).

## 3. STATISTICAL ANALYSIS

The data collected were analyzed using SPSS.19.0 version. For descriptive Statistics frequencies, percentages, means ad standard deviations of different variables were calculated. For Categorical variables "Chi Square test" was used. The p values were two tailed and probability level of significant difference was set at <0.05.

## 4. RESULTS

A total of 100 patients of acute coronary syndrome participated in the current study. As evident from Table 1, the male to female ratio in the study was 1.08 and 61% of the patients hailed from urban background with an urban: rural ratio of 1.56. The mean age of the participants was 59.39±12.16 (42-90). Female patients (mean age = 62.65 ± 11.93) were significantly older than their male counterparts (mean age = 56.38±11.68). Family History of Coronary Artery disease was present in 12% of the participants and 25% of them had a past history of CAD.

The most common presenting symptom was chest pain (77% of Patients) followed by breathlessness, ghabrahat (35%) and diaphoresis (31%).

Table 2 and 3 highlight that hypertension was the most common coronary risk factor prevalent in 44% of the study subjects followed by hypercholestrolemia (37%), hypertriglyceridemia (35%) and smoking (33%) in that order. Obesity emerged as the least common risk factor (11%).

Three fourth of the subjects had more than 1 risk factor. Around 20% of the subjects had more than 5 risk factors.

Smoking as a risk factor was present in significantly higher percentage of male patients. Compared with male patients, females had greater prevalence of hypertension, diabetes mellitus, low HDL-Cholesterol and central obesity.(Table 2) None of the risk factors showed any significant rural- urban difference in its prevalence (Table 3)

## 5. DISCUSSION

Acute coronary syndrome is the major manifestation of Coronary Artery Disease (CAD), which takes a heavy toll on mankind. Identification and control of conventional risk factors is expected to result in a decline in incidence of CAD similar to that seen in industrialized countries.

Prevalence of CAD has been reported to be higher in males than females in most of the studies. Previous Indian studies by Singh et al.[10],Yadav et al.[11] and Kalra et al.[12] reported male to female ratio to be 3:1, 2.57:1 and 1.6:1 respectively suggesting that Coronary Artery Disease (CAD) is still predominantly a disease of men. In contrast our study had a male: female ratio of 1.08. Although ACS was higher in males than females but this narrowing gap may still be indicative of rising prevalence of ACS in women and suggestive of the changing trends that heart disease is no longer a disease that affects just men. The urban: rural ratio of 1.5 reflects that even though there is still a higher prevalence of ACS among urban population but this urban versus rural gap is shrinking at a faster rate even in developing countries like India. In developed countries, no rural-urban differences exist in the prevalence of coronary artery disease and coronary risk factors. Our study brings out diminishing differences in trends of heart diseases between developing and developed countries.[13]

Possible reasons of more patients hailing from urban background could be that such patients are likely to avail tertiary care facilities more and sooner compared to rural patients due to proximity to health facilities and easy availability of transport. There is also the possibility that many of the rural patients would have succumbed to death on the way itself before they could reach a tertiary care facility due to time lost in consulting primary health care facilities before becoming aware of the gravity of the situation.

The mean age of the ACS patients in our study was 59.39 years which is comparable to another Indian study by Gupta et al.[14] (mean age - 58.32 years) and Indian subjects in CREATE registry study[15] (mean age - 57·5 years ).The mean age in our study was however higher than previous Indian studies by Bhasin et al.[16] ,Sharma and Ganguly.[17] and Yadav et al.[11] in which the corresponding values were 49.7 years ,53 years and 56 years respectively. The INTERHEART study had found the mean age among the Indians to be 53 years which is also lower than in our study.[18] This difference can be accounted to inclusion of only first episode Acute Coronary Syndrome in some of these studies. Moreover in our study we had excluded patients younger than 40 years unlike previous studies.

The mean age in our study was lower than reported in two previous Nepali studies by Parajuli et al.[19] and Paudel et al.[20] with mean age of 63.5 and 64.2 years respectively possibly reflecting regional differences. Female patients of ACS in our study were significantly older (mean age = 62.65 years) than their male counterparts (mean age = 56.38 years) again in line with international experience.[21]

This could be due to increased longevity among females due to greater life expectancy and higher risk of coronary artery disease with advancing age. Moreover, women experience an increased risk of heart disease after menopause. This pattern can be explained by decreasing levels of estrogen during menopause, a hormone that holds direct relationship with HDL.

The highest number of patients was in the age group of 50-60 years (25%). The prevalence continued to decrease with each decade despite advanced age being a well-established risk factor for Acute Coronary Syndrome. This could be due to lower life expectancy and moreover many patients who had already died from Acute Coronary Syndrome by that time could not be a part of the study. This concurs with the finding of a previous study by Kalra et al.[12] who found the highest incidence of CAD in the age group of 51 - 60 years.

As a single risk factor, hypertension (44%) ranked first followed by Hypercholesterolemia (37%),

hypertriglyceridemia (35%) and smoking (33%). This is in striking resemblance to the findings of Deb and Dasgupta[22] who found hypertension to be the most common risk factor in their study present in about 46% of the subjects. In congruence with our findings, Acharya et al.[23] and Jhala et al.[24] had mentioned dyslipidemia and hypertension to be the commonest risk factors in their studies.

Obesity was the least common risk factor (11%) in our study. This finding concurs with that of Hafeez et al.[25] who also reported the least common risk factor to be obesity present in only 4% patients.

In our study 30% patients were current smokers. This figure is much lower when compared to many of the other Indian and International studies *viz.* Ranjith et al.[26] (79%), Yadav et al.[11] (65%) and Bhasin et al.[16] (53%). These huge differences could be because of inclusion of different patient profile in terms of age (smoking being more prevalent in younger population) and gender (studies exclusively on male population or studies with male preponderance), counting all forms of tobacco use and not just smoking, variations due to culture and religion. Our study has been carried out in an area that serves a large number of Sikh population.Smoking as such is condemned and prohibited in Sikhism and most of the contribution to smoking in our study was from male patients of neighbouring districts of Haryana and Non -Sikh population of Punjab.

Analysis of gender differences in our study found that more males compared to females were smokers, while females were more likely to have central obesity, diabetes, hypertension, and low HDL cholesterol levels. This finding is supported by Ranjith et al.[26] and Khot et al.[27] who had found that for all risk factors except cigarette smoking, the prevalence of coronary risk factors was significantly higher in women than in men. Similarly Butt et al.[28] also found that women with acute coronary syndrome, when compared to men, had more prevalence of Diabetes and Hypertension and less prevalence of smoking.

The huge gender difference in smoking is quite understandable keeping in view the social scenario of India where smoking is more prevalent among males even in the general population even though there has been a recent rise in the number of female smokers.

In contrast to most of the previous Indian Studies, our study did not find any significant rural- urban difference in the prevalence of coronary risk factors. A previous Indian study by Singh et al.[10] had found that coronary risk factors were two or three times higher among the urban compared with the rural subjects which may be due to greater sedentary lifestyle, a higher intake of dietary trans fatty acids and alcohol intake among urbans.

Despite similar prevalence of coronary risk factors, there was greater prevalence of acute coronary syndrome in urban subjects. This could be because Urbans consume higher trans-fatty acids, which may have an adverse effect on lipoprotein (a) and on insulin resistance. This may predispose a subject to coronary artery disease even at relatively lower levels of conventional risk factors.[29]

**Table 1:** Demographic Profile of the Study Subjects

| **Variables** | | Total (n=100) |
|---|---|---|
| **Gender** | Male<br>Female | 52<br>48 |
| **Background** | Urban<br>Rural | 61<br>39 |
| **Age Group** | 40-50<br>50-60<br>60-70<br>70-80<br>Above 80 | 24<br>25<br>24<br>19<br>9 |
| **Mean Age** | Male<br>Female | 56.38±11.68<br>62.65 ± 11.93 |
| **Family History of CAD** | | 12 |
| **Past history of CAD** | | 25 |

**Table 2: G**ender differences in prevalence of Risk Factors for Acute Coronary Syndrome

| Risk Factors | Total | Male (n=52) | Female (n=48) | $X^2$ | p value |
|---|---|---|---|---|---|
| **Hypertension** | 44 | 15 (28.8%) | 29 (60.4%) | 10.096 | **0.001** |
| **Diabetes Mellitus** | 16 | 2 (3.8%) | 14 (29.2%) | 11.907 | **<0.001** |
| **Obesity** | 11 | 5 (9.6%) | 6 (12.5%) | 0.212 | 0.645 |
| **Central Obesity** | 25 | 4 (7.7%) | 21 (43.8%) | 17.308 | **<0.001** |
| **Hypercholestrolemia** | 37 | 17 (32.7%) | 20 (41.7%) | 0.862 | 0.353 |
| **Hypertriglyceridemia** | 35 | 14 (26.9%) | 21 (43.8%) | 3.107 | 0.078 |
| **Increased LDL** | 29 | 13 (25.0%) | 16 (33.3%) | 0.842 | 0.349 |
| **Decreased HDL** | 23 | 7 (13.5%) | 16 (33.3%) | 5.565 | **0.018** |
| **Smoking** | 33 | 30 (57.7%) | 3 (6.3%) | 29.874 | **<0.001** |

**Table 3:** Rural – Urban Differences in prevalence of risk factors for ACS

| Risk Factors | Total | Urban (n=61) | Rural (n=39) | $X^2$ | p |
|---|---|---|---|---|---|
| **Hypertension** | 44 | 28 (45.9%) | 16 (41.0%) | 0.230 | 0.632 |
| **Diabetes Mellitus** | 16 | 11 (18.0%) | 5 (12.8%) | 0.481 | 0.488 |
| **Obesity** | 11 | 7 (11.5%) | 4 (10.3%) | 0.036 | 0.849 |
| **Central Obesity** | 25 | 16 (26.2%) | 9(23.1%) | 0.126 | 0.723 |
| **Hypercholestrolemia** | 37 | 19(31.1%) | 18(46.2%) | 2.298 | 0.130 |
| **Hypertriglyceridemia** | 35 | 19 (31.1%) | 16 (41.0%) | 1.020 | 0.312 |
| **Increased LDL** | 29 | 16 (26.2%) | 13 (33.3%) | 0.583 | 0.445 |
| **Decreased HDL** | 23 | 12 (19.7%) | 11 (28.2%) | 0.978 | 0.323 |
| **Smoking** | 33 | 18(29.5%) | 15 (38.5%) | 0.863 | 0.353 |

## 6. CONCLUSION

Our study has brought out diminishing gender and urban –rural differences in prevalence of acute coronary syndrome. Around 75% of the subjects had more than one risk factor. Hypertension was the most common coronary risk factor while obesity being the least common risk factor. Compared with male patients, females had greater prevalence of hypertension, diabetes, low HDL-C, central obesity and overweight. Except for higher prevalence of non –vegetarian dietary pattern in urban patients, none of the risk factors showed any significant urban – rural difference in its prevalence. To sum up, ACS is no longer a disease that affects just men or limited to city residents. Our study recommends early identification of modifiable cardiovascular risk factors, focus on reducing the clustering of risk factors in an individual at-risk person, necessity of health education programs and need for

prospective longitudinal follow- up studies. The study was however limited by lack of assessment of all cardiovascular risk factors, lack of a matched control group, lack of generalizability for the whole country and being cross sectional in nature.

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