

# Epidemiology and Risk Factors of Ischemic Heart Disease: A Hospital-Based Study from Faisalabad, Pakistan

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## Abstract

**Background:** Ischemic heart disease (IHD) remains a major global public health concern. This study aimed to determine the hospital-based prevalence of IHD and identify its associated risk factors among patients presenting to a tertiary care hospital in Faisalabad, Pakistan.

**Methodology:** A cross-sectional study was conducted among 7,087 patients presenting to the Faisalabad Institute of Cardiology between September 2023 and February 2024. Of these, 385 patients diagnosed with IHD were included through consecutive sampling. Diagnosis was confirmed via medical records and physician assessment, supported by standard diagnostic criteria, including troponin I testing. Statistical analysis was performed using SAS version 9.0. Associations between variables were assessed using the chi-square test, with a significance level set at  $p < 0.05$ .

**Results:** The hospital-based prevalence of IHD was 5.43% (95% CI: 4.92-5.99). Among affected patients, 63.38% were male and 36.62% were female ( $p = 0.002$ ). The majority were aged over 45 years (81.30%,  $p = 0.002$ ) and resided in urban areas (58.96%,  $p = 0.001$ ). Most patients were married (87.53%;  $p < 0.001$ ) and belonged to the upper-middle socioeconomic class (47.01%;  $p = 0.001$ ). A sedentary lifestyle was significantly associated with IHD (41.30%;  $p = 0.001$ ), while a positive family history (64.41%) was the most prevalent risk factor.

**Conclusion:** The findings underscore the importance of demographic and lifestyle factors in the risk profile of IHD. Targeted interventions addressing physical inactivity, obesity, and other modifiable risk factors are essential to reduce disease burden, while acknowledging family history as a key non-modifiable determinant.

**Keywords:** Prevalence; risk factors; sedentary lifestyle; cardiovascular disease; Pakistan

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## Introduction

Ischemic heart disease (IHD), also called coronary artery disease (CAD) remains the third leading cause of mortality worldwide and commonly presents as myocardial infarction (1). It results from reduced coronary blood flow as a result of atherosclerosis and associated macrovascular and microvascular processes that disrupt the oxygen balance in the heart (2, 13).

Metabolic risk factors such as hypertension, elevated blood sugar, elevated serum triglycerides, low serum high-density lipoprotein and abdominal obesity have been found to be the main causes of cardiovascular illnesses (3). Lifestyle or modifiable factors including smoking, high body mass index (BMI) and physical inactivity have also been linked to cardiovascular illness. Effective management of these modifiable risk factors can help in preventing IHD (4).

The burden of IHD is still increasing in many low- and middle-income countries, including Pakistan, as a result of changing lifestyles, aging populations and shortcomings in the healthcare system (4,9,10). Gender differences have been reported with men being at higher risk of mortality due to behavioral and psychosocial factors such as lifestyle choices and stress exposure (6,7). Women are subject to increasing risk after menopause due to loss of estrogen-related cardioprotection (8).

Beyond its health consequences, IHD imposes a substantial economic burden due to hospitalizations, revascularization procedures, clinic visits, emergency department visits, and pharmaceutical therapies. Lifestyle modifications used in the management of myocardial ischemia also contribute to its prevention (11).



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Given the lack of local hospital-based evidence describing the distribution of IHD risk factors across demographic groups in Faisalabad, this study describes the hospital-based prevalence of IHD and the distribution of major associated risk factors among patients diagnosed with ischemic heart disease at a tertiary care hospital in Faisalabad, Pakistan.

## Methodology

The relationship between various risk factors of ischemic heart disease in Faisalabad was examined using a cross-sectional research methodology. The patients who went to the Faisalabad Institute of Cardiology (FIC), Pakistan were included in this cross-sectional study. Data was collected based on the national geographic boundaries such as rural and urban through a questionnaire. Age, gender, socioeconomic status, and risk factors (diabetes, hypertension, obesity, and physical inactivity) were considered in this study. The research was carried out over six months. The number of patient cases with ischemic heart disease admitted to the Faisalabad Institute of Cardiology (FIC), located in Faisalabad, was used as the foundation of the estimated study population. The results may not be applicable to the general population as this study was hospital-based and carried out at a tertiary care cardiology center. Instead, they represent individuals needing specialized cardiac care.

A total of 7087 patients' reports were checked. Of these, a final analytical sample of 385 cases was obtained by including all patients who met the diagnostic criteria for ischemic heart disease during the study period. All patients diagnosed with ischemic heart disease during the study period were included based on consecutive sampling technique. Since there are limited population-based prevalence data in Pakistan, a 50% estimated prevalence, 5% absolute precision, and 95% confidence interval ( $Z=1.96$ ) were used to calculate the sample size according to the standard epidemiological formula (12). This resulted in a required sample size of 385 participants.

As advised by epidemiological sample size guidelines (12), we utilized  $P = 50\%$  to generate the maximum necessary sample size for conservative planning in the absence of prior local estimates to inform  $P$ . 385 participants completed the questionnaire containing closed-ended questions on ischemic heart disease and associated risk factors. The questionnaire, which comprised sections on demographics, medical history, lifestyle choices and food habits was developed based on previously published cardiovascular risk factor surveys and it was reviewed by subject experts for its validity before data collection. All variables were self-reported unless verified through medical records.

### Operational definitions

Obesity was defined as body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup>, calculated using height and weight measurements available in patient records. High cholesterol was defined as total serum cholesterol  $\geq 200$  mg/dL, based on documented laboratory reports. Sedentary lifestyle was defined as self-reported

engagement in less than 150 minutes of moderate-intensity physical activity per week. Physical activity levels were categorized as sedentary, moderately active, active, and highly active based on questionnaire responses.

A structured questionnaire was used as a research tool which collected data from cardiac patients. The questionnaire had various sections that were used to collect information such as demographic data, socioeconomic status, medical history, information about diet and nutrition of patients, and risk factors associated with ischemic heart disease. According to regionally used income classifications, socioeconomic status was divided into lower-middle, middle, upper-middle classes based on self-reported monthly household income and occupation.

Data collected through questionnaires were compiled in the form of an Excel file. Then, Statistical Analysis System (SAS) software was employed to analyze the data for total prevalence and distribution of risk factors among patients with ischemic heart disease. Categorical variables were summarized as frequencies and percentages. Group-wise comparisons were performed using the chi-square test. A p-value less than 0.05 was considered statistically significant.

The study included individuals who were diagnosed with ischemic heart disease and provided informed consent to participate in the research. The diagnosis was established on the grounds of medical records, physician diagnosis, or specific diagnostic criteria (such as troponin I test). The study excluded individuals with heart disease other than ischemic heart disease. It also eliminated those with severe co-morbid conditions such as terminal cancer, advanced renal failure, or other life-threatening illnesses. Pregnant women, patients with incomplete data about their medical history, and those who did not provide informed consent did not participate in this study.

Before starting, the research objective was meticulously explained to the patients to take their informed consent for participation. Since the study involves human population as participants, ethical approval was obtained from the Office of Research, Innovation, and Commercialization (ORIC) at the University of Agriculture, Faisalabad (Approval No. 648/ORIC, dated February 13, 2024).

## Results

During the six-month study period, 7087 patients presented to the Faisalabad Institute of Cardiology. Of these, 385 were diagnosed with ischemic heart disease and included in the study, resulting in hospital-based prevalence of 5.43% (95% CI: 4.92-5.99).

### Gender distribution

Among the 385 patients with IHD, 244 (63.38%) were male and 141 (36.62%) were female ( $p=0.002$ ) (Table 1).

### Age-wise distribution

IHD was most frequently observed among individuals above 45 years, with significantly lower proportions in younger age groups ( $p = 0.002$ ) (Table 2).

**Table 1: Distribution of risk factors by gender among patients with ischemic heart disease**

Group	Risk Factors						
Gender	Smoking	Hypertension	Diabetes	High Cholesterol Level	Obesity	Family History	Fatty Food Consumption
Male	219	228	198	211	212	108	171
Female	15	119	102	113	121	76	122
P-value	0.353	0.041	0.046	0.031	1.00	0.089	0.097
Df	1	1	1	1	1	1	1

**Table 2: Distribution of risk factors across age groups among patients with ischemic heart disease**

Group	Risk Factors						
Age (years)	Smoking	Hypertension	Diabetes	High Cholesterol Level	Obesity	Family History	Fatty Food Consumption
15 - 25	2	6	0	8	9	0	9
26 - 35	3	7	0	7	5	1	8
36 - 45	36	37	7	25	29	12	19
Above 45	208	273	251	236	212	119	176
P-value	0.001	0	0.005	0.001	0.000	0.000	0.002
Df	3	3	3	3	3	3	3

**Area of Residence**

A higher proportion of IHD cases was observed among urban residents compared to rural residents ( $p = 0.001$ ) (Table 3).

**Table 3: Distribution of risk factors by area of residence among patients with ischemic heart disease**

Group	Risk Factors						
Region	Smoking	Hypertension	Diabetes	High Cholesterol Level	Obesity	Family History	Fatty Food Consumption
Urban	221	203	211	201	198	123	210
Rural	149	115	137	129	113	56	61
P-value	0.015	0.093	0.033	0.038	0.090	0.175	0.293
Df	1	1	1	1	1	1	1

**Marital status**

A higher proportion of IHD cases was observed among married individuals compared to unmarried individuals (Table 4).

**Table 4: Distribution of risk factors by marital status among patients with ischemic heart disease**

Group	Risk Factors						
Marital Status	Smoking	Hypertension	Diabetes	High Cholesterol Level	Obesity	Family History	Fatty Food Consumption
Married	298	303	271	281	310	172	292
Unmarried	36	31	27	27	31	14	41
P-value	0.014	0.025	0.027	0.029	0.026	0.039	0.002
Df	1	1	1	1	1	1	1

**Socioeconomic status**

IHD was more frequently observed among individuals belonging to the upper-middle socioeconomic class (Table 5).

**Table 5: Distribution of risk factors by socioeconomic status among patients with ischemic heart disease**

Group	Risk Factors						
Socio-economic Status	Smoking	Hypertension	Diabetes	High Cholesterol Level	Obesity	Family History	Fatty Food Consumption
Lower Middle	57	42	39	45	49	27	38
Middle	122	132	102	113	108	57	129
Upper Middle	69	134	147	141	139	109	136
P-value	0.772	0.204	0.056	0.033	0.004	0.215	0.176
Df	2	2	2	2	2	2	2

**Physical activity level**

People who had a sedentary lifestyle constituted the largest proportion of IHD cases, while highly active individuals represented the smallest proportion ( $p < 0.05$ ) (Table 6).

**Table 6: Distribution of risk factors by physical activity level among patients with ischemic heart disease**

Group	Risk Factors						
Physical Activity Level	Smoking	Hypertension	Diabetes	High Cholesterol Level	Obesity	Family History	Fatty Food Consumption
Sedentary	147	135	118	124	129	98	141
Moderate Active	87	98	91	72	101	61	106
Active	13	36	51	21	27	38	39
Highly Active	9	31	39	38	18	29	38
P-value	0.004	0.000	0.002	0.043	0.004	0.025	0.002
Df	3	3	3	3	3	3	3

### Distribution of risk factors

The most prevalent risk factors of IHD were family history (64.41%), obesity (50.38%), hypertension (45.97%), smoking (37.66%), high cholesterol levels (35.58%), diabetes (33.24%), fatty food consumption (26.23%).

### Discussion

This hospital-based study found that ischemic heart disease was more frequently observed among males, individuals over 45 years of age, urban residents and those leading a sedentary lifestyle. Family history, obesity, high cholesterol levels and hypertension were the most prevalent associated risk factors. Importantly, the 5.43% statistic should not be taken as community prevalence because it represents the hospital-based percentage of IHD among patients who visited a tertiary cardiology facility.

In this study, male patients were more likely than female patients to have ischemic heart disease. Studies from low and middle income countries have revealed similar gender difference, with males experiencing a high burden of ischemic heart disease (20). On the other hand, previous research has shown that the cardio-protective effects of estrogen before menopause may contribute to the comparatively lower frequency seen in women (21). Similar findings have been reported in a population-based study from Pakistan where ischemic heart disease was observed more in men across all age groups compared to women (22).

With most instances of ischemic heart disease occurring in people over 45, age emerged as a significant demographic factor. This pattern is consistent with previous research showing that cumulative exposure to metabolic risk factors, vascular aging and long-term lifestyle choices increase cardiovascular risk with age (1). The recognized notion that ischemic heart disease primarily affects middle-aged and older people is supported by the observed age-related distribution. There has been a similar demographic shift in cardiovascular risk in Pakistan, as seen by comparable age distributions at other tertiary care facilities, where majority of the patients with ischemic heart disease were over 40 to 45 (23).

In comparison to rural communities, a greater percentage of ischemic heart disease cases were seen among urban residents. This result lines up with other research from developing nations that found a higher prevalence of cardiovascular disease in metropolitan areas (24). Living in urban area is frequently linked to environmental and lifestyle changes, such as dietary transitions and decreased physical activity, that increase the risk of cardiovascular disease. Furthermore, increased detection and reporting of ischemic heart disease patients may result from better access to medical facilities in urban regions (25).

In the current study, ischemic heart disease also seems to be related to marital status, with married individuals having a larger percentage of instances. Similar correlations have been documented in earlier research, indicating that married status may affect cardiovascular risk through lifestyle-related factors,

financial obligations, and psycho-social stress (26). This association may be confounded by age distribution and healthcare-seeking behavior because older persons are more likely to be married and seek tertiary care (27).

The distribution of ischemic heart disease in this study also seems to be influenced by socioeconomic status, with a higher proportion of cases found among people in middle and upper-middle socioeconomic categories. Similar trends have been seen in other developing nations where sedentary lifestyle, dietary modifications and increased incidence of metabolic risk factors are frequently linked to rising income levels (28). The increased percentage of cases seen in upper-middle class in a hospital setting may be partly explained by better access to diagnostic and treatment services (29). Cardiovascular risk profiles are shaped by lifestyle and environmental factors, as evidenced by the combined impact of urban location and socioeconomic status.

In this study, patients with ischemic heart disease were found to be physically inactive. This result is in line with strong evidence that regular exercise protects against cardiovascular disorders (30). Exercise lowers the risk of ischemic heart disease by promoting better blood pressure control, healthy lipid profiles, weight management and increased endothelial function. The reduced incidence of ischemic heart disease seen in physically active people can be explained by these processes (31).

Among the study population, family history was found to be a significant non-modifiable risk factor. The high prevalence of ischemic heart disease in those with positive family history is in line with earlier studies showing that these people are two to four times more likely to develop ischemic heart disease (32). This increased risk may be caused by a combination of familial lifestyle behaviors, common environmental exposures and genetic vulnerability. Furthermore, this population's high obesity prevalence adds validity to the body of research that links being overweight to a higher risk of cardiovascular disease (33).

The limitations of this study should be taken into account when evaluating the results. First, because the study group consists of patients seeking cardiac care rather than the general population, the hospital-based and single-center design restricts the applicability of results to a larger community. Due to a tertiary care setting, selection bias cannot be completely eliminated even though all ischemic heart disease cases were included consecutively over the study period. Second, the study's cross-sectional design makes it impossible to determine a causal relationship between risk factors and IHD. Third, a self-reported questionnaire that may be subjected to recall bias was used to evaluate several risk factors. Lastly, the lack of multivariate analysis makes it difficult to find independent predictors of ischemic heart disease and it is impossible to completely rule out residual confounding caused by variables like age and access to healthcare. Multivariate models like logistic regression should be used in future research to find independent predictors while adjusting for age, gender and socioeconomic factors.

## Conclusion

The hospital-based study found that ischemic heart disease is more common among males over 45 years, individuals with a sedentary lifestyle, urban residents and those belonging to the upper-middle socioeconomic class. Family history, obesity, high cholesterol levels, high blood pressure and smoking were the most prevalent associated risk factors. These findings highlight the need for targeted strategies focusing on early screening and lifestyle modification programs at the primary care level.

### Ethical Approval:

This study was approved by the Office of Research, Innovation, and Commercialization (ORIC) at the University of Agriculture, Faisalabad.

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**Data Availability:** Data supporting the findings are available upon reasonable request.

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### Authors' Contribution:

**KN:** Conceptualization, formal analysis, project administration, writing original draft.

**FR:** Conceptualization, review and editing.

**HMIA:** Methodology, visualization

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