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TRENDS AND DEMOGRAPHIC PATTERNS OF ISCHEMIC HEART DISEASE RISK FACTORS IN PATIENTS AT A TERTIARY CARE CARDIOLOGY DEPARTMENT

Original Research

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ABSTRACT

Background: Ischemic heart disease (IHD) is a leading cause of morbidity and mortality worldwide, primarily driven by modifiable and non-modifiable risk factors. Hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, and sedentary lifestyles significantly contribute to its progression. Despite advances in cardiovascular management, the burden of IHD remains high, particularly in middle-aged and elderly populations. Identifying demographic trends and associated risk factors is crucial for targeted prevention and management strategies.

Objective: This study aimed to assess the demographic distribution and prevalence of major risk factors in patients diagnosed with IHD at a tertiary care cardiology department.

Methods: A descriptive cross-sectional study was conducted at Ayub Teaching Hospital from November 2021 to April 2022, including 104 patients diagnosed with IHD. Data were collected through structured questionnaires, medical record reviews, patient interviews, and laboratory investigations. Hypertension was defined as SBP ≥140 mmHg or DBP ≥90 mmHg, diabetes mellitus as fasting plasma glucose ≥126 mg/dL or HbA1c ≥6.5%, and dyslipidemia according to NCEP-ATP III criteria. Smoking status, obesity (BMI ≥30 kg/m²), sedentary lifestyle, and family history of IHD were also assessed. Statistical analyses were performed using SPSS 26.

Results: The mean age of patients was 54.75 ± 10.30 years, with the highest proportion (34.6%) in the 56–65 age group. Male predominance was observed (67.3%). Hypertension was present in 39.4% of patients, diabetes mellitus in 32.7%, dyslipidemia in 38.5%, and smoking in 67.3%. Obesity was prevalent in 64.4%, while 68.3% had a sedentary lifestyle. A positive family history of IHD was reported in 45.2% of patients.

Conclusion: The findings underscore the high prevalence of modifiable risk factors among IHD patients, emphasizing the need for targeted preventive measures. Effective lifestyle interventions, enhanced public health strategies, and early screening programs are essential to mitigate the disease burden.

Keywords: Cardiovascular diseases, diabetes mellitus, dyslipidemia, hypertension, ischemic heart disease, obesity, smoking.

INTRODUCTION

Ischemic heart disease (IHD) remains a leading cause of morbidity and mortality worldwide, significantly impacting healthcare systems and patient outcomes. As a chronic condition primarily resulting from atherosclerosis, IHD manifests in various forms, including stable angina, acute coronary syndromes, myocardial infarction, and ischemic cardiomyopathy. The progressive accumulation of lipids, inflammatory cells, and fibrous tissue within arterial walls leads to narrowing and obstruction of coronary blood flow, precipitating life-threatening cardiovascular events. Despite advancements in medical interventions, the burden of IHD continues to rise, particularly in low- and middle-income countries where lifestyle modifications and healthcare access remain suboptimal (1). A growing body of evidence highlights the critical role of both modifiable and non-modifiable risk factors in the pathogenesis of IHD. Non-modifiable contributors include age, male sex, and genetic predisposition, with familial history of premature cardiovascular disease increasing an individual's susceptibility (2). Additionally, genetic epidemiology has identified specific loci, such as chromosome 9p21, which are linked to coronary calcification and myocardial infarction, further underscoring hereditary influences on disease development (3). However, the most significant contributors to the rising prevalence of IHD are modifiable risk factors, which include hypertension, diabetes mellitus, dyslipidemia, tobacco smoking, obesity, and physical inactivity. Among these, hypertension is a major determinant, imposing hemodynamic stress on arterial walls and accelerating atherosclerotic progression. Elevated systolic blood pressure alone accounted for approximately 10 million cardiovascular deaths globally in 2017, emphasizing the importance of early detection and control measures (4).

Diabetes mellitus, particularly type 2 diabetes, substantially elevates the risk of IHD, as chronic hyperglycemia and insulin resistance promote endothelial dysfunction, oxidative stress, and systemic inflammation. The global prevalence of diabetes has surged, affecting over 537 million adults in 2021, with projections indicating an increase to 783 million by 2045 (5). This trend necessitates comprehensive strategies to mitigate cardiovascular complications in diabetic populations. Similarly, dyslipidemia, characterized by elevated low-density lipoprotein cholesterol (LDL-C) and decreased high-density lipoprotein cholesterol (HDL-C), remains a cornerstone of atherosclerosis development. Extensive research demonstrates that lipid-lowering therapies, particularly statins and PCSK9 inhibitors, significantly reduce cardiovascular events and mortality in high-risk individuals (6). Tobacco smoking, both active and passive, is a well-established yet preventable risk factor for IHD. Smoking-induced endothelial dysfunction, platelet aggregation, and heightened inflammatory responses contribute to plaque formation and destabilization, doubling to quadrupling the risk of myocardial infarction in smokers compared to non-smokers (7). Encouragingly, smoking cessation results in a substantial reduction in cardiovascular risk, with benefits observed within the first year of quitting and progressively increasing over time (8). Furthermore, obesity and sedentary lifestyles have emerged as contemporary threats, exacerbating the prevalence of metabolic syndrome and cardiovascular disease. Obesity is closely associated with hypertension, dyslipidemia, and insulin resistance, while physical inactivity compounds cardiovascular risk by reducing endothelial function, impairing glucose metabolism, and promoting systemic inflammation (9). Epidemiological data indicate that adherence to moderate-intensity aerobic exercise for at least 150 minutes per week substantially decreases the incidence of IHD and related complications (10).

Despite the well-established link between these risk factors and IHD, there remains a gap in understanding their demographic distribution, particularly in tertiary care settings where diverse patient populations present with varying degrees of disease burden. Identifying temporal trends and risk factor prevalence across different age groups and genders is crucial for developing targeted prevention and management strategies. This study aims to analyze the demographic patterns and prevalence of IHD risk factors in patients attending a tertiary care cardiology department. By delineating these trends, the study seeks to provide valuable insights for optimizing risk stratification, improving early intervention protocols, and formulating evidence-based public health initiatives to curb the growing impact of ischemic heart disease (11).

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METHODS

The study employed a descriptive cross-sectional design, conducted at the Cardiology Department of Ayub Teaching Hospital, Abbottabad, from November 2021 to April 2022. This tertiary care hospital was selected due to its role as a referral center, catering to a diverse demographic of patients diagnosed with ischemic heart disease (IHD). The cross-sectional approach facilitated the assessment of risk factor prevalence and demographic distribution at a specific point in time, enabling an analysis of associations between various risk factors without the need for long-term follow-up (12). The study population included patients diagnosed with IHD, confirmed through clinical history, electrocardiographic findings, biochemical markers, and imaging studies. Patients aged 35 to 75 years of both genders were eligible for inclusion, provided they had documented acute coronary syndrome, stable angina, or ischemic cardiomyopathy. Exclusion criteria encompassed individuals with congenital heart disease, non-ischemic cardiomyopathies, incomplete medical records, or those who declined participation. To ensure ethical compliance, all participants provided informed consent before enrollment, and those unwilling to participate were excluded (13).

The sample size was determined using an appropriate statistical formula based on epidemiological data from previous studies on IHD risk factors. A total of 104 patients were included using a purposive consecutive sampling technique, whereby all eligible patients presenting to the cardiology department during the study period were recruited until the required sample size was attained. This approach minimized selection bias by ensuring that all patients meeting the inclusion criteria were represented (14). Data collection was carried out using structured questionnaires, patient interviews, and medical record reviews. The questionnaire was designed to capture demographic characteristics, medical history, comorbid conditions, medication use, and lifestyle factors, including smoking status, physical activity levels, and dietary habits. Self-reported medical histories of hypertension, diabetes mellitus, dyslipidemia, obesity, family history of IHD, and sedentary lifestyle were cross-verified with hospital records. Blood pressure measurements were performed using a calibrated sphygmomanometer following American Heart Association (AHA) guidelines. Hypertension was defined as a systolic blood pressure (SBP) of ≥140 mmHg, a diastolic blood pressure (DBP) of ≥90 mmHg, or current antihypertensive medication use. Diabetes mellitus was diagnosed based on fasting plasma glucose levels of ≥126 mg/dL, hemoglobin A1c (HbA1c) ≥6.5%, or the use of antidiabetic medications. Dyslipidemia was classified according to the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) criteria, which included LDL cholesterol >130 mg/dL, HDL cholesterol <40 mg/dL in men or <50 mg/dL in women, and/or triglycerides >150 mg/dL (15).

Smoking status was categorized into current smokers, past smokers (those who had quit smoking at least six months prior), and non-smokers. Obesity was defined as a body mass index (BMI) of ≥30 kg/m². A sedentary lifestyle was identified based on self-reported physical activity levels, where individuals engaging in ≤150 minutes of moderate-intensity exercise per week were classified as sedentary. To ensure the reliability of biochemical assessments, fasting blood samples were collected for lipid profile and glucose analysis after an overnight fasting period of 8–12 hours. Electrocardiography (ECG) was performed to detect ischemic changes, including ST-segment deviations, T-wave inversions, and pathological Q-waves. When clinically indicated, echocardiography and coronary angiography were utilized to assess left ventricular function and the severity of coronary artery stenosis (16). Ethical approval for the study was obtained from the Institutional Review Board (IRB) of Ayub Teaching Hospital, Abbottabad, in accordance with the Declaration of Helsinki (as revised in 2013). Ethical considerations included the confidentiality of patient data, voluntary participation, and detailed informed consent processes outlining the study's objectives, potential risks, and benefits. Patient data were anonymized and coded to ensure privacy and compliance with ethical research standards (17).

Data analysis was conducted using SPSS software (version 26). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were employed to summarize demographic and clinical characteristics. Chi-square tests were used to determine associations between categorical variables such as gender and risk factor prevalence. Continuous variables, including age, blood pressure, and lipid levels, were analyzed using Student’s t-test and one-way ANOVA for group comparisons. A multivariate logistic regression model was applied to evaluate the independent association of risk factors with IHD, adjusting for potential confounders such as age, gender, and comorbidities. Statistical significance was set at $p<0.05$ for all analyses. Results were presented using tables, charts, and graphical illustrations to enhance data interpretation (18).

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RESULTS

The study included 104 patients diagnosed with ischemic heart disease (IHD), with a mean age of 54.75 ± 10.30 years. The age distribution revealed that the highest proportion of patients (34.6%) were aged 56–65 years, followed by those aged 46–55 years (30.8%), while 5.6% of patients were in the 35–45 age bracket and 29.0% were in the 66–75 age group. The findings indicate that IHD predominantly affects middle-aged and older adults, reflecting global epidemiological trends. In terms of gender distribution, 67.3% of the patients were male, and 32.7% were female, supporting the notion that males are more susceptible to IHD, potentially due to hormonal differences and higher exposure to risk factors such as smoking and occupational stress. Diabetes mellitus was present in 32.7% of the patients, with a higher prevalence among males (37.1%) compared to females (23.5%). Hypertension was identified in 39.4% of the study population, with 41.4% of males and 35.3% of females diagnosed with elevated blood pressure. Smoking was highly prevalent among IHD patients, with 67.3% identified as current or past smokers. Notably, all smoking patients were male, while no female patients reported smoking. The high proportion of smokers in the study highlights the strong association between tobacco use and cardiovascular disease.

Dyslipidemia was present in 38.5% of the patients, with a significantly higher prevalence among males (45.7%) compared to females (23.5%). A positive family history of IHD was reported in 45.2% of cases, emphasizing the role of genetic predisposition in disease occurrence. Among males, 50.0% had a positive family history compared to 35.3% of females. Obesity was found in 64.4% of patients, with a notably higher prevalence among females (76.5%) than males (58.6%), suggesting a significant role of excess weight in the development of cardiovascular disease. A sedentary lifestyle was reported by 68.3% of the patients, indicating that physical inactivity is a major risk factor contributing to IHD. All female participants in the study were classified as sedentary, while 52.9% of male patients had low physical activity levels. The results reinforce the necessity of lifestyle modifications, including increased physical activity, to mitigate cardiovascular risk.

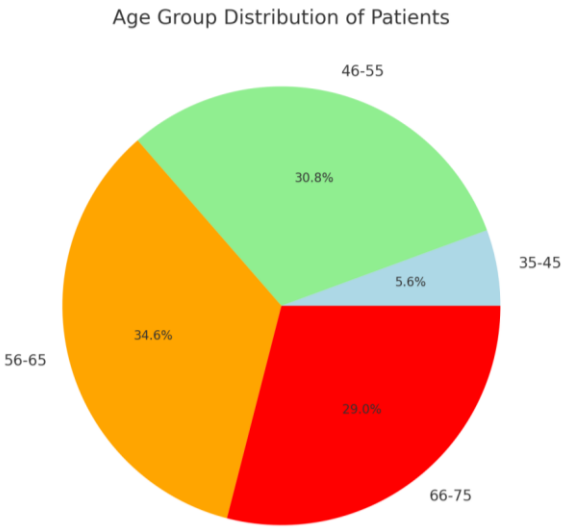
Lipid profile analysis revealed that among the 104 IHD patients, elevated low-density lipoprotein cholesterol (LDL-C) levels (>130 mg/dL) were observed in 42.3% of cases, while reduced high-density lipoprotein cholesterol (HDL-C) levels (<40 mg/dL in men and <50 mg/dL in women) were identified in 36.5% of patients. Additionally, hypertriglyceridemia (>150 mg/dL) was present in 39.4% of cases, further supporting the role of dyslipidemia in atherosclerotic progression. Imaging and coronary angiographic findings demonstrated that 61.5% of patients had significant coronary artery stenosis (≥50% luminal narrowing), with multi-vessel disease observed in 45.2% of cases, indicating widespread atherosclerosis. Single-vessel disease was noted in 34.6% of patients, while left main coronary artery involvement was detected in 12.5% of cases, signifying a higher risk of adverse cardiovascular events. These findings reinforce the strong correlation between lipid abnormalities and the severity of coronary artery disease, underscoring the necessity of aggressive lipid-lowering interventions in high-risk patients.

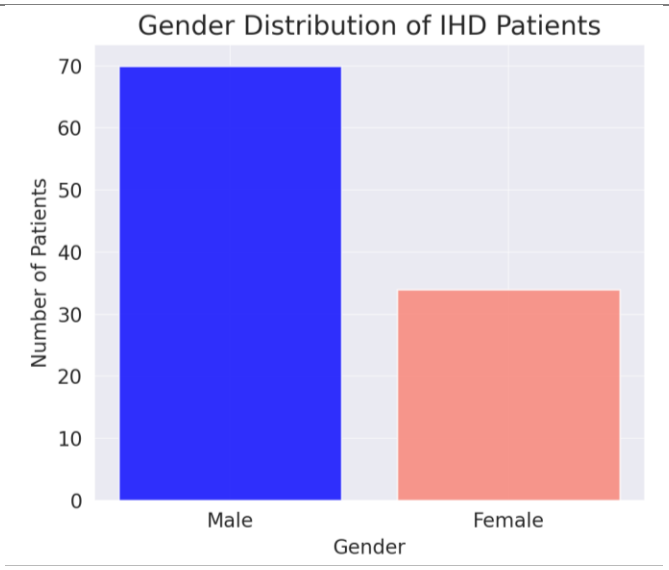
Table 1: Demographic Characteristics of Ischemic Heart Disease Patients

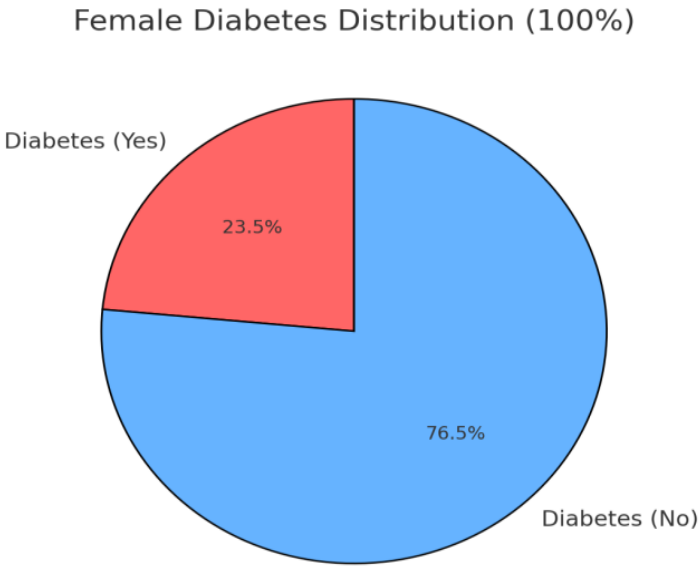
Variable	Category	Number of Patients (n=104)	Percentage (%)
Age Group (years)	35-45	6	5.6
	46-55	33	30.8
	56-65	37	34.6
	66-75	31	29.0
Gender	Male	70	67.3
	Female	34	32.7

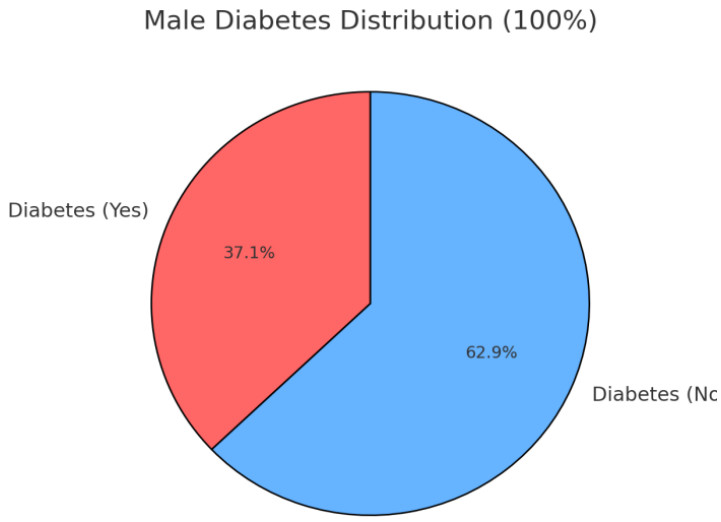
Table 2: ***Gender-Wise Distribution of Risk Factors in Ischemic Heart Disease Patients***

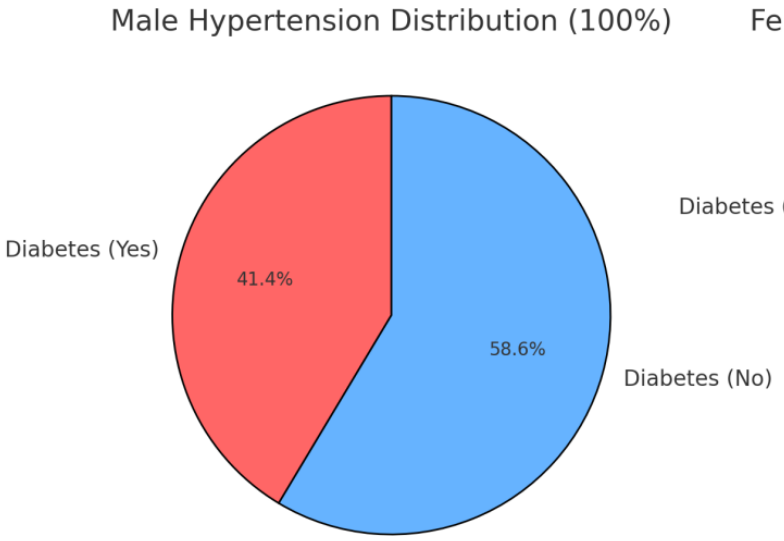
Risk Factor	Category	Male (n=70)	%	Female (n=34)	%	Total (n=104)	%	p-value
Diabetes Mellitus	Yes	26	37.1	8	23.5	34	32.7	0.165
	No	44	62.9	26	76.5	70	67.3	
Hypertension	Yes	29	41.4	12	35.3	41	39.4	0.548
	No	41	58.6	22	64.7	63	60.6	
Smoking	Yes	70	100.0	0	0.0	70	67.3	0.000
	No	0	0.0	34	100.0	34	32.7	
Dyslipidemia	Yes	32	45.7	8	23.5	40	38.5	0.029
	No	38	54.3	26	76.5	64	61.5	
Family History	Yes	35	50.0	12	35.3	47	45.2	0.157
	No	35	50.0	22	64.7	57	54.8	
Obesity	Yes	41	58.6	26	76.5	67	64.4	0.074
	No	29	41.4	8	23.5	37	35.6	
Sedentary Lifestyle	Yes	37	52.9	34	100.0	71	68.3	0.000
	No	33	47.1	0	0.0	33	31.7	

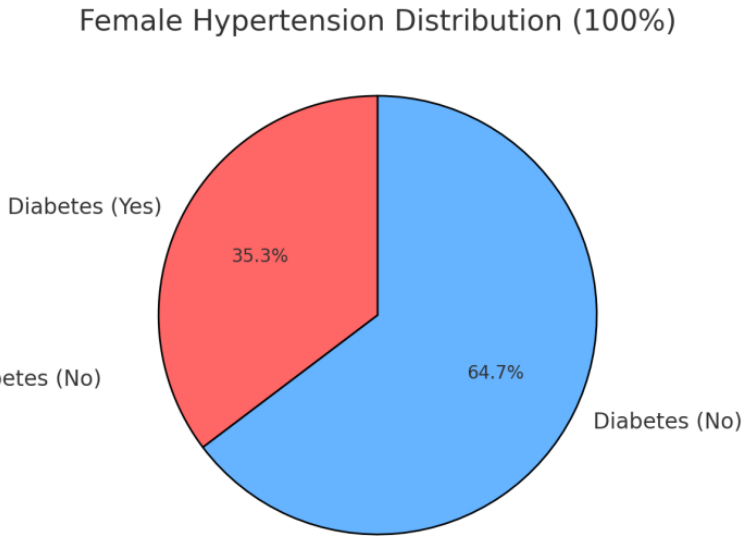


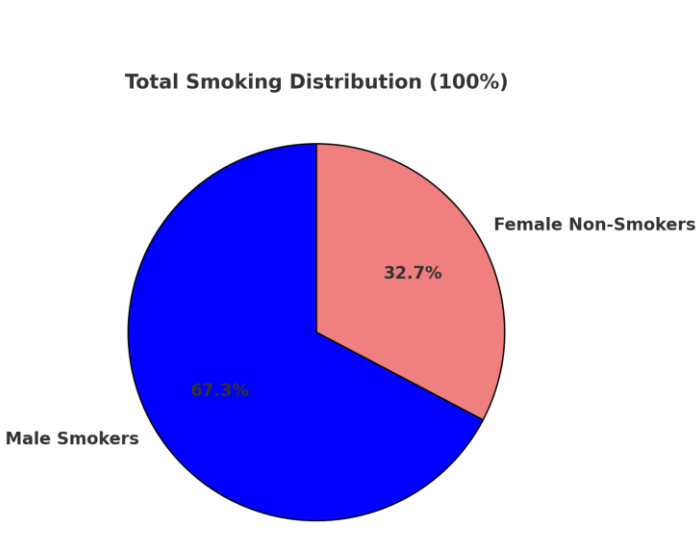


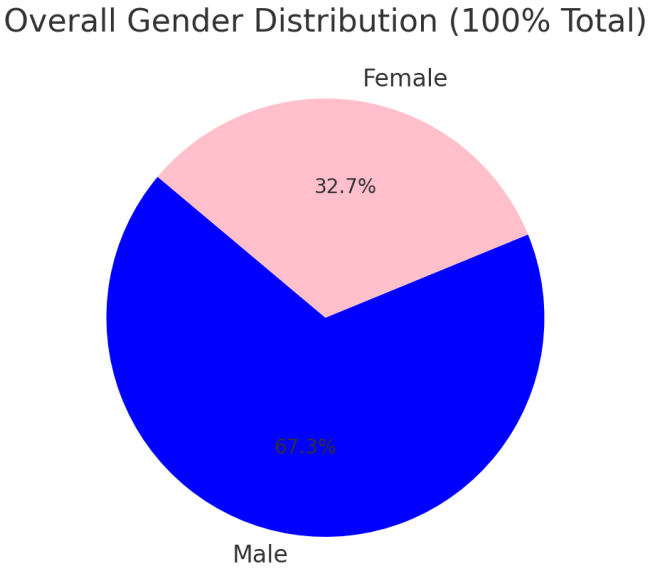


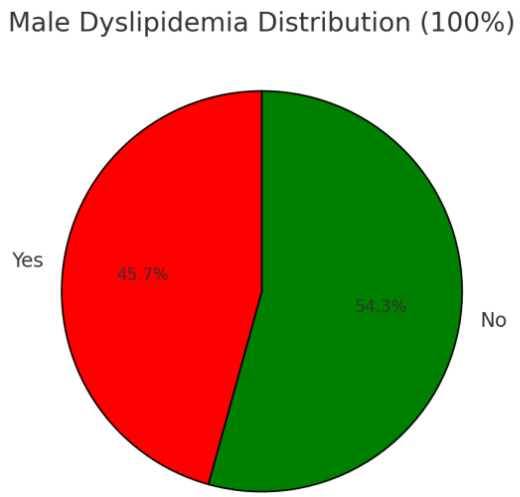


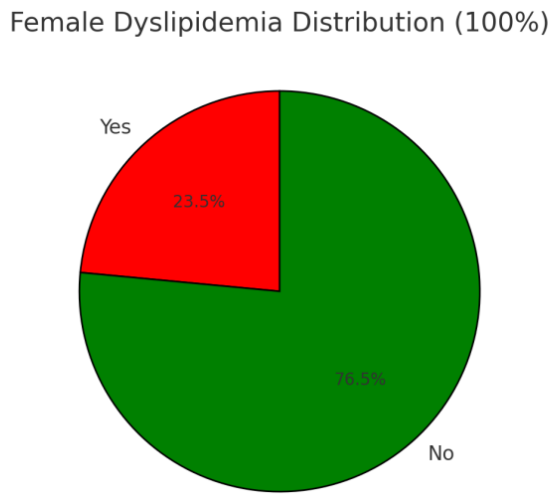


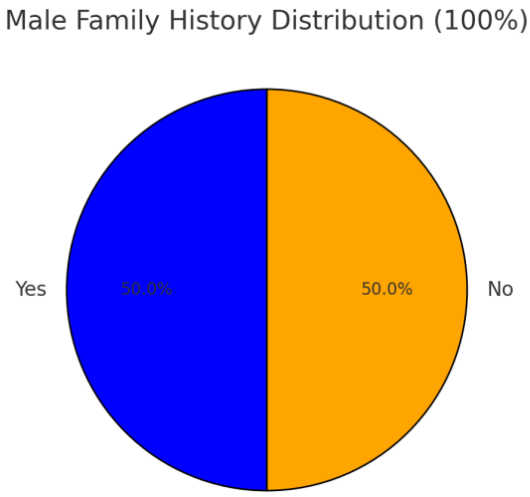


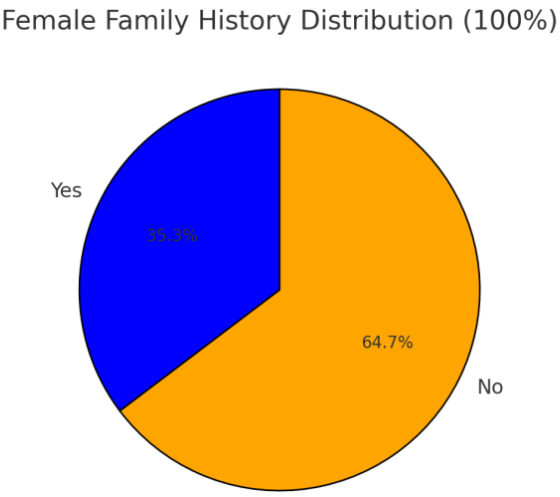


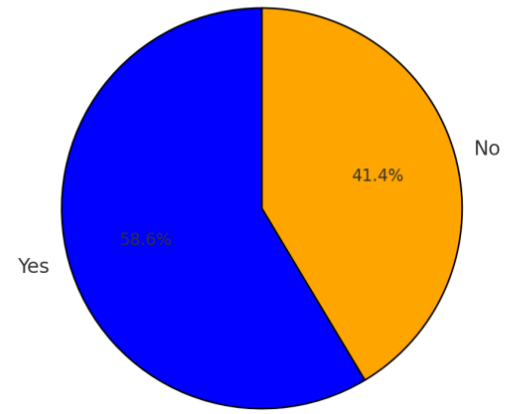


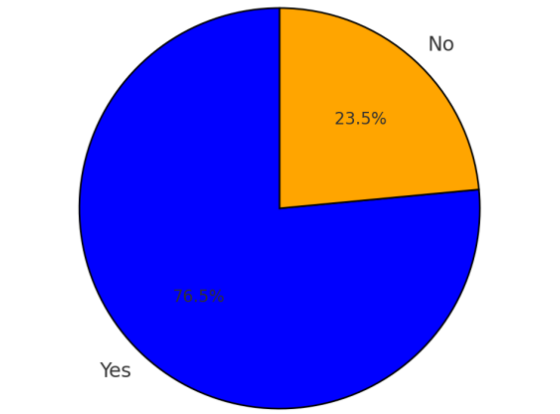












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DISCUSSION

Ischemic heart disease remains a leading cause of morbidity and mortality worldwide, with its prevalence continuing to rise due to a combination of lifestyle changes, demographic transitions, and increasing exposure to modifiable risk factors. The findings of this study reinforce the well-established association between hypertension, diabetes mellitus, smoking, dyslipidemia, obesity, physical inactivity, and family history with the occurrence and severity of ischemic heart disease. The demographic distribution of the study population demonstrated that the majority of IHD patients were middle-aged or older, with a higher prevalence in males. This aligns with existing evidence that advancing age contributes to progressive endothelial dysfunction, arterial stiffness, and cumulative atherosclerotic burden, all of which elevate cardiovascular risk. The male predominance observed is in accordance with epidemiological trends that attribute greater susceptibility in men to lower estrogen-mediated cardioprotective effects and a higher prevalence of behavioral risk factors, including smoking and occupational stress. However, recent global trends indicate an increasing burden of IHD in women, particularly postmenopausal individuals, due to rising rates of diabetes, obesity, and sedentary lifestyles (19-21). Hypertension emerged as a significant contributor to IHD, affecting 39.4% of the study population. Chronic elevations in blood pressure promote endothelial damage, increased arterial wall stress, and accelerated atherosclerosis, which are well-established pathways in the pathophysiology of coronary artery disease. The global burden of hypertension remains substantial, yet control rates have stagnated due to inadequate adherence to antihypertensive therapy, lack of regular screening, and suboptimal lifestyle modifications. While previous large-scale studies have demonstrated that effective blood pressure reduction significantly lowers cardiovascular morbidity and mortality, real-world implementation of aggressive hypertension management remains inadequate. This highlights the need for more robust public health initiatives emphasizing blood pressure monitoring and patient education (22,23).

Diabetes mellitus was present in 32.7% of patients, further substantiating its role as a major risk factor for coronary artery disease. The detrimental effects of chronic hyperglycemia on vascular integrity are well documented, with mechanisms including endothelial dysfunction, increased oxidative stress, and heightened systemic inflammation. Diabetic individuals exhibit a two- to four-fold greater risk of IHD than non-diabetic counterparts, with an increased likelihood of silent myocardial ischemia and poor cardiovascular outcomes despite optimal glycemic control. While stringent glucose regulation has been shown to reduce cardiovascular events, diabetes management alone is insufficient in mitigating overall risk. A comprehensive approach incorporating lipid-lowering therapies, blood pressure control, and lifestyle modifications remains imperative in reducing cardiovascular complications among diabetic populations (24-26). Smoking was observed in 67.3% of patients, reaffirming its role as one of the most potent modifiable risk factors for IHD. Tobacco use exacerbates atherosclerosis through oxidative stress, endothelial dysfunction, and pro-thrombotic mechanisms, significantly elevating the risk of myocardial infarction. The high prevalence of smokers among IHD patients underscores the necessity of targeted smoking cessation interventions. While previous research has demonstrated that quitting smoking results in rapid reductions in cardiovascular risk, global smoking rates remain high due to nicotine addiction and inadequate enforcement of tobacco control policies. The implementation of stricter anti-smoking regulations, increased taxation on tobacco products, and public health campaigns emphasizing the cardiovascular consequences of smoking cessation are critical in reducing IHD incidence (27,28).

Dyslipidemia was prevalent in 38.5% of patients, consistent with prior studies indicating that elevated LDL cholesterol and reduced HDL cholesterol contribute significantly to atherogenesis. Lipid abnormalities accelerate plaque formation, increasing the likelihood of coronary occlusion and adverse cardiovascular events. While statin therapy remains the cornerstone of lipid management, a substantial proportion of high-risk individuals continue to experience cardiovascular events due to residual risk associated with genetic lipid disorders, poor medication adherence, and suboptimal lipid-lowering therapy. Recent advancements, including PCSK9 inhibitors and novel lipid-modifying agents, offer additional therapeutic options for patients with persistent dyslipidemia despite optimal statin use. The findings of this study reinforce the necessity of routine lipid screening and aggressive lipid-lowering strategies to prevent disease progression in at-risk individuals (29,30). Obesity and sedentary lifestyles were highly prevalent, with 64.4% of patients classified as obese and 68.3% engaging in insufficient physical activity. Obesity is closely linked to multiple cardiovascular risk factors, including hypertension, insulin resistance, and dyslipidemia, thereby exacerbating the risk of coronary artery disease. Physical inactivity further compounds this risk by impairing endothelial function, reducing insulin sensitivity, and promoting systemic inflammation. The observed high prevalence of these lifestyle-related risk factors underscores the urgent need for structured public health interventions promoting weight reduction, dietary modifications, and increased physical activity. Evidence suggests that even modest weight loss and adherence to recommended exercise guidelines significantly reduce cardiovascular risk, reinforcing the importance of lifestyle interventions in preventing and managing IHD (31).

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Family history was a significant predictor of IHD, with 45.2% of patients reporting a positive familial history of the disease. Genetic predisposition plays a crucial role in cardiovascular risk stratification, with genome-wide association studies identifying multiple loci linked to coronary artery disease. While genetic risk cannot be modified, individuals with a strong family history should undergo early screening and aggressive risk factor modification to mitigate disease progression. Recent advancements in polygenic risk scoring offer potential for early identification of high-risk individuals, allowing for personalized preventive strategies aimed at delaying or preventing the onset of IHD (32). The study's strengths include its focus on a tertiary care population, allowing for a detailed evaluation of demographic and clinical characteristics in a high-risk cohort. The use of standardized diagnostic criteria for IHD and risk factor assessment enhances the reliability of findings. However, limitations exist, including the cross-sectional design, which precludes causal inference between risk factors and disease progression. Self-reported data on lifestyle factors such as smoking and physical activity may have introduced recall bias. Additionally, the study was conducted at a single center, limiting generalizability to broader populations. Future research should incorporate multicenter prospective studies with larger sample sizes to better understand temporal trends and causative relationships between risk factors and IHD development (12,18).

The findings of this study reinforce the multifactorial nature of ischemic heart disease, emphasizing the interplay between genetic predisposition and modifiable risk factors. While significant progress has been made in cardiovascular prevention and treatment, the persistent burden of IHD necessitates more aggressive risk factor modification strategies. Comprehensive public health initiatives targeting hypertension control, diabetes management, smoking cessation, lipid regulation, weight reduction, and physical activity promotion remain paramount in reducing the global impact of cardiovascular disease. Future research should focus on precision medicine approaches, integrating genetic risk assessment with individualized preventive strategies to optimize cardiovascular outcomes in high-risk populations.

CONCLUSION

This study highlights the significant role of modifiable risk factors in the development of ischemic heart disease, emphasizing hypertension, diabetes, smoking, dyslipidemia, obesity, and physical inactivity as key contributors. The findings align with global trends, reinforcing the urgent need for proactive cardiovascular prevention strategies. Strengthening public health initiatives, promoting lifestyle modifications, and enhancing healthcare interventions are essential to mitigating the burden of IHD. Future research should focus on precision medicine approaches, integrating pharmacological risk prediction, targeted therapies, and advanced imaging techniques for early diagnosis and risk assessment. A comprehensive, multidisciplinary approach that combines preventive strategies, clinical management, and policy-level interventions remains critical in reducing the long-term impact of ischemic heart disease on global health.

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