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FREQUENCY OF MYOCARDIAL INFARCTION IN DIABETIC AND HYPERTENSIVE PATIENT ABOVE THE AGE OF 40 YEAR

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Keywords

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Abstract

Background

Myocardial Infarction is a cardiac disorder that develops when blood supply to a section of the heart is interrupted, leading to damage the cardiac muscles due a lack of oxygen. This often happens because of a blood clot in the coronary arteries that supplies to the heart muscles or build of plaque within the arteries walls due to excessive levels of lipids in the blood, such as LDL (bad cholesterol) and triglycerides. All living tissue, including heart muscles, need an adequate blood flow to meet its oxygen needs.

Objectives: *To determine the frequency of myocardial infarction (MI) in patients with hypertension (HTN) and diabetes mellitus (DM).*

Methodology: *Cross sectional study was carried out in Rehman Medical Institute at cardiology department over a period of 06 months from June 2023 to November 2023. A sample of 328 patients of Myocardial infarction was collected through a self-structured questionnaire.*

Results

In 328 studied participants result showed that there were 188 male and 140 female. In our study 107 were diabetic who were diagnosed with myocardial infarction, 120 were hypertensive patients who were diagnosed with myocardial infarction and 101 were diagnosed for both diseases i.e., diabetes and Hypertension.

Among 328 patients 168(57%) patients were diagnosed with anterior myocardial infarction, 15 (4.6%) patients were diagnosed with posterior MI, 65 (19.8%) were diagnosed with Extensive MI and 80 (24%) patients were diagnosed with Inferior MI.

Conclusion*: We concluded in our study that hypertension is more common disease for the myocardial infarction as compared to diabetes. Our study also*

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concluded that male is much more suffered from myocardial infarction as compared to female.

INTRODUCTION

Myocardial infarction (MI), commonly known as a heart attack, is derived from the Latin term *infarctus myocardii*, meaning "necrosis of heart muscle." MI is a cardiovascular disorder that occurs when the blood supply to a portion of the heart is suddenly interrupted, leading to ischemic injury and subsequent damage to the cardiac muscle due to oxygen deprivation.[1] This condition most commonly results from thrombotic occlusion of the coronary arteries or from progressive atherosclerotic plaque formation within the arterial walls, which is associated with elevated levels of blood lipids such as low-density lipoprotein (LDL) cholesterol and triglycerides. All living tissues, including the myocardium, require an adequate blood supply to meet their oxygen demands, a balance referred to as the supply–demand ratio.[2]

Clinically, myocardial infarction presents with symptoms such as chest pain radiating to the left arm or neck, diaphoresis, dyspnea, nausea, vomiting, palpitations, and fatigue.[3] These symptoms are important indicators for early diagnosis and management.

Coronary artery disease (CAD) and myocardial infarction are among the leading contributors to the global burden of disease and are responsible for nearly one-third of all deaths worldwide. They also contribute significantly to morbidity, disability, and healthcare costs across both developed and developing countries. Despite major advancements in cardiology, cardiovascular diseases (CVDs) remain one of the leading causes of mortality globally.[4] It is estimated that annually more than 3 million individuals experience ST-segment elevation myocardial infarction (STEMI), while over 4 million suffer from non-ST-segment elevation myocardial infarction (NSTEMI).[5] Notably, the burden of MI is increasingly shifting toward developing countries.

Based on electrocardiographic (ECG) findings, myocardial infarction is broadly classified into two major types: ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI). STEMI is characterized by complete occlusion of a coronary artery leading to transmural myocardial ischemia and necrosis. It is identified by persistent ST-segment elevation on ECG, typically greater than 2 mm, along with clinical symptoms of chest pain.[6] STEMI is a medical emergency that requires immediate reperfusion therapy, most commonly through percutaneous coronary intervention (PCI), to restore blood flow to the affected myocardium.[7]

NSTEMI, on the other hand, occurs in the presence of elevated cardiac biomarkers such as troponins without persistent ST-segment elevation on ECG (except in posterior MI).[8] It is differentiated from unstable angina based on biochemical evidence of myocardial necrosis. Patients with NSTEMI present with a wide range of risk for early mortality (1%–10%) and recurrent infarction (3%–5%), with recurrent acute coronary syndrome (ACS) occurring in 5%–15% of cases.[9] Globally, more than 4 million cases of NSTEMI are reported annually.[9]

Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both.[10] It is a systemic disease that affects multiple organ systems, including the cardiovascular, nervous, immune, and gastrointestinal systems. Long-term complications of diabetes include peripheral neuropathy, diabetic foot ulcers, and in severe cases, limb amputation.[11]

Type 1 diabetes mellitus (T1DM) is an autoimmune condition characterized by destruction of pancreatic β-cells, leading to absolute insulin deficiency and hyperglycemia.[12] It commonly presents in children with symptoms such as polyuria, polydipsia, weight loss, and in some cases diabetic ketoacidosis. Genetic susceptibility, particularly HLA class II haplotypes (HLA-DR3-DQ2 and HLA-DR4-DQ8), plays a key role in disease development.[13]

Type 2 diabetes mellitus (T2DM) is the most prevalent form of diabetes worldwide and is primarily caused by insulin resistance and

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impaired insulin secretion.[14] T2DM significantly increases the risk of cardiovascular diseases, particularly coronary artery disease, by two- to three-fold compared to non-diabetic individuals. Dyslipidemia, characterized by elevated LDL cholesterol and triglycerides, contributes to vascular damage and accelerates atherosclerosis, thereby increasing the risk of myocardial infarction and cardiovascular mortality.[15]

Hypertension is another major modifiable risk factor for cardiovascular disease and is the leading preventable cause of morbidity and mortality worldwide.[20] It is defined as a persistent elevation in blood pressure that can lead to target organ damage if left untreated. According to ACC/AHA guidelines, normal blood pressure is defined as 120/80 mmHg, while hypertension is diagnosed when blood pressure exceeds 130/80 mmHg.[21] Chronic hypertension causes structural and functional changes in blood vessels, including reduced arterial elasticity, which impairs coronary blood flow and increases the risk of myocardial infarction.[22]

Globally, more than 1.13 billion people are affected by hypertension, with approximately two-thirds residing in low- and middle-income countries. It is responsible for an estimated 7.5 million deaths annually.[23] Hypertension is strongly associated with ischemic heart disease, stroke, and renal disorders. Stage 1 hypertension is defined as systolic blood pressure (SBP) of 130–139 mmHg or diastolic blood pressure (DBP) of 80–89 mmHg, while stage 2 hypertension is defined as SBP ≥140 mmHg or DBP ≥90 mmHg.[25] Severe or uncontrolled hypertension significantly increases the risk of myocardial infarction, stroke, and other cardiovascular complications.[26]

Multiple studies have demonstrated that hypertension and diabetes mellitus frequently coexist and synergistically increase the risk of coronary artery disease and myocardial infarction.[29] Approximately 31% to 59% of patients with acute myocardial infarction have a history of hypertension.[30] The pathophysiological link between hypertension and myocardial infarction involves endothelial dysfunction, atherosclerosis, insulin resistance, and activation of the renin-angiotensin-aldosterone system (RAAS), all of which contribute to vascular injury and cardiac ischemia.[30]

MATERIALS AND METHODS

3.1 Study design: Cross sectional study

3.2 Study setting: The study was carried out in Rehman medical Institute (RMI) Cardiology department.

3.3 Study duration

The duration of study was four months (from August to November 2023) for this cross-sectional study.

3.4 Sampling Technique: Non-probability sample technique.

3.4.1 Sample size: We calculate sample size using this formula ($n=P(1-P)\ z^2/\ e^2$) through open EPI calculator using (31%) of prevalence for both hypertensive and diabetic patients with comparison of myocardial infarction. "E" is margin of error taken as 5% and "Z" for confidence level of 95% is 1.96. Diabetic patients along with myocardial infarction was (32%)[15] and hypertensive patients along with myocardial infarction was (31%). [39]

A sample of 328 patients were selected at Rehman Medical Institute cardiology department (RMI).

3.5 SAMPLE SELECTION

3.5.1 Inclusion criteria

- Patients aged more than **40 years**
- Both **male and female** patients
- Patients with a confirmed diagnosis of **myocardial infarction**
- Patients with a known history of **diabetes mellitus**
- Patients with a known history of **hypertension**
- Patients having **both diabetes mellitus and hypertension**
- Patients admitted or treated in the **cardiology department** during the study period

3.5.2 Exclusion Criteria

Patients aged **below 40 years**

Patients without a confirmed diagnosis of **myocardial infarction**

Patients with **congenital heart diseases**

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Patients with **traumatic or non-ischemic causes of cardiac injury**

Patients with **chronic kidney disease, malignancy, or severe systemic illness** that may confound results

Patients who **refused to participate** or did not give consent**3.5.3 Data collection procedure**

- After receiving approval from the GSC Head of Department at a couple of hospitals, A permission was required to be granted by the ethical committee.
- Data were collected from the chosen patients using a self-structured questionnaire.

3.6 Data Analysis Procedure

I. Data analysis has been done via using SPSS v23.0

II. In this analysis procedure frequency tables and graphs were used to present the data. Categorical variables were compared using statistical tests and descriptive was calculated in comparison the rate of myocardial infarction between hypertensive and diabetic patients.

RESULTS

Figure 4.1: Frequency of gender in MI patients

Frequency of Gender in MI patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	188	57.3	57.3	57.3
	Female	140	42.7	42.7	100.0
	Total	328	100.0	100.0	

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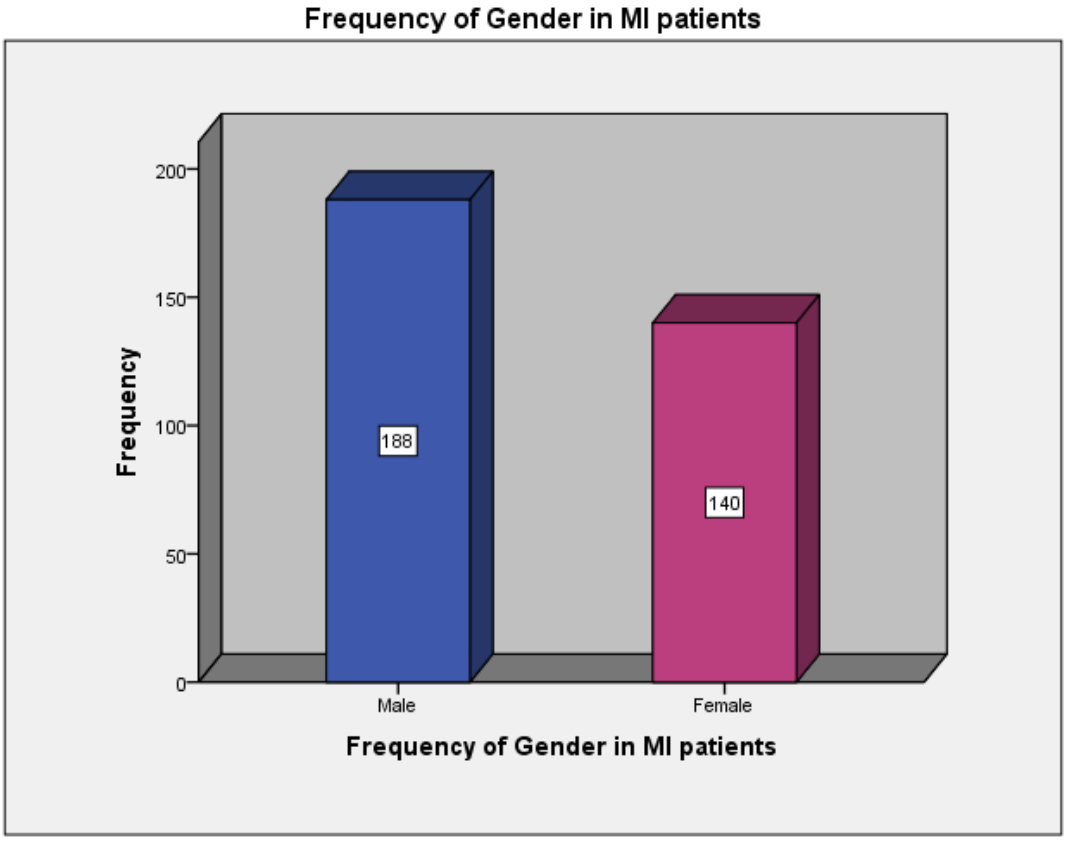


Figure 4.1 Shows the frequency of gender in MI patients. Out of 328 patients 188 (57.3%) was male and 140 (42.7 %) was female.

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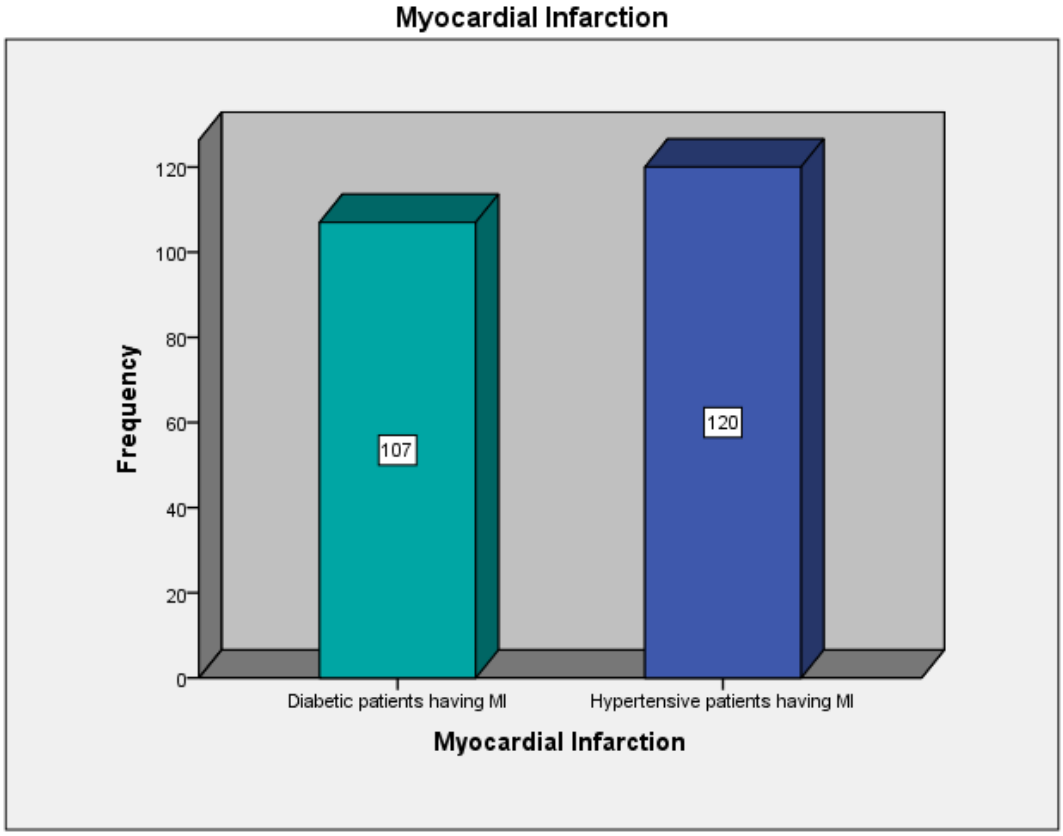


Figure 4.2 Frequency of Myocardial Infarction in DM and HTN patients

Myocardial Infarction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diabetic patients having MI	107	32.6	47.1	47.1
	Hypertensive patients having MI	120	36.6	52.9	100.0
	Total	227	69.2	100.0	
Missing	System	101	30.8		
Total		328	100.0		

Figure 4.2 Shows the frequency of myocardial infarction in diabetic patients and hypertensive patients. Out of (328) 107 (32.5%) patients were diabetic who wasdiagnosed with MI and 120 (36.6%) were hypertensive patients who was diagnosed with MI.

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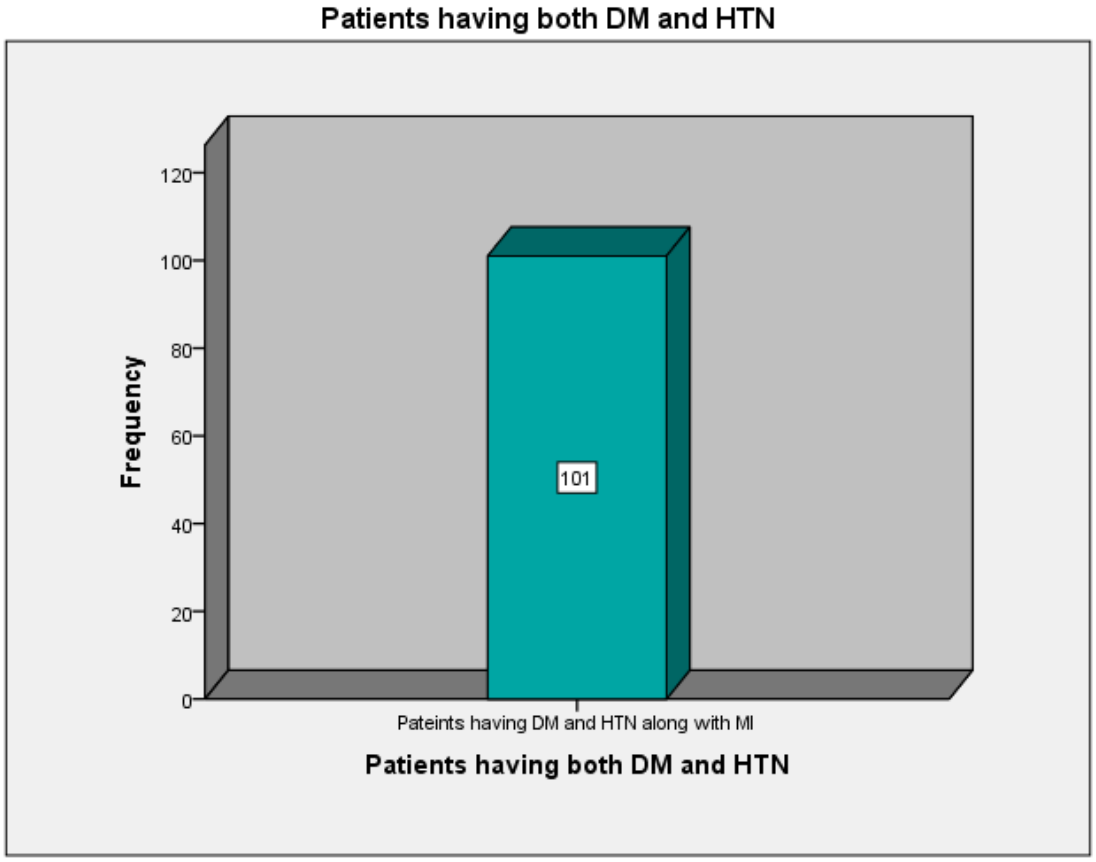


Figure 4.3 Frequency of Patients having both Diabetic Mellitus and Hypertension

Patients having both DM and HTN

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Patients having DM and HTN along with MI	101	30.8	100.0	100.0
Missing	System	227	69.2		
Total		328	100.0		

Figure 4.3 Shows that patients who were affected from both DM and HTN along with MI was 101 (30.8%) out of 328

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Anterior MI	168	51.2	51.2	51.2
	Posterior MI	15	4.6	4.6	55.8
	Extensive MI	65	19.8	19.8	75.6
	Inferior MI	80	24.4	24.4	100.0
	Total	328	100.0	100.0	

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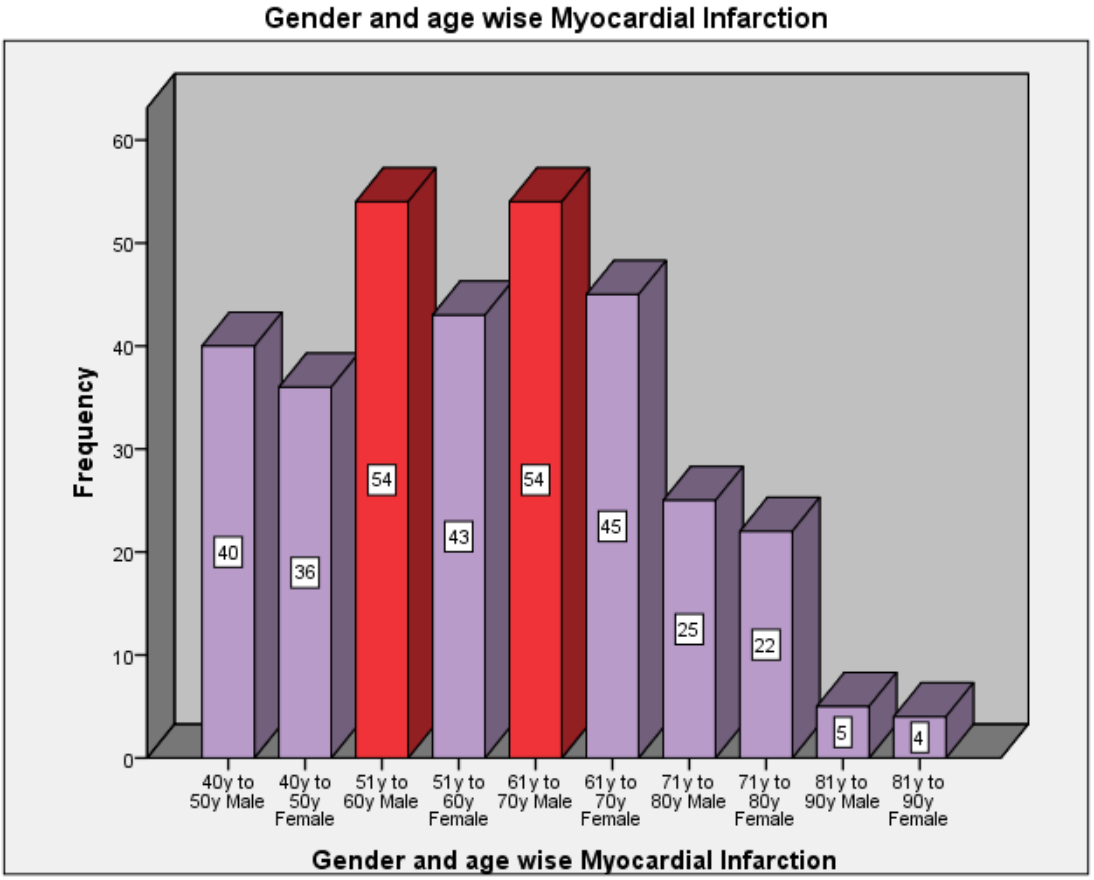


Figure 4.4 Frequency of MI according to Gender and Age

Types of Myocardial Infarction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Anterior MI	168	51.2	51.2	51.2
	Posterior MI	15	4.6	4.6	55.8
	Extensive MI	65	19.8	19.8	75.6
	Inferior MI	80	24.4	24.4	100.0
	Total	328	100.0	100.0	

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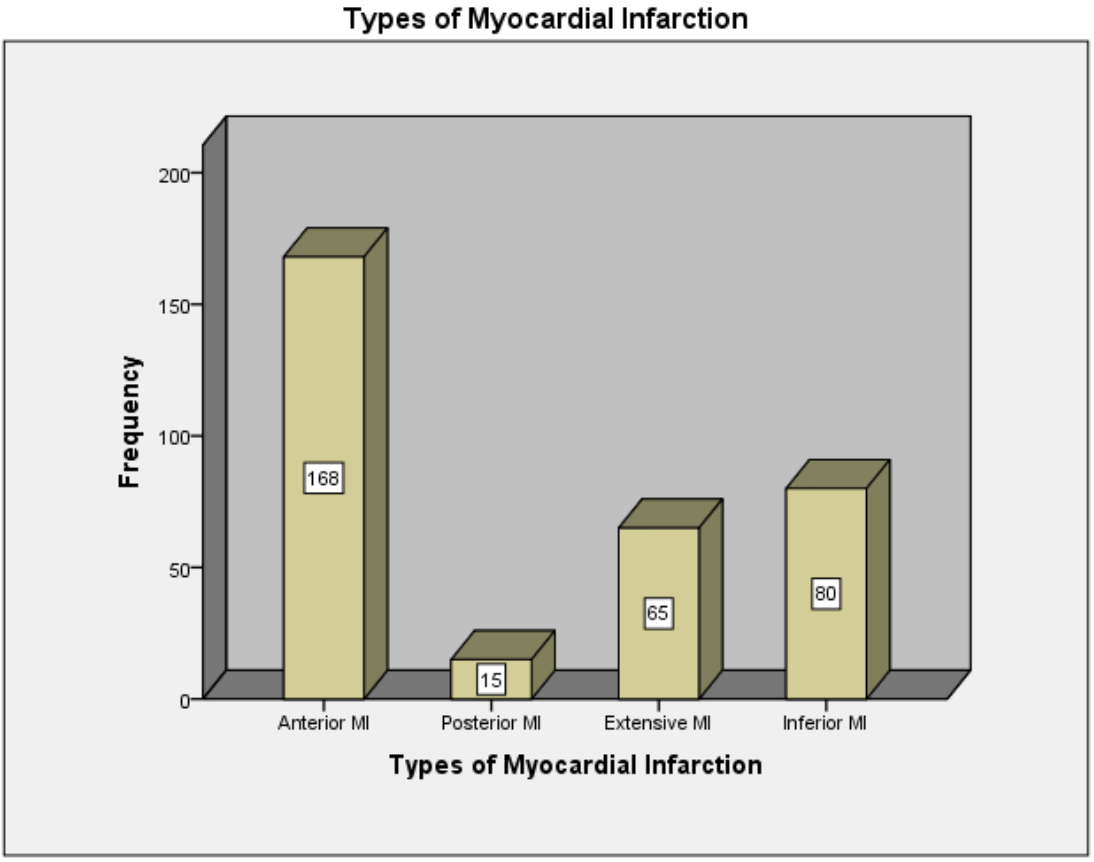


Figure 4.5 Frequency of Myocardial Infarction Types

Figure 4.7 Shows the frequency of types of myocardial Infarction. Out of 328 patients 168 (51%) were diagnosed with anterior MI, 15 (4.6%) patients were diagnosed with posterior MI, 65 (19.8%) were diagnosed with Extensive MI and 80 (24%) patients were diagnosed with Inferior MI.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Anterior MI	168	51.2	51.2	51.2
	Posterior MI	15	4.6	4.6	55.8
	Extensive MI	65	19.8	19.8	75.6
	Inferior MI	80	24.4	24.4	100.0
	Total	328	100.0	100.0	

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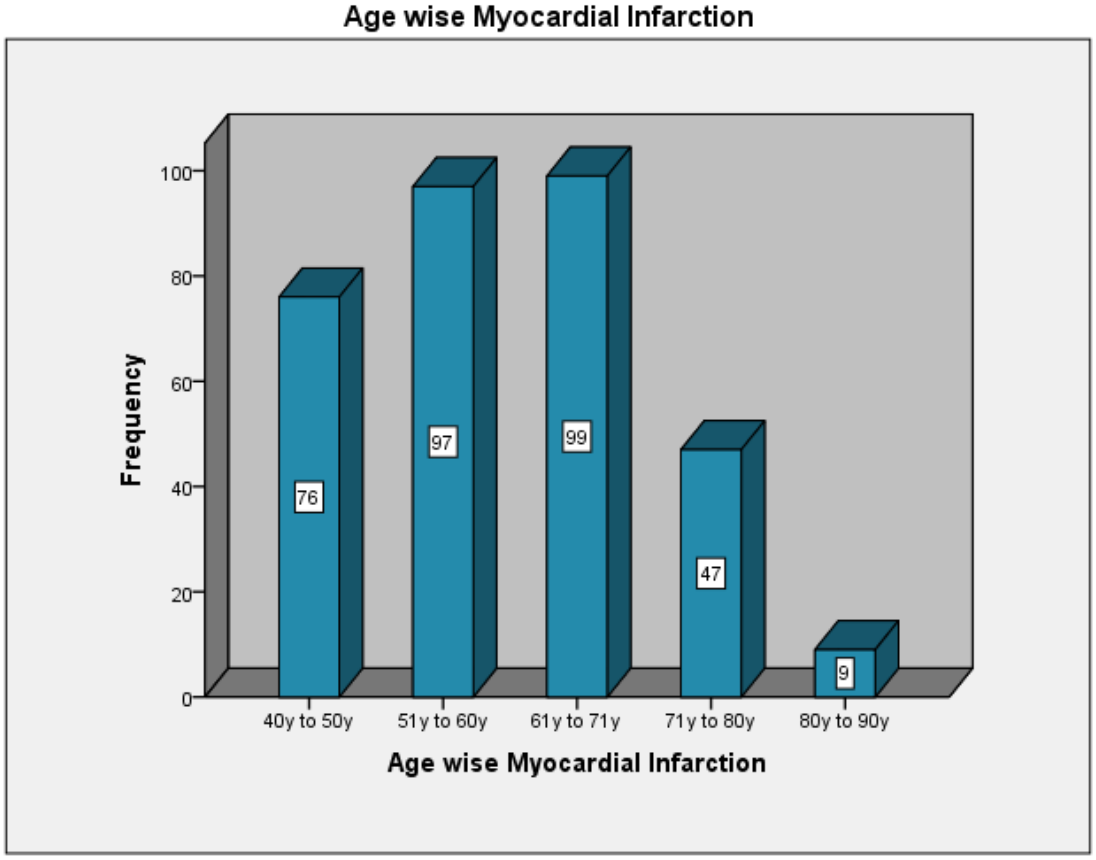


Figure 4.6 Frequency of Myocardial Infarction according to age

DISCUSSIONS

Myocardial infarction (MI) remains one of the leading causes of morbidity and mortality worldwide, particularly among patients with established cardiovascular risk factors such as diabetes mellitus (DM) and hypertension (HTN). The present study was conducted to determine the frequency of MI among patients with DM, HTN, or both, in individuals aged 40 years and above. The findings of this study highlight a strong association between these comorbid conditions and the occurrence of myocardial infarction, with hypertension emerging as a more prevalent risk factor compared to diabetes mellitus.

In the current study, a higher proportion of patients with MI had a history of hypertension (120 patients) compared to those with diabetes mellitus (107 patients). Additionally, 101 patients had both conditions simultaneously, indicating that the coexistence of DM and HTN may further increase the risk of developing myocardial infarction. These findings are consistent with existing literature, which suggests that hypertension plays a central role in the pathogenesis of coronary artery disease by promoting endothelial dysfunction, accelerating atherosclerosis, and increasing cardiac workload. Similarly, diabetes mellitus contributes to cardiovascular complications through mechanisms such as chronic hyperglycemia, oxidative stress, and dyslipidemia, all of which promote vascular damage.

The present study also demonstrated a higher incidence of myocardial infarction in males compared to females, with 188 male and 140 female patients affected. This gender disparity is in agreement with previous studies, which have reported that males are at a higher risk of developing MI, particularly at younger ages. This may be attributed to protective effects of estrogen in premenopausal females, as well as differences in

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lifestyle factors such as smoking, physical activity, and healthcare-seeking behavior.

Regarding the type of myocardial infarction, anterior MI was the most frequently observed (51.2%), followed by inferior MI (24.4%), extensive MI (19.8%), and posterior MI (4.6%). The higher prevalence of anterior MI may be explained by the fact that the left anterior descending (LAD) artery supplies a large portion of the myocardium, and its occlusion often results in more clinically significant infarctions. These findings are consistent with previous studies that have also reported anterior wall involvement as the most common site of infarction.

The inclusion of patients aged 40 years and above in this study reflects the increased risk of cardiovascular disease with advancing age. Age-related vascular changes, along with the cumulative effect of risk factors such as HTN and DM, significantly contribute to the development of coronary artery disease. The strict inclusion and exclusion criteria ensured that confounding factors such as congenital heart disease, traumatic cardiac injury, and severe systemic illnesses were minimized, thereby improving the reliability of the results.

Overall, the findings of this study emphasize the strong relationship between hypertension, diabetes mellitus, and myocardial infarction. The results suggest that hypertension is a more dominant risk factor in the studied population, although the combination of both conditions significantly increases the risk of MI. Early identification and strict control of these risk factors are essential in reducing the burden of myocardial infarction.

CONCLUSION

This study concludes that both hypertension and diabetes mellitus are important and significant risk factors for myocardial infarction, with hypertension being the more prevalent contributing factor in the studied population. The coexistence of both conditions further increases the risk and severity of myocardial infarction, indicating a compounded effect on cardiovascular health. Additionally, the findings show that males and individuals aged 40 years and above are more commonly affected by myocardial infarction compared to other groups. These results highlight the importance of early screening, timely diagnosis, and effective management of hypertension and diabetes mellitus. Furthermore, lifestyle modifications such as a healthy diet, regular physical activity, weight control, and smoking cessation play a crucial role in reducing the overall burden of myocardial infarction and improving patient outcomes.

RECOMMENDATION

Myocardial Infarction is the leading cause of death worldwide. Those people who have Myocardial Infarction should consult with cardiac physician. If MI is diagnosed that should be improved by medication and Intervention procedure such as PCI.

There should be arranging some seminars to aware the people about myocardial infarction, its symptom, management and risk factors such as diabetes, hypertension

7. LIMITAIONS

We have some limitations in our study due to lack of enough time and resources one of them is myocardial infarction among all age groups. Another limitation is the lifestyle of patient that the patient taking good food, having exercise daily or other lifestyle changes that doctor recommend to them.

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