ORIGINAL ARTICLE

Epidemiological Study in Admitted Patients With Ischaemic Heart Disease at a Tertiary Care Hospital in North-Western India

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Abstract

Background/Aim: Ischaemic heart disease (IHD) is a major cause of morbidity and the leading cause of mortality in either men or women globally. IHD incidence is more common in the elderly and there are multiple well-known risk factors for IHD. This study aimed to evaluate the epidemiological trend of IHD in North-Western India. This study also evaluated the risk factors of IHD and associated comorbidities.

Methods: A cross-sectional observational study for a period of 12 months was conducted in the Cardiology Department of the Tertiary Care Hospital, Jaipur, India. A total of 400 IHD patients were enrolled in this study. Statistical Package for Social Sciences (SPSS) version 20.0 software was used for statistical calculation.

Results: The most common age group was 61-80 years (mean age was 57.8 ± 0.66) with men predominated (76.3 %). More patients (56 %) were from urban areas than rural areas (44 %). Among all the patients, 161 (40.3 %) patients were smokers and 42 (10.3 %) were alcoholics. Hypertension (34.8 %) followed by diabetes mellitus (17 %) and obesity (7.3 %) were found to be the predominant risk factors.

Conclusion: IHD was more common in elderly patients and in men. Heavy alcohol consumption and smoking were potential risk factors for the development of IHD. Hypertension, diabetes mellitus and obesity also significantly contributed to occurrence of IHD. The burden of the IHD can be reduced by the limiting alcohol consumption, smoking cessation and adaptation of healthy lifestyle.

Key words: Ischaemic heart disease; Risk factors; Epidemiology; Comorbidities.

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Introduction

Ischaemic heart disease (IHD) is defined as an imbalance between myocardial oxygen demand and required blood supply.[1] Basically, ischaemia indicates not receiving adequate blood supply and oxygen in a portion of an organ. It occurs due to the deposition of atherosclerotic plaques in coronary arteries that results in the narrowing of the lumen of coronary arteries, furtherly it affects the supplied area.[2] In 2019, according to Government of India, assessed National Programme for prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) reported the overall prevalence of ischaemic heart diseases in India is 37 per 1000 population.[3] There is high prevalence of risk factors like smoking, physical inactivity, hypertension, diabetes mellitus, truncal obesity, low HDL-cholesterol and high triglyceride in urban population

of Jaipur area.[4] The reported data suggest that IHD has been identified as the pervasive cause of mortality and disability which is anticipated to keep increasing in developing countries ie, India.[5]

Systematic studies, ie by Gupta et al,[6] Kutty et al,[7] Jajoo et al,[8] Wander et al[9] were conducted in India to find out the trends of epidemiology of IHD. These studies conclude that the prevalence of IHD in 1960 in urban areas of India was 2 % and increased by 7 to 14 times by 2013. Similarly, the prevalence of IHD of rural areas of India was 1.7 % and increased by 7.4 % between 1970 and 2013.[10] Acute coronary syndrome is classified into three types based on the clinical manifestation of the patients:[11]

1. Unstable angina (UA),
2. Non-ST segment elevation myocardial infarction (NSTEMI),
3. ST-segment elevation myocardial infarction (STEMI).

There are several risk factors for IHD, of which some can be controlled but some cannot be controlled. The controllable or modifiable risk factors are high blood pressure (BP), hyperlipidaemia, diabetes mellitus, obesity, smoking and poor lifestyle among others. The non-modified risk factors are age, sex, family history etc.[12] The concept of "risk factors" in IHD was first coined by the Framingham heart study, which published its finding in 1957.[13] The study established that hypertension is the most common risk factor for developing IHD because it provides oxidative as well as mechanical stress over the arterial wall.[14] The second common risk factor for IHD is hyperlipidaemia.[15]

The objectives of the management of IHD are to decrease the progression of atherosclerosis of the arterial wall, prevention of future consequences including mortality and eliminate near-complete ischaemic symptoms with restoring functions of the heart. These three aspects can be achieved by risk modifications, pharmacological therapy and revascularisation.

The risk modifications include salt restriction, weight reduction, smoking cessation and regular brisk exercises, while pharmacological treatment includes antiplatelet drugs, statins, angiotensin-converting enzyme (ACE) inhibitors, fibrinolytics, anti-ischaemic agents, anticoagulants, cardio-selective beta-blockers, nitrates etc.[16] Revascularisation mean restoration of perfusion to an ischaemic body part or organ by both medical and surgical therapy, but it is typically accomplished by percutaneous coronary intervention (PCI) therapy and coronary artery bypass graft (CABG).[16]

Epidemiological studies aim to identify the risk factors that are correlated with a particular disease and how it is preventable in an individual group due to the observational disposition of epidemiology.[17] It can't tell answers about what caused disease in an individual group. This study aimed to analyse the prevalence and risk factors and other disease-related problems in IHD patients of the tertiary care hospital in Jaipur, India.

Methods

This was a cross-sectional observational study conducted on IHD patients admitted in indoor wards and Cardiac Care Unit (CCU) of the Cardiology Department at SMS Medical College & Hospital, Jaipur, India after approval from Institutional Ethical Committee (IEC), Research review board (RRB) and the Cardiology Department. The indoor patients included patients admitted to CCU who underwent intervention for IHD and patients admitted to wards for IHD. The study duration was 12 months, from June 2020 to May 2021.

Patients aged between 20-80 years of either sex were included in this study. IHD patients without any comorbidities and having comorbidities with diabetes, hypertension, and obesity both were included in this study. Patients with diseases other than IHD, like endocarditis, rheumatic heart disease, arrhythmia, cardiac tumours etc and pregnant and lactating women were not included in the study.

Sampling

A sample of 400 cases of IHD was required at a 95 % confidence level (CI) and 10 % relative allowable error to verify the expected prevalence of 50 % IHD of the total population. The sampling was done by random selection from indoors and patients fulfilling inclusion criteria were enrolled for the study until the required sample size was attained. All patients, irrespective of their interventional status, were recruited and categorised into two groups: non-interventional group (those who had not undergone any intervention and interventional group (those who had already undergone intervention).

■ Singh et al. Scr Med 2023 Sep;54(3):245-51.

247

Data collection

A predesigned proforma was used to collect the data and demographic information such as age, sex, patient habitat, family history and comorbidities (hypertension, diabetes mellitus (DM) and obesity) associated with IHD. The study's purpose, methods and objective have been explained to each patient. After their consent was taken in written form, each patient was asked about their personal habits regarding alcohol consumption and smoking.

Statistical analysis

Quantitative data were expressed in the form of percentages and proportions. The significance of the difference in the proportions of data in the non-interventional and interventional group was assessed by Chi-square test. Apart from that, an adjusted odd ratio (aOR) was calculated for comparing different categories according to the BMI status of IHD patients with comorbidities and dependent variables were adjusted (diabetes mellitus, hypertension, total comorbidities). P value < 0.05 was considered statistically significant. Statistical Package for Social Sciences (SPSS) version 20.0 software was used for statistical calculation.

Results

Table 1 shows the demographic profile of patients with IHD. The mean age group in this study was 57.8 ± 13.11 years. More patients belonged to non-interventional group (325), while interventional group had 75 patients. In the study population, 89.5 % patients belonged to the age group of 41-80 years, while 10.5 % patients belonged to the age group of 21-40 years.

Table 1: Demographic characteristics of patients with ischaemic heart disease

Parameter	Non-interventional group [n (%)]	Interventional group [n (%)]	Total [n (%)]
Age			
21- 40	31 (9.5 %)	11 (14.7 %)	42 (10.5 %)
41- 60	152 (46.8 %)	20 (26.7 %)	172 (43.0 %)
61- 80	142 (43.7 %)	44 (58.6 %)	186 (46.5 %)
Mean ± SD	57.88 ± 12.54	57.70 ± 15.28	57.8 ± 13.11
Sex			
Man	254 (78.1 %)	51 (68.0 %)	305 (76.2 %)
Woman	71 (21.9 %)	24 (32.0 %)	95 (23.8 %)
Man : Woman	3.58 : 1	2.13 : 1	3.21 : 1
Environment			
Urban	177 (54.5 %)	47 (62.7 %)	224 (56.0 %)
Rural	148 (45.5 %)	28 (37.3 %)	172 (44.0 %)
Total	325 (100.0 %)	75 (100.0 %)	400 (100.0 %)

Table 2: Distribution of patients with ischaemic heart disease according to their personal habits

Parameter	Non-interventional group [n (%)]	Interventional group [n (%)]	Total [n (%)]
Smoker	132 (40.6 %)	29 (38.7 %)	161 (40.3 %)
Alcoholic	35 (10.8 %)	7 (9.3 %)	42 (10.5 %)
Smoker, Alcoholic	30 (9.2 %)	7 (9.3 %)	37 (9.2 %)
Non-smoker, Non-alcoholic	128 (39.4 %)	32 (42.7 %)	160 (40.0 %)
Total	325 (100.0%)	75 (100.0%)	400 (100.0 %)

The number of men was higher in both the groups, 254 (78.1 %) and 51 (68.0 %) in non-interventional and interventional group, respectively. The overall man-to-woman ratio was 3.21 : 1. In both groups, more patients lived in urban areas (56.0 %).

Table 3: Distribution of patients with ischaemic heart disease (IHD) according to the presence of a family history of IHD

Family history	Non-interventional group (N = 325)	Interventional group (N = 75)	Total (N = 400)
Positive	14 (4.3 %)	6 (8.0 %)	20 (5.0 %)
Negative	311 (95.7 %)	69 (92.0 %)	380 (95.0 %)

Table 2 shows the personal habits of IHD patients. Among all the patients, 161 (40.3 %) patients were only smokers, 42 (10.5 %) were only alcoholics and 37 patients (9.2 %) were smokers as well as alcoholics.

Table 3 shows the distribution of IHD patients according to their presence of family history. Among all, 20 patients had the presence of a family history of IHD. In the non-interventional group, 14 (4.3 %) patients and in the interventional group, 6 (8.0 %) a had positive family history of IHD.

Table 4 shows distribution of IHD patients according to their body mass index (BMI in kg/m^2). Among all men, 139 (45.6 %) had a normal weight (BMI < 25), 147 (48.2 %) were overweight (BMI = 25-29.9) and 19 (6.2 %) were obese (BMI ≥ 30). Among all women, 48 (50.5 %) had a normal weight, 37 (38.9 %) were overweight and 10 (10.5 %) were obese.

Table 5 shows distribution of patients according to the type of IHD. Among all IHD patients, 16.2 % had STEMI, 68.8 % had non-STEMI and 15.0 % were diagnosed with angina. In the non-interventional group, 81.5 % were non-STEMI patients and 18.5 % were diagnosed with angina. There were no patients with STEMI in this group. In the interventional group, 86.7 % were STEMI patients and 13.3 % were non-STEMI patients. There were no

patients with angina in the interventional group. The difference in the type of IHD between non-interventional and interventional group was found to be statistically significant ($p < 0.05$).

Table 4: Distribution of patients with ischaemic heart disease according to BMI

BMI (kg/m²)	Non-interventional group (N = 325)		Interventional group (N = 75)		Total (N = 400)	
	Male	Female	Male	Female	Male	Female
Normal	113 (44.5 %)	36 (50.7 %)	26 (51.0 %)	12 (50.0 %)	139 (45.6 %)	48 (50.5 %)
Overweight	126 (49.6 %)	28 (39.4 %)	21 (41.2 %)	9 (37.5 %)	147 (48.2 %)	37 (39.0 %)
Obese	15 (5.9 %)	7 (9.9 %)	4 (7.8 %)	3 (12.5 %)	19 (6.2 %)	10 (10.5 %)
Total	254 (100.0 %)	71 (100.0 %)	51 (100.0 %)	24 (100.0 %)	305 (100.0 %)	95 (100.0 %)

BMI: body mass index; normal weight: BMI < 25; Overweight: BMI = 25-29.9; Obese: BMI ≥ 30;

Table 5: Distribution of patients with ischaemic heart disease (IHD) according to the type of IHD

Type of IHD	Non-interventional group [n (%)]	Interventional group [n (%)]	Total [n (%)]	p-value (Chi-square test)
STEMI	0 (0.0 %)	65 (86.7 %)	65 (16.2 %)	
NSTEMI	265 (81.5 %)	10 (1.3 %)	275 (68.8 %)	< 0.001
Angina	60 (18.5 %)	0 (0.0 %)	60 (15.0 %)	
Total	325 (100.0 %)	75 (100.0 %)	400 (100.0 %)	

STEMI: ST elevation myocardial infarction; NSTEMI: non-ST elevation myocardial infarction;

Table 6 shows the distribution of IHD patients according to comorbidities. In the non-interventional group, 122 (37.5 %) patients had any of the comorbidities and 203 patients had no comorbidities. In interventional group, 39 (52.0 %) patients had comorbidities.

Table 6: Distribution of patients with ischaemic heart disease (IHD) according to the comorbidities

Comorbidities	Non-interventional group [n (%)]	Interventional group [n (%)]	Total [n (%)]
DM	12 (3.7 %)	1 (1.3 %)	13 (3.2 %)
HBP	64 (19.7 %)	18 (24.0 %)	82 (20.5 %)
Obesity	3 (0.9 %)	3 (4.0 %)	6 (1.5 %)
DM, HBP	24 (7.4 %)	13 (17.4 %)	37 (9.2 %)
DM, obesity	1 (0.3 %)	2 (2.7 %)	3 (0.8 %)
HBP, obesity	4 (1.2 %)	1 (1.3 %)	5 (1.2 %)
DM, HBP, obesity	14 (4.3 %)	1 (1.3 %)	15 (3.8 %)
Total comorbidities	122 (37.5 %)	39 (52.0 %)	161 (40.2 %)
No comorbidities	203 (62.5 %)	36 (48.0 %)	239 (59.8 %)
Total	325 (100.0 %)	75 (100.0 %)	400 (100.0 %)

DM: diabetes mellitus; HBP: Hypertension.

Table 7: Association of the overweight and obesity with comorbidities among patients with ischaemic heart disease (IHD)*

BMI status	HBP (aOR at 95 % CI)	DM (aOR at 95 % CI)	Combined comorbidities (aOR at 95 % CI)
Normal	1	1	1
Overweight	2.45 (2.21-2.74)	1.56 (1.36-1.82)	2.22 (1.80-2.72)
Obesity	2.63 (2.14-3.23)	1.84 (1.46-2.42)	2.85 (2.09-3.89)

aOR: adjusted odd ratio; CI: confidence interval; DM: diabetes mellitus; HBP: hypertension; *p < 0.05 for all aOR; BMI: body mass index; normal weight: BMI < 25; Overweight: BMI = 25-29.9; Obese: BMI ≥ 30;

■ Singh et al. Scr Med 2023 Sep;54(3):245-51.

249

Table 7 shows the association of risk factors, overweight and obesity with comorbidities, hypertension, diabetes mellitus and total comorbidities. In overweight/obese patients associated with hypertension, diabetes mellitus and total comorbidities were statistically significant.

Discussion

In this study, the mean age of the patients was found to be 57.8 years ± 13.11. Among all total patients, 46.5 % belonged to 61 to 80 years and 43 % belonged to 41 to 60 years, while only 10.5 % were in the age group of 21-40 years. In this study, it was seen that IHD was most common in elderly patients. This is similar to the results of the study by Sawant MP et al[18] wherein the majority (59.6 %) of the patients were in the age group of 61-80 years and only 4.6 % of patients were from the age group 21-40. This is also similar to the study by Saju et al[19] wherein the majority (47.4 %) of the patients belonged to the age group of 61-79 years and only 5.2 % of patients were from the age group of 21-39 years. This result also corroborates with the finding in the study of Veena et al[20] where most patients (55.6 %) were in the age group of 61- 80 years and only 6.2 % patients belonged to the age group of 19-40 years.

In this study, the incidence of IHD was predominant in men (76.3 %). This predominance is similar to the studies by Sawant et al,[18] Panchaksharimath et al[21] and Gaur et al.[22] On the contrary, Shankar et al[23] showed that there was a slightly more percentage of woman patients (51.94 %) suffering from IHD. In this study, IHD patients came from different geographical regions of Rajasthan. Among them, 56 % of the patients were from urban areas. Similarly, Gaur et al[22] had a majority of urban patients (61.5 %).

The study revealed that 49.5 % patients were smokers and 19.7 % patients were alcoholics. It shows that smoking and alcohol increase the risk of IHD. The study by Hbejan et al[24] shows that smoking is an independent risk factor for acute myocardial infarction in young persons who were less than 45 years of age. In this study, 27 out of 400 patients were smokers who under 45 years of age which can be correlated with smoking as a risk factor for the progression of IHD at in early age. Smoking can change the process of platelet adhesion and haemostasis. So, it works as a triggering factor for IHD in the presence of atherosclerosis.[25]

In this study, 184 (46 %) patients were overweight. Normal-weight had 46.7 % of patients and 7.3 % patients were obese. The mean BMI was 25.17 ± 3.54 which is less than in the study by Gregory et al[26] where mean BMI was 30.3 ± 5.7.

This study showed that 40.3 % of IHD patients had comorbidity - DM, hypertension or obesity. Among comorbidities, hypertension (34.8 %) predominated. This implies that hypertension, DM and obesity increase the progression of IHD if present as a comorbidity. A similar study by Leon et al[27] shows that DM, obesity and hypertension comorbidities were powerful risk factors for IHD.

According to American Heart Association reports, risk factors ie, smoking, alcohol intake, obesity, family history and comorbidities (diabetes mellitus, hypertension) are responsible for the development of IHD.[15] This study also authenticated the role of the same risk factors in the development of IHD.

Study strengths and limitations

In this study, a wide range of age groups has been included so that the effects of IHD could be seen not only in elder patients but also in younger patients. Comorbidities such as DM and hypertension have been studied in IHD patients which have a key role in the development of IHD. Patients have been motivated to adopt a healthy lifestyle by telling them the beneficial role of a healthy lifestyle to maintain blood pressure, maintaining normal BMI and preventing IHD.

On the other hand, the self-reporting of enrolled persons cannot exclude the possibility of bias in the responses of enrolled persons, such as under-reporting of cigarette/bidi smoking and liquor consumption. This study also did not take into account the laboratory findings of the serum cholesterol level of IHD patients which might be a risk factor. Also, this study did not include other risk factors like physical activity, stress level, education, literacy level etc.

250

Singh et al. Scr Med 2023 Sep;54(3):245-51.

Conclusion

IHD was more common in elderly patients and in men. The risk factors ie, older age, family history, alcohol consumption and smoking were determinants of IHD and comorbidities like hypertension, diabetes mellitus and obesity also significantly contribute to the occurrence of IHD. Most of the risk factors are modifiable in order to reduce the burden of IHD. Among these, limiting alcohol consumption, smoking cessation, increasing physical activity and adaptation of a healthy lifestyle can be followed to decrease the chance of development of IHD and other non-communicable diseases.

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Conflict of interest

None.

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Singh et al. Scr Med 2023 Sep;54(3):245-51.

251

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