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The Study of Risk Factors in Young Adults Suffering with Acute Coronary Syndrome

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Abstract: ***Background: Acute coronary syndrome occurs due to the decreased blood flow to the heart which causes a set of symptoms. Due to the change in the lifestyle of younger individuals like smoking, sedentary lifestyle, etc the prevalence of ACS in increasing in the younger population, and hence identification of these risk factors will help in better prognosis and early identification of the syndrome and can help the clinicians in diagnosing it early. Objectives: To identify the risk factors in acute coronary syndrome. Methods and methodology: It was a cross sectional study, conducted in the coronary care unit of AIIMS, Nagpur. Convenient sampling was used for patients' selection. The serum cardiac enzyme level was measured, and serial ECHO was done at admission and repeated if required. Blood samples were collected after an overnight fast of 14 hours and tests were done for total cholesterol and HDL cholesterol. Results: Out of 62 patients of acute coronary syndrome, 9 (14.5%) were female and 53 (66.67%) were males. Out of 62 patients 30 (50.7%) had diabetes mellitus, while 35 (57.8%) were suffering from hypertension.23 out of 62 patients (37%) had family history of coronary artery disease. Out of 62 patients 30 (54.8%) were smokers and 30 (54.8%) were alcohol consumers.16 patients (25.8%) out of 62 were obese and 3 (33.33%) out of 9 females had a history of early menopause.***

Keywords: Acute coronary syndrome, risk factors for ACS, young ACS, smoking

1. Introduction

Acute coronary syndrome (ACS) is a syndrome (a set of signs and symptoms) due to decreased blood flow in the coronary arteries such that part of the heart muscle is unable to function properly or dies (1). It is an umbrella term representing a common end result, acute myocardial ischemia (AMI): Including ST - segment elevation myocardial infarction (STEMI), non - ST - STEMI (NSTEMI), and unstable angina (UA) (10). Young ACS patients have a lower incidence of multi - vessel disease (MVD) and left main (LM) disease (24, 25) whereas involvement of the left anterior descending (LAD) artery is more common (26). Acute coronary syndrome usually occurs in >50 years age group. However, 5 - 10% of myocardial infarctions (MI) occur in patients younger than 46 years old (17 - 21). ACS in young adults may have some characteristics that are different from those in older patients (18, 20, 21). Of these markers, C - reactive protein (CRP) and white blood cell (WBC) count are examples (23).

The occurrence of ACS in a young person leads to premature morbidity and mortality in the most productive years of life. There are few studies of risk factor profile and pattern of coronary artery involvement in AMI in young, so the purpose of the study. Out of all the cardiovascular diseases, Acute coronary syndrome which when unidentified results in acute myocardial infarction is the leading cause of death of patients (2, 3). These days due to the change in the lifestyle of the individuals the chance of occurrence of Acute coronary syndrome has greatly increased. This may be because the incidence of ACS in younger people is much lower than in older people, although the incidence varies depending on the population, the age limits considered and social changes (4 - 7). The currently available evidence, young patients represent 0.4 - 19% of all ACS cases, depending on the cut - off age used (11).

A recent study in Spain, approximately 10% of patients with ST-segment–elevation myocardial infarction (STEMI) were young patients, and 2% of these patients were women (9). However, we are still not sure if there is any sex - age related risk factors among these individuals suffered greatly from ACS. Unlike older people younger people have different risk factors and clinical profile which needs to be identified and then eliminated to reduce the deaths due to unidentified ACS resulting in Acute myocardial infarction. The recent pandemic COVID can also serve as a risk factor in the younger adults in the long run. Due to the lifestyle changes in the women, many of them are suffering with early menopause and this can also serve as a risk factor. There are many such risk factors which affect the incidence of ACS in the younger population which may vary from individual to individual.

The risk factors are more likely to be hypertension, Diabetes mellitus (DM), hypercholesterolemia, obesity, smoking, high lipoprotein a level, coronary vasospasm, medium vessel vasculitis, hyper coagulable states, metabolic syndrome and less likely the preceding angina (19, 22). Obese patients manifest CAD at a younger age (11). According to recent epidemiological studies, more than half of the worldwide cardiovascular disease burden will be borne by the Indian subcontinent in the next decade (12). Cardiovascular risk factors for ACS are on the rise in people of Indian origin, and ACS is now the leading cause of death (12 - 16). Hence in this study we will identify the risk factors including the effects of gender, smoking, FH, DM, etc in patients younger than 45 years who are hospitalized for Acute coronary syndrome and look for the risk factors in each patient separately.

The purpose of this study was to investigate the clinical presentation and outcome of patients aged ≤45 years hospitalized for ACS. To analyze specific differences, findings of young patients were compared with those of the older population (aged >45 years). Furthermore, we assessed angiographic data to correlate sex differences in clinical presentation with the magnitude of vascular disease burden as a function of age, along with analysing the other major risk factors.

2. Review of Literature

There is very little knowledge regarding the prognosis of ACS in younger adults previously due to very less occurrence, but there is a constant change in the lifestyle these days therefore increasing occurrence of ACS in younger individuals. The risk factors may include hypertension, Diabetes mellitus (DM), hypercholesterolemia, obesity, smoking, etc. Hence most of the research articles which were published were mainly regarding the risk factors of ACS in older patients rather than younger patients. The study on the risk factors, symptoms, characteristic features, treatment, etc in the younger patients has become equally important to treat them and for better prognosis.

Etiology of Acute Coronary Syndrome:
Acute coronary syndrome is usually caused after a pathological condition known as atherosclerosis. The causes of atherosclerosis are smoking, hypertension, increased cholesterol, high lipoprotein (a), lack of regular exercise, diabetes, thrombosis.

Faryal Murtaza Cheema et al performed a study which showed that a male predominance (66%) with the involvement of modifiable risk factors; most common was hypertension (46%) followed by smoking (42%), family history (32%), diabetes mellitus (31%), and dyslipidemias (21%). A study conducted by Balakrishnan et al at tertiary care level in India showed high prevalence of all the risk factors; Male gender (83%) smoking (82%), hypertension (57%), diabetes (63%), dyslipidemia (66%), and family history (66%). In another study conducted by Jafary et al the frequencies of risk factors revealed were male 68%, hyperlipidemia 18% and diabetes mellitus 37.2%. Low level of EPA/AA, but not DHA/AA, was a common critical risk factor for ACS in both middle - aged older patients and younger adult patients. EPA, eicosapentaenoic acid; AA, arachidonic acid; DHA, docosahexaenoic acid

The study conducted in Spain revealed that incidence of ACS among young patients was associated with diabetes and unhealthy lifestyle that included cocaine use, smoking, and obesity (26). Frequency of hypertension (46.3%) as risk factor of ACS was also in agreement with studies by Akhtar et al (47.6%) (27) and Gupta et al (33%) (28). Hypertension in young adults with Acute Coronary Syndrome had also been implicated as independent risk factor for muti - vessel coronary artery disease (29). Patients of ACS also having chronic kidney disease showed very high prevalence of hypertension (81.3%) and diabetes mellitus (63.8%). Another study conducted in Pakistan by Muhammad F et al (30) showed frequency of smoking as risk factor for ACS as 46%, that was close to our finding of 41.9%.

A study conducted by Aram J et al (31) concluded that the prevalence of family history is 24% and diabetes 20% as the risk factors of ACS. Another study by Kumar V et al (32) showed prevalence of diabetes (68.5%) and family history (71.7%) as the risk factors of ACS. Dyslipidemia is one important modifiable risk factor for acute coronary disease. A study by Ricci B et al (33) about risk factors in ACS showed dyslipidemia 36.6%. Another study by Reda AA et al (34) about frequency of risk factors for ACS dyslipidemia was 38.5%.

Most of the articles conclude that diabetes, hypertension, smoking, dyslipedemia are the most important risk factors of acute coronary syndrome in younger patients but there are a few gaps in the knowledge like there are very few articles which consider early menopause and recent pandemic, COVID as one of the risk factors. Hence keeping these in mind evaluating the risk factors is important to evaluate these risk factors for identifying the cause of ACS in younger patients for their better prognosis.

Gaps in knowledge
Till date the exact cause for development of ACS is not clear and incidence for young ACS is rising. Due to the lifestyle changes majorly in women there is early menopause which might be one of the risk factors of acute coronary syndrome. COVID - 19, being a recent infection which has come to the spotlight in spite of having few other outbreaks, the long term effects of COVID aren't known. Extensive research hasn't been done on the long - term effects of COVID. It might or might not act as a risk factor of ACS. Hence studying about the risk factors helps in better prognosis in patients suffering with ACS. Most of the studies conclude that Acute coronary syndrome in the patients between 18 - 45 years is mainly predominant males and the common risk factors are hypertension followed by Diabetes Mellitus, smoking and dyslipidemia. The positive family history of a genetic or non - modifiable cause can also act as a risk factor in the patients.

Risk factor definitions
The study used the following criteria to label the risk factors for the disease. History of sudden death or ACS father/mother or male/female first degree relative for patients was considered to have a family history positive. History of any tobacco smoking/consumption occasionally or daily and those who left this habit within a period of three months of diagnosis. Those on anti - hypertensive medicines of any kind or with blood pressure more than systolic 140 mmHg and diastolic 90 mmHg at least on two occasions. Those on anti - diabetic medicines of any kind or with blood sugar random more than 200 mg/dl or blood sugar fasting more than 126 mg/dl. History of high density lipoprotein less than 1.04 mmol/litre, low density lipoproteins equal or more than 3.37 mmol/litre and a total cholesterol more than 5.18 mmol/litre in patients either treated or diagnosed are labeled as patients of Dyslipidemia. Development of menopause less than 45 years of age is considered as early menopause

Aims and objectives

The study the prevalence of risk factors of Acute Coronary Syndrome in younger patients

3. Materials and Methods

It is a study where patients who came to theAIIMS Nagpur were screened and included. Convenient sampling was used for patients' selection. The serum cardiac enzyme level was measured, and serial ECHO and ECG was done at admission and repeated if required. Blood samples were collected after an overnight fast of 14 hours and tests were done for total cholesterol and HDL cholesterol.

It was a cross - sectional, retrospective observational study conducted AIIMS Nagpur. Study population was patients coming to department of Cardiology at AIIMS Nagpur. Duration of study was 2 months. Inclusion criteria was patients diagnosed with ACS who more than 18 years of age and who gave consent for the study. Data collection procedure included taking the history of the patients and analyzing the lipid profiles, CBC, Troponin, CKMB, ECG along with other investigations. Patient will be subjected to angiography and angioplasty or CABG or given OMT (Optimal medical therapy) according to disease indication.

Statistical analysis

Statistical Analysis will be performed using IBM SPSS version 28. Descriptive Statistics will be used to describe the data. Categorical data will be expressed as frequencies and percentages. For continuous data, means and Standard deviations will be presented. Association between variables will be analyzed using Chi - square test. Statistical Significance will be defined as p - value <0.05.

4. Results

Baseline characteristics of the patients

Baseline characteristics of 62 patients of acute coronary syndrome included in our study is shown in the following table no.1.

Table 1: Baseline characteristics of patients

Parameters	Total number (percentage/Mean + SD)
Total no. of patients	62
Age	38.706 (+6.11)
Male	53 (84.5%)
Female	9 (14.5%)
Diabetes	30 (48.38%)
Hypertension	35 (57.8%)
Smoking	34 (54.8%)
Alcohol consumption	34 (54.8%)
Dyslipidemia	27 (43.5%)
Family history	23 (37%)
Obesity	16 (25.8%)
Early menopause	3 (33.33%)
Mean Hb	14.10
Mean platelets count	300.28
Mean LDL	96.526
Mean Cholesterol	160.04
Mean triglyceride	196.59
Mean HDL	35.2
Mean ejection fraction %	43.72
No. of patients underwent PTCA	61
No. of patients undergoing CABG	1
No. of Deaths	0

Gender distribution of the patients

Majority of the population in our study was male (85%).

Risk factor distribution

Table 2: Risk factor distribution

S. No:	Risk Factor	Percentage
1	Diabetes	50.7%
2	Smoking	54.8%
3	Hypertension	57.8%
4	Alcoholism	54.8%
5	Obesity	25.8%
6	Family history	37%
7	Dyslipidemia	44.23%
8	Early menopause	33.33%

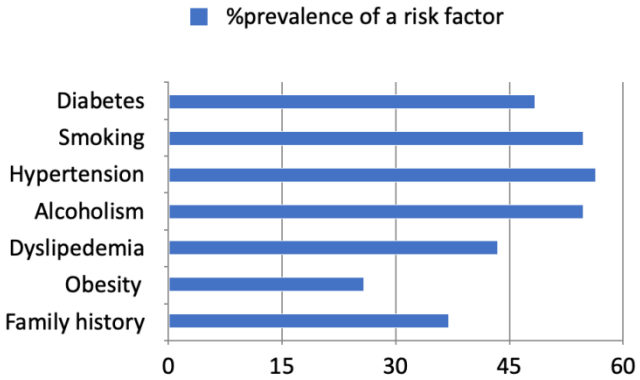

Figure 1: Risk factor distribution of ACS in 18 - 45 yrs

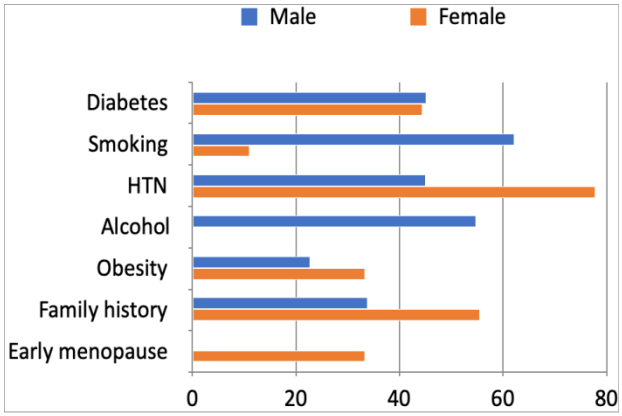

Figure 2: % prevalence of risk factors in male and female respectively

5. Discussion

In our study, the observations made in 62 patients of Acute Coronary Syndrome are discussed and compared with other studies. The youngest age of patient with ACS in this study was 22 years and oldest was 45 years. The majority of ischemia / infarct occurred in the age group between 35 - 45 years and only 15 patients are less than 35 years. The average age is 38 years. This correlates with the observation made by Tamrakar R et al (35) and Abdul Wajid et al (38). This study showed male predominance (85%) with the involvement of modifiable risk factors; most common was

hypertension (57.8%) followed by smoking (54.8%) and alcoholism (54.8%), diabetes mellitus (50.7%), dyslipidemias (44.23%), family history (37%), and obesity (25.8%).

In our study 85% of patients were male. This finding is consistent with the study of Akhtar et al (27) who showed 85% of their patients as male in their study. Male predominance also correlates with the observation made by Tamrakar R et al; Abdul Wajid et al; PS Singh et al and P. Yadav et al (35) (38) (36) (37). Family history of CAD has an increased risk of premature coronary events. Present study showed that 37% of patients had a family history of premature CAD, whereas Akhtar et al showed 57% (27) and Tamrakar R (35) et al showed 33% patients having family history of premature CAD. This difference between the results is probably because of the difference in sample size selected. There are 109 patients in Akhtar et al study (27), 100 patients in Tamrakar R et al (35) study and 62 patients in our study.

Obesity is itself a risk factor for ACS in both men and women. But in present study only 25.8% of patients were obese. This small proportion is because of the fact that in our study most of the patients belonged to poor socioeconomic status. This correlates with Abdul wajid et al (38) study in which only 17% of patients were obese and Tamrakar R et al (35) (4.3% obese) and most of the patients in these studies also belonged to poor socioeconomic status (38).

Hyperinsulinemia in these patients accelerates the atherosclerotic process in the coronary arteries. Diabetes is second only to CAD as a health burden in India. Hyperinsulinemia, insulin resistance, and higher rate of prevalence of metabolic syndrome in people with type - 2 diabetes were attributed to high coronary risk in South Asians. We found 50.7% of the patients to be diabetic in our study. Another study by Kumar V et al (32) showed prevalence of diabetes as the risk factors of ACS/MI, 68.5%. More than half (50.8%) of ACS patients in Al - Mukhtar & Ahmed study (40) and 22% of patients were diabetics the study conducted by Aram et al (31). In a study from Sudan, ACS occurred in 5.44% of diabetic patients (41).

Alcohol intake in our study was a risk factor in 54.8% and might as well be an important risk factor. Alcohol intake is not an important risk factor in our society according to Saumya Gupta et al as only 17% of patients had a history of alcohol consumption in that study (39). This correlates with Abdul Wajid et al study in which only 3% patients were alcoholic (38). In our study 57.8% of the patients were hypertensive making it the highest prevalent risk factor. In the study by Saumya Gupta et al (39) 33% of patients were hypertensive. However, the study conducted by Akhtar et al in 1993 on young patients of IHD found 47.6% hypertensive patients (27). This difference is probably because Akhtar et al study included all the patients with IHD whereas our study included only those patients who had ACS, but not the stable angina. Another reason is that obesity has also contributed to hypertension in Akhtar et al study, as almost half of their patients were obese whereas most of our patients belonged to poor socioeconomic status and only 13% were obese.

Dyslipidemia is one of the major risk factors. Akhtar et al reported dyslipidemia in 63.2% of patients. In a study conducted by Saumya et al 50% patients had dyslipidemia (39). In our study 44.23% patients had dyslipidemia. Sedentary lifestyle seems to be contributing to the increased prevalence of dyslipidemia in our population (38). In the study conducted by Ravi sahi et al 40% of young ACS patients dyslipidemia was present which was comparable to other existing studies which showed a similar prevalence of 47% (Moccetti and Malacrida, et al.1997), 42% (Dwiwedi, et al.2000), and 42% (Dani, et al.2003) (42 - 44).

In present study 54.8% of patients were smokers/ tobacco consumers. In a study conducted by Saumya et al 30% of patients were cigarette smokers and 37%were tobacco chewers. Study by Zimmerman et al found that among Acute myocardial infarction patients <40 years old 73% to 90% reported a history of smoking. Many other studies have also found high rates of smoking among young patients who have Acute myocardial infarction, with percentages ranging from 70% to >90% (35). Smoking was the leading risk factor (65%) as seen in the study by Yusuf et al (36). All these evidences point out smoking as an important modifiable risk factor and preventable cause of CAD in young adults (38, 35). So, we support the conclusion that tobacco control programs could have an important contribution in preventing and decreasing the incidence of ACS in our young adults.

Early menopause was considered as one among the risk factors in most of the studies, and in present study 3 (33.33%) females out of 9 had a history of early menopause. Atherosclerotic burden is greater in postmenopausal women than premenopausal women as understood from the higher prevalence of obstructive CAD, especially multivessel disease in postmenopausal group (45) and that of normal epicardial coronaries in premenopausal group. Premenopausal women have lower incidence of IHD due to the protective effect of endogenous estrogen on the vascular endothelium (46), whereas in the postmenopausal women, the risk of IHD doubles (47, 48).

6. Limitation

This study was conducted in a short period of time and acute coronary syndrome in young age that too in a low socioeconomic group is very uncommon so the sample size of the study is small (n=62). This study was conducted in an urban set up in a tertiary care hospital, but most of the patients are of low socio - economic group; this is the main confounding factor in our study.

7. Conclusion

- Young patients (at or below 45 years of age) diagnosed with ACS have some major differences in the risk factors that should be appreciated.
- The most important modifiable risk factor is hypertension.
- Commonest non - modifiable risk factor is Male sex.
- Smoking, oral tobacco consumption, hypertension, diabetes, dyslipidemia, alcohol consumption and early

menopause are other important modifiable risk factors in young adults.

- Other risk factors such as obesity and family history of premature CAD are also prevalent in young ischemic patients.
- If timely managed, young patients with ACS have favourable in hospital prognosis.

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