Relative Frequency and Classification of Myocardial Infarction in Smokers and Non-Smokers: Evidence from Peshawar Tertiary Care Hospitals

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Original Research Article

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ABSTRACT

Background: Infarction or acute myocardial infarction (AMI), commonly known as a heart attack occurs when blood flow to be a part of the heart is obstructed, resulting in damage to the heart muscle. The most common symptoms are chest pain or discomfort, which may radiate to the shoulder, arm, back, neck or jaw. The pain is often located in the centre or left side of the chest and may persist for several minutes. The discomfort may irregularly touch like heartburn. Other symptoms may include shortness of breath, nausea, faint, cold sweat or feeling tired.

Objective: The main objective of the study is to determine the frequency and type of MI among smokers and non-smokers in tertiary care hospitals of Peshawar.

Methodology: A descriptive cross-sectional study was conducted in the cardiology departments of tertiary care hospitals of Peshawar. The sample size calculated was 200. Primary data were collected, and records of 200 patients meeting the inclusion criteria were analysed. Data related to age, height, weight, MI, smokers and non-smokers were obtained.

Results: The mean age of the study participants was 58.63 years with standard deviation of 13. 372. Smoking status of the research participants 41.00% were smokers and 59.00% were non-smokers. Location wise distribution of type of

MI of the research participants such as 55% in anterior wall, 23% in posterior wall, 13% in lateral wall, 37% in extensive anterior wall, 43% in inferior wall, 2% in anterior lateral wall, and 25% in non-STEMI.

Conclusion: From our Descriptive Cross Sectional study, we conclude that frequency and type of myocardial infarction among non-smokers were high (59.00%) as compared to smokers (41.00%). We also conclude that among types of MI percentage of STEMI was high (86.50%) compared to NON-STEMI (13.50%).

Keywords: Myocardial Infarction, Acute Myocardial Infarction (AMI), STEMI, Non-STEMI, Smokers, Non-Smokers, Coronary Artery Disease, Tertiary Care Hospitals, Peshawar, Cardiovascular Risk Factors

1. INTRODUCTION

Heart disease, also referred to as cardiovascular disease (CVD), encompasses a range of conditions that impair heart function, primarily through abnormalities in the blood vessels that may lead to myocardial infarction (heart attack) [1]. Heart diseases can be broadly categorized into congenital and acquired forms. Congenital heart disease (CHD) arises from structural or functional defects present at birth, affecting approximately 1.35 million children worldwide annually. Its prevalence varies by region, with 8.1 per 1,000 live births in North America and 9.3 per 1,000 in Asia [2]. While the etiology of CHD is often unclear, it may be hereditary or influenced by environmental factors such as maternal alcohol use, exposure to toxins, medications, or infections during pregnancy. Acquired heart diseases develop after birth and include coronary artery disease, hypertensive heart disease, valvular heart disease, cerebrovascular disease, peripheral vascular disease, and cardiac arrhythmias.

Globally, cardiovascular diseases remain the leading cause of mortality, accounting for nearly 30% of all deaths [3]. Coronary heart disease (CHD) is particularly significant, causing millions of deaths annually in both developed and developing countries, including Pakistan and India. Despite this high burden, region-specific data on the epidemiology and risk factors of myocardial infarction remain limited, especially regarding variations among smokers and non-smokers.

The significance of this study lies in its potential to enhance understanding of the distribution, type, and severity of myocardial infarction in a tertiary care hospital

setting, providing evidence to inform clinical practice and public health interventions. The research gap addressed is the lack of comparative data on the relative frequency and location of MI among smokers and non-smokers in Pakistan.

This study aims to determine the relative frequency of various forms of myocardial infarction, categorized by type and location, among smokers and non-smokers admitted to tertiary care hospitals in Peshawar, KPK.

2. BACKGROUND

Myocardial infarction (MI), commonly known as a heart attack, is characterized by irreversible necrosis of the myocardium due to prolonged ischemia caused by obstruction of a coronary artery [7]. The pathophysiology involves rupture of a coronary artery plaque, leading to thrombus formation and impaired blood flow. The subendocardial region is typically affected first, and tissue death may occur within 15–30 minutes of ischemia, potentially progressing to full-thickness transmural infarction [8,9,10].

MI is classified into two major types:

- ST-elevation myocardial infarction (STEMI) – indicated by ST-segment elevation on ECG; associated with complete arterial occlusion and significant myocardial damage. STEMI is further categorized based on the affected wall: anterior, inferior, posterior, and lateral [11,12,13].
- Non-ST-elevation myocardial infarction (NSTEMI) – characterized by partial arterial occlusion and less extensive myocardial damage.

Risk factors for MI include modifiable factors such as hypertension, diabetes, smoking, physical inactivity, and hyperlipidemia, as well as non-modifiable factors like age, gender, ethnicity, and genetic predisposition [6]. Coronary artery disease, the primary underlying cause of MI, leads to significant morbidity and mortality worldwide. In 2016, approximately 15.5 million individuals in the USA over age 25 were affected, with a mortality rate of 102.6 per 100,000 population [4,5].

Clinical relevance: Understanding the type, location, and risk profile of MI is crucial for timely diagnosis, intervention, and improving patient outcomes. Regional differences in MI prevalence, presentation, and outcomes underscore

the need for localized studies, particularly in developing countries where data remain scarce.

3. MATERIALS AND METHODS

3.1. Study Design

A descriptive cross-sectional study was conducted to investigate the targeted research objectives.

3.2. Study Setting and Target Population

The study was carried out in the Cardiology Departments of government tertiary care hospitals in Peshawar. The target population included patients from all age groups admitted to these departments.

3.3. Sampling Technique

A convenience sampling method was employed to select participants for the study. Patients from all age groups meeting the inclusion criteria were considered.

3.4. Sample Size Calculation

The required sample size was calculated using the World Health Organization (WHO) sample size calculator, resulting in a recommended size of 180 participants. Based on the guidance of the supervising authority, a total of 200 participants were recruited.

3.5. Study Duration

The study was conducted over a period of approximately four months, from February to May 2018.

3.6. Inclusion Criteria

Adult patients diagnosed with myocardial infarction were included in the study.

3.7. Exclusion Criteria

- Patients with terminal heart disease
- Patients using any addictive substances

3.8. Ethical Considerations and Informed Consent

All ethical issues related to the study were discussed with the responsible hospital authorities. Various aspects of the research were evaluated to ensure confidentiality and privacy of participants. After reviewing the measures and ethical considerations, the hospital granted permission to conduct the study.

3.9. Data Collection Procedure

Data were collected using a pre-designed data collection form (performa), ensuring uniformity and completeness of information.

3.10. Statistical Analysis

Data analysis was performed using SPSS version 23. Descriptive statistics, including frequencies and graphs, were computed. Inferential analysis was conducted using the Chi-square test to determine associations between categorical variables.

4. RESULTS

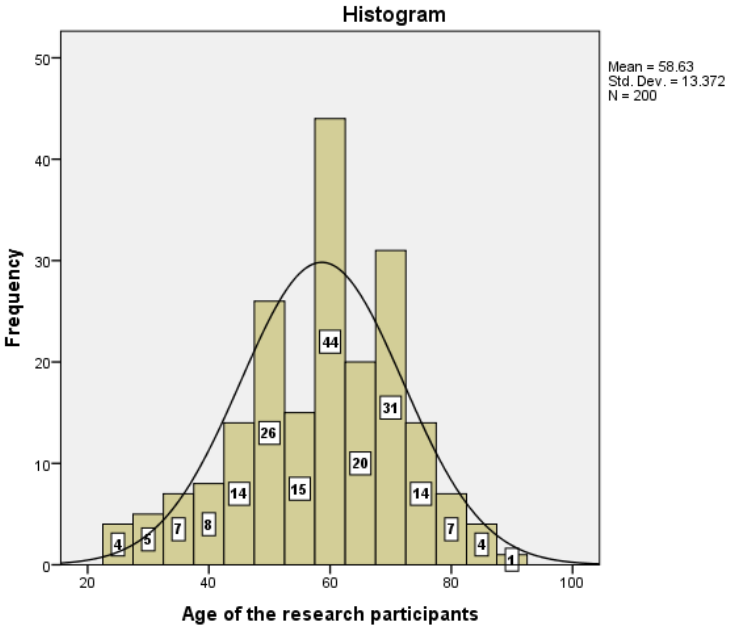
Table 1: Descriptive Statistics (Age of the Research Participants)

N	**Valid**	200
	Missing	0
Mean		58.63
Median		60.00
Mode		60
Std. Deviation		13.372

Source: Author's own calculations.

Table 1 presents the descriptive statistics for the age of the 200 study participants. The mean age was 58.63 years, with a median and mode of 60 years, indicating a slightly left-skewed distribution around older adults. The standard deviation of 13.37 suggests moderate variability in age, reflecting a diverse age range among the participants. No data were missing for this variable.

Figure 1: Age Wise Distribution of Research Participants



Source: Author's own.

Figure 1 illustrates the age-wise distribution of the 200 research participants. The mean age was 58.63 years, with a standard deviation of 13.37, indicating that most participants were middle-aged to older adults, with moderate variation in age across the sample. The distribution suggests a concentration of participants around the ages 55–65 years.

Table 2: Descriptive Statistics (Smoking Status)

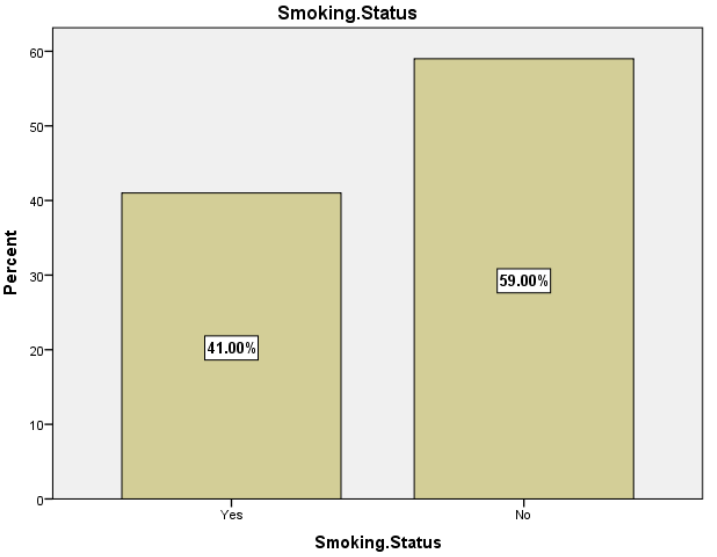
N	**Valid**	200
	Missing	0
Std. Deviation		0.493

Source: Author's own calculations.

The descriptive statistics for smoking status indicate that all 200 participants have valid data (no missing values). The standard deviation of 0.493 reflects the variability in smoking status, which is a binary variable (smoker vs. non-smoker).

Since binary variables coded as 0 and 1 have a maximum possible standard deviation of 0.5 when the categories are evenly split, a standard deviation of 0.493 suggests that the sample is nearly balanced between smokers and non-smokers, consistent with the reported frequencies of 41% smokers and 59% non-smokers. This indicates moderate variability in smoking status, which is appropriate for analysis.

Figure 2: Smoking Status of Research Participants



Source: Author's own.

Figure 2 illustrates smoking status of the research participants. (41.00%) were smokers and (59.00%) were non-smokers.

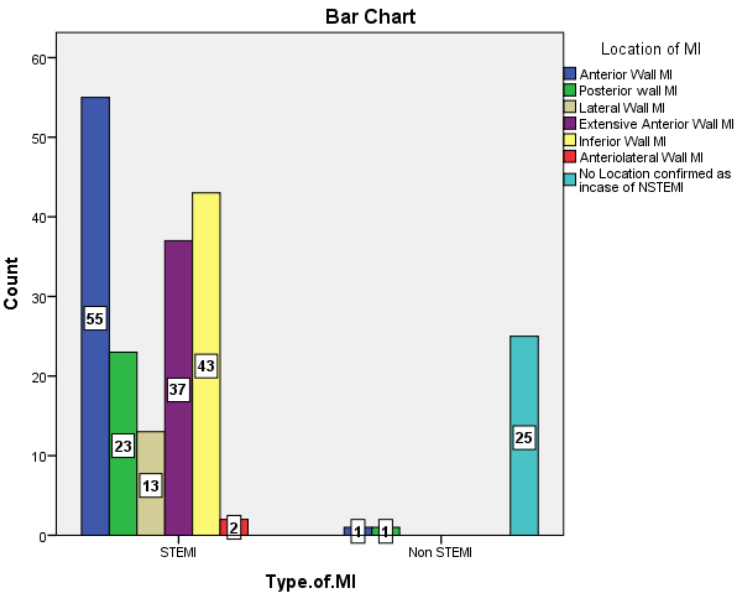
Table 3: Frequency of Type of MI

Type of MI * Location of MI Cross Tabulation									
		Location of MI							Total
		Anterior Wall MI	Posterior wall MI	Lateral Wall MI	Extensive Anterior Wall MI	Inferior Wall MI	Anterolateral Wall MI	No Location confirmed as in case of NSTEMI	
Type of MI	STEMI	55	23	13	37	43	2	0	173
	Non-STEMI	1	1	0	0	0	0	25	27
Total		56	24	13	37	43	2	25	200

Source: Author's own calculations.

Table 3 presents the cross-tabulation of the type and anatomical location of myocardial infarction among the study participants. Out of 200 patients, the majority experienced STEMI (n = 173; 86.5%), while non-STEMI accounted for 27 cases (13.5%). Among STEMI patients, the most frequently affected location was the anterior wall (n = 55), followed by the inferior wall (n = 43) and extensive anterior wall (n = 37). Posterior wall (n = 23), lateral wall (n = 13), and anterolateral wall (n = 2) involvement were comparatively less common. All non-STEMI cases (n = 25) were classified without a confirmed anatomical location, as expected clinically. Overall, anterior wall involvement emerged as the predominant MI location in this cohort.

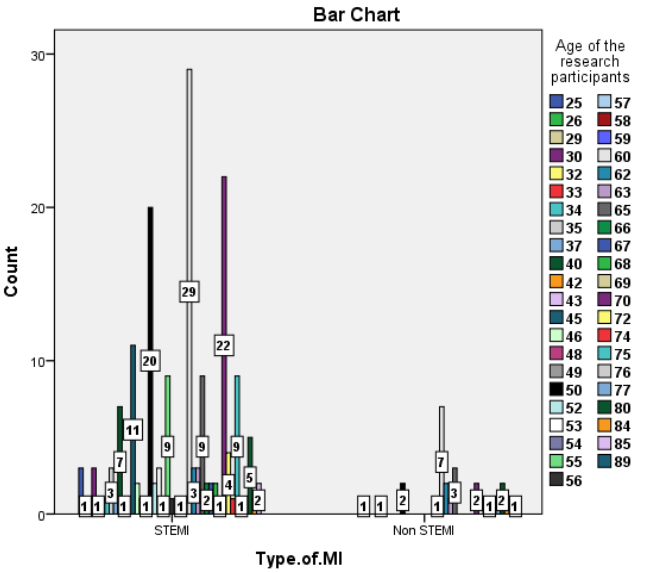
Figure 3: Location wise Distribution of Type of MI



Source: Author's own.

Figure 3 shows frequency of type of MI of the research participants. The above figure shows location wise distribution of type of MI of the research participants such as (55%) in anterior wall (23%) in posterior wall, (13%) in lateral wall, (37%) in extensive anterior wall, (43%) in inferior wall, (2%) in anterio lateral wall and (25%) in NON- STEMI.

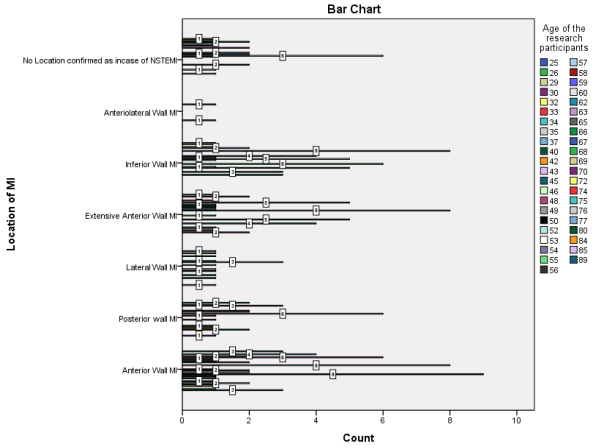
Figure 4: Age wise Distribution of Type of MI



Source: Author's own.

Figure 4 illustrates the age-wise distribution of different types of myocardial infarction among the study participants. The findings indicate that STEMI was more prevalent across all age groups, particularly among individuals aged 50 years and above, whereas non-STEMI cases were comparatively fewer and predominantly observed in older age groups. This pattern suggests an increased burden of severe myocardial infarction with advancing age.

Figure 5: Age wise Distribution of Location of MI



Source: Author's own.

Figure 5 depicts the age-wise distribution of myocardial infarction according to anatomical location among the research participants. The figure demonstrates that anterior wall and inferior wall myocardial infarctions were most common across all age groups, with a higher concentration observed among individuals aged 50 years and above. Less frequent involvement of the posterior, lateral, and anterolateral walls was noted across the age strata, indicating variation in MI location with advancing age.

Table 4: Type.of.MI * Smoking. Status Cross Tabulation

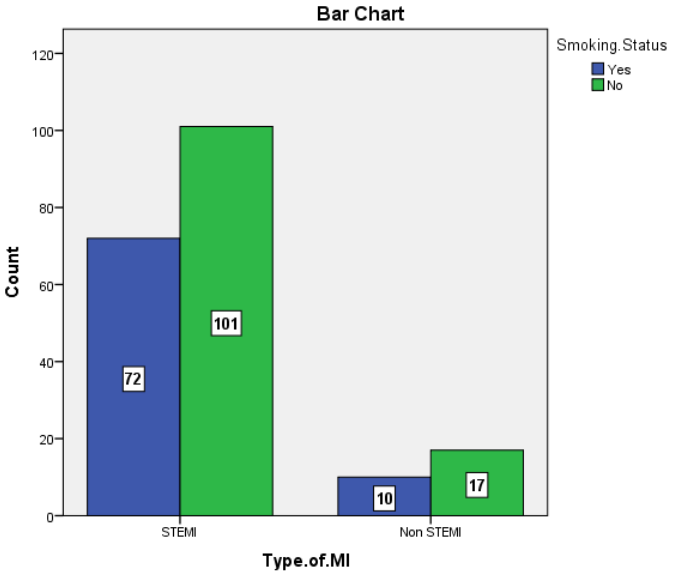
		Smoking. Status		Total
		Yes	No	
Type.of.MI	STEMI	72	101	173
	Non-STEMI	10	17	27
Total		82	118	200

Source: Author's own calculations.

Table 4 shows the cross-tabulation between type of myocardial infarction and smoking status among the study participants. Of the 173 patients diagnosed with STEMI, 72 (41.6%) were smokers and 101 (58.4%) were non-smokers. Similarly, among non-STEMI cases (n = 27), 10 patients (37.0%) were smokers, while 17 (63.0%) were non-smokers. Overall, myocardial infarction was more frequently

observed among non-smokers (59.0%) compared to smokers (41.0%), with STEMI being the predominant type in both groups.

Figure 6: Smoking Status wise Distribution of Type of MI



Source: Author's own.

Figure 6 illustrates the distribution of myocardial infarction types according to smoking status. Among patients with STEMI, 72 cases (41.6%) were smokers, while 101 cases (58.4%) were non-smokers. In contrast, among non-STEMI patients, 10 cases (37.0%) were smokers, and 17 cases (63.0%) were non-smokers. Overall, both STEMI and Non-STEMI were more frequently observed among non-smokers, with STEMI remaining the predominant type of myocardial infarction in both smoking categories.

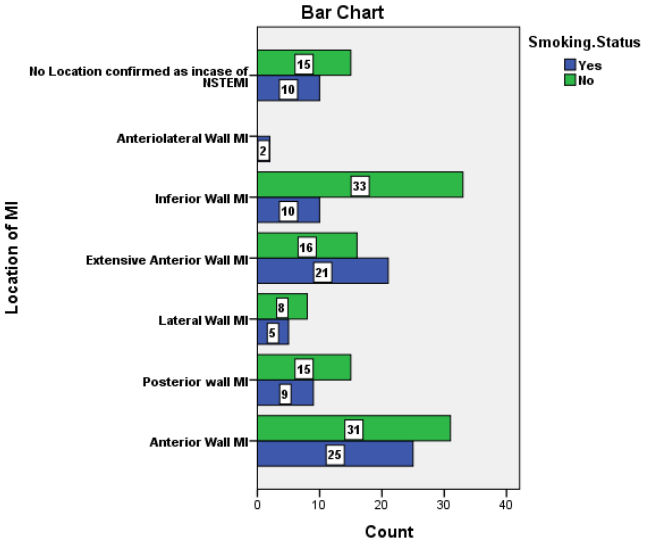
Table 5: Location of MI * Smoking Status Cross Tabulation

		Smoking. Status		Total
		Yes	No	
Location of MI	Anterior Wall MI	25	31	56
	Posterior wall MI	9	15	24
	Lateral Wall MI	5	8	13
	Extensive Anterior Wall MI	21	16	37
	Inferior Wall MI	10	33	43
	Anteriolateral Wall MI	2	0	2
	No Location confirmed as in case of NSTEMI	10	15	25
Total		82	118	200

Source: Author's own calculations.

Table 5 presents the cross-tabulation between the anatomical location of myocardial infarction and smoking status. Among smokers, the most frequently observed locations were anterior wall MI (n = 25) and extensive anterior wall MI (n = 21), followed by inferior wall MI (n = 10). In contrast, among non-smokers, inferior wall MI (n = 33) and anterior wall MI (n = 31) were the most prevalent. Posterior and lateral wall involvement was comparatively less common in both groups. All cases classified as non-STEMI (n = 25) showed no confirmed anatomical location, with a higher proportion observed among non-smokers. Overall, variations in MI location were evident across smoking categories, with anterior and inferior wall involvement predominating.

Figure 7: Smoking Status wise Distribution of Location of MI



Source: Author's own.

Figure 7 illustrates the distribution of myocardial infarction locations according to smoking status. Among non-STEMI cases, 15 patients (7.5%) were non-smokers, and 10 patients (5.0%) were smokers. For anterolateral wall MI, all cases (n = 2; 1.0%) were observed among smokers. Inferior wall MI was more prevalent among non-smokers (n = 33; 16.5%) compared to smokers (n = 10; 5.0%). In contrast, extensive anterior wall MI was more common among smokers (n = 21; 10.5%) than non-smokers (n = 16; 8.0%).

Similarly, anterior wall MI was frequently observed in both groups, with a higher frequency among non-smokers (n = 31; 15.5%) compared to smokers (n = 25; 12.5%). Overall, anterior and inferior wall involvement predominated across both smoking categories, with notable variation in MI location by smoking status.

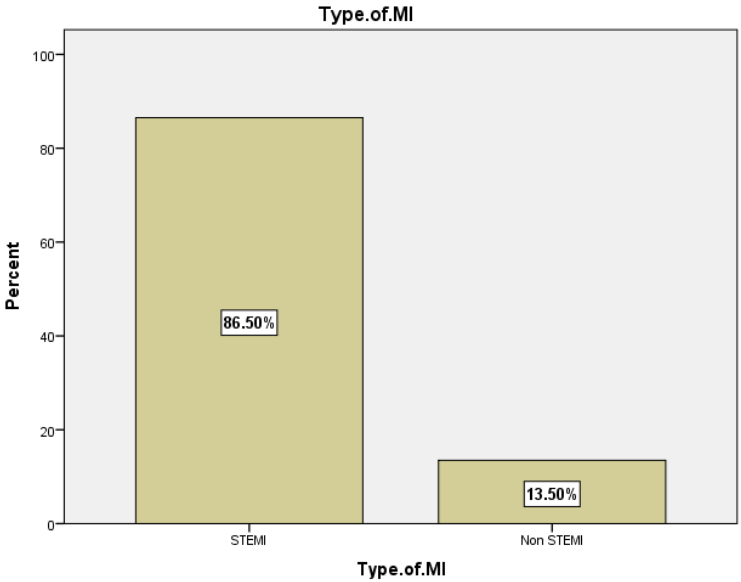
Table 6: Type of MI

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**STEMI**	173	86.5	86.5	86.5
	Non-STEMI	27	13.5	13.5	100.0
	Total	200	100.0	100.0	

Source: Author's own calculations.

Table 6 presents the distribution of myocardial infarction types among the study participants. The majority of patients were diagnosed with STEMI (n = 173; 86.5%), while non-STEMI accounted for 27 cases (13.5%). These findings indicate a substantially higher prevalence of STEMI compared to non-STEMI in the studied population.

Figure 8: Type of MI of Research Participants



Source: Author's own.

Figure 8 illustrates the distribution of myocardial infarction types among the research participants. Out of the total sample of 200 patients, the majority were diagnosed with STEMI (86.5%), while non-STEMI accounted for 13.5% of the cases.

5. DISCUSSION

We conducted this study to evaluate the frequency and type of MI among smokers and non-smokers. We have 200 research participants. The mean age of the study participants was 58.63 years with a standard deviation of 13.37. Smoking status of the research participants 41.00% were smokers and 59.00% were non-smokers. Location wise distribution of type of MI of the research participants such as 55% in anterior wall, 23% in posterior wall, 13% in lateral wall, 37% in extensive anterior wall, 43% in inferior wall, 2% in anterio lateral wall and 25% in non-STEMI.

Smoking status wise distribution of location of MI in Non STEMI 15% were non-smokers and 10% were smokers, in anterio lateral wall MI 2% were smokers and 0% were non- smokers in inferior wall MI 33% were non-smokers and 10% were smokers, in extensive anterior wall MI 16% were non-smokers and 21% were smokers, in lateral wall MI 8% were non-smokers and 5% were smokers, in posterior wall MI 15% were non-smokers and 9% were smokers and in anterior wall MI 31% were non-smokers and 25% were smokers. In total sample sizes of 200 types of MI 86.50% were STEMI and 13.50% were NON-STEMI.

We conducted this study to assess the frequency and type of MI among smokers and non-smokers .The frequency of types of MI was found to be 173 in STEMI and 27 in NON STEMI .In our 200 sample size study the percentage of NON STEMI was 13.50%.However in line with our results javed et al [14] create a 29.6% frequency of NON STEMI in a study of 216 patients. On the other hand, Melberg et al [15] already redirected 1093 patients with MI; they found that only 1.6% had NON-STEMI. American data report that people who persistently smoke had a 76% increase risk of death compared to non-smokers and 44% higher risks of death compared to those who stop smoking [16] but our 200 sample data suggest that 41.00% participants used to smoke while 59.00% participants were non-smokers. The Minnesota Heart Surgery stated that the chance of death with in the 28 days after a MI was 15 to 25% [17]. The

limitation of the current research study was the descriptive cross sectional study design which only defines the frequency and distribution of the outcome variable and causality cannot be determined with this study design. The other limitation of the study is the convenience sampling technique which is a non-probability sampling technique so that the findings of this cannot be established on the population.

6. CONCLUSION

From our Descriptive Cross Sectional study, we conclude that frequency and type of myocardial infarction among non-smokers were high (59.00%) as compared to smokers (41.00%). We also conclude that among types of MI percentage of STEMI was high (86.50%) compared to NON-STEMI (13.50%).

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