**Arab American University**

**Faculty of Graduate Studies**

**Prevalence and Risk Factors of Arrhythmias in Patients Undergoing Percutaneous Coronary Intervention in Palestine**

By

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**This thesis was submitted in partial fulfillment of the requirements for the Master`s degree in Intensive Care Nursing**

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**Thesis Approval**

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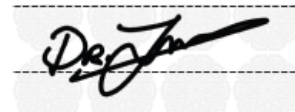
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# Declaration

I declare that this study is the result of my own work research, except where otherwise indicated. It has been submitted for Master degree.

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# Acknowledgment

Praise be to God, Lord of the Worlds, and prayers and peace be upon the most honorable of messengers, our Master Muhammad - may God's prayers and peace be upon him - the Messenger of Love, sent as a mercy to the worlds.

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# Abstract

Background:Heart disease stands as one of the leading global causes of mortality. In Palestine heart attacks accounted for 11.7% of all reported deaths. Percutaneous coronary intervention is considered the primary intervention, but complications may occur, including arrhythmia.

Aim:This study seeks toassess the prevalencerateandcontributing risk factors of cardiac arrhythmias in patients with acute myocardial infarction undergoing percutaneous coronary intervention.

Methods:A cross-sectional design was implemented, with data collected via data collection sheet. Study participants were recruited using convenience sampling technique. Data collection was conducted from March 1, 2024, to May 1, 2024.

Results:Among 484 participants (mean age 47.45 years), 10.1% experienced post-Percutaneous coronary interventionarrhythmias, with atrial fibrillation being most common (2.3%). Significant associations were found between arrhythmias and smoking, family history of coronary artery disease, body mass index, mean arterial pressure, and number of affected coronary arteries. Gender, prior medical history, and reason for percutaneous coronary intervention also correlated with arrhythmia risk, emphasizing its multifactorial nature in acute myocardial infarction patients undergoing percutaneous coronary intervention.

Conclusion:This study highlights a 10.1% prevalence of postpercutaneous coronary intervention arrhythmias, with atrial fibrillation being the most frequent. Key risk factors include smoking, family history of coronary artery disease, body mass index, mean Arterial pressure, and multi-vessel coronary artery disease. Gender and prior

medical conditions, such as hypertension and diabetes, further contribute to arrhythmia risk. These results highlight the critical need for early detection and management of high-risk patients undergoing percutaneous coronary intervention to mitigate arrhythmia-related complications and improve clinical outcomes.

Keywords:Risk Factors, Prevalence, Arrhythmias, Patients, PCI, Palestine.

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# List of Abbreviations

| Abbreviations | Explanation |
|---|---|
| CHD | Coronary Heart Disease |
| STEMI | ST-segment Elevation Myocardial Infarction |
| ECG | ElectroCardioGraphy |
| PCI | Percutaneous Coronary Intervention |
| CABG | Coronary Artery Bypass Grafting |
| CVD | CardioVascular Diseases |
| DM | Diabetes Mellitus |
| HTN | Hypertension |
| AMI | Acute Myocardial Infarction |
| BMI | Body Mass Index |
| CAG | Coronary Artery Angiography |
| RHC | Right Heart Catheterization |
| LBBB | Left Bundle Branch Block |
| VT | Ventricular Tachycardia |
| AF | Atrial Fibrillation |
| LMCAD | Left Main Coronary Artery Disease |
| MI | Myocardial infarction |
| VF | Ventricular Fibrillation |
| LVEF | Left Ventricle Ejection Fraction |
| LHC | Left  Heart Catheterization |
| MOH | Ministry Of Health |

| SBP | Systolic Blood Pressure |
|---|---|
| TIMI | Thrombolysis In Myocardial Infarction |
| SVT | SupraVentricular Tachycardia |
| eGFR | estimated Glomerular Filtration Rate |
| CKD | Chronic Kidney Disease |
| CAD | Coronary Artery Disease |
| PVC | Premature Ventricular Contractions |
| AIVR | Adioventricular rhythm |
| MAP | Mean Arterial Pressure |
| VD | Vessel Disease |

# Chapter One: Introduction

## 1.1 Introduction

This chapter presents an introduction to the study, offering context on cardiovascular diseases, coronary artery disease, and the role of percutaneous coronary intervention. It highlights the challenges of post-percutaneous coronary intervention arrhythmias and the lack of research in Palestine. The chapter outlines the study's aim, significance, and research questions, aiming to address the gap in knowledge regarding arrhythmia prevalence and risk factors in percutaneous coronary intervention patients in Palestinian hospitals.

## 1.2 Background

Cardiovascular diseases (CVDs) represent a significant global health burden, accounting for an estimated 17.9 million deaths annually, making them the leading cause of mortality worldwide (World Health Organization [WHO], 2021). Among CVDs, coronary artery disease (CAD) stands as the most prevalent, described by the narrowing or occlusion of coronary arteries due to atherosclerosis. CAD can lead to myocardial ischemia, angina, acute coronary syndromes (ACS), and, if left untreated, myocardial infarction (MI) (Młynarska et al., 2024). Over the past few decades, advancements in diagnostic and therapeutic modalities have revolutionized the management of CAD. Percutaneous coronary intervention (PCI) has emerged as a cornerstone in the management of CAD, offering a minimally invasive alternative to traditional coronary artery bypass grafting (CABG) (Abubakar et al., 2023; Thuijs et al., 2019).

Percutaneous coronary intervention, a minimally invasive procedure, involves the use of a catheter to place a stent in the narrowed or or occluded coronary arteries, restoring blood flow to the myocardium (Abubakar et al., 2023; Thuijs et al., 2019). Therefore, alleviating symptoms of ischemia and decreasing mortality rates and enhancing quality of life for millions of patients.Despite its effectiveness, PCI is not without risks, and post-procedural complications remain a critical concern in clinical practice. Among the most notable complications associated with PCI are bleeding, vascular injury, and arrhythmias. Bleeding complications, often related to access site issues or the use of antiplatelet and anticoagulant therapies, can lead to significant morbidity and require careful management. Vascular injuries, such as dissections or perforations, though relatively rare, can have severe consequences if not promptly addressed. However, arrhythmias represent one of the most clinically significant and potentially life-threatening complications following PCI (Doll et al., 2020; Mahilmaran, 2023; Ndrepepa and Kastrati 2014; Thuijs et al., 2019).

Post-PCI arrhythmias encompass a wide range of irregular heart rhythms, varying from mild to severe conditions like atrial fibrillation (AF), ventricular tachycardia (VT), ventricular fibrillation (VF), and bradyarrhythmias, all of which can significantly impact patient prognosis. These post-PCI arrhythmias can develop due to a complex interplay of factors, including pre-existing patient conditions (e.g., advanced age, diabetes, and heart failure), procedural challenges (e.g., prolonged operation times or coronary dissection), and post-procedural issues (e.g., electrolyte imbalances or ischemia-reperfusion injury) (He et al., 2024; Kang et al., 21; Mahilmaran, 2023; Rymer et al., 2024).

The prevalence of arrhythmias following PCI varies widely across studies, rates have been reported to range from 5% to 30%, depending on the population, setting, and definition of arrhythmias used. Notably, atrial fibrillation is the most commonly reported arrhythmia in this context, frequently leading to prolonged hospital stays higher rates of readmission, and an elevated risk of adverse cardiovascular events. Furthermore, the management of these arrhythmias often requires additional interventions, such as antiarrhythmic medications, electrical cardioversion, or device implantation, which can further complicate the clinical course and increase healthcare costs (Angiolillo et al., 2021; Kosmidou et al., 2018; Peretto et al., 2014; Rymer et al., 2024)

Although the risk factors and prevalence of post-PCI arrhythmias have been extensively investigated in high-income countries, where advanced healthcare infrastructure and robust research frameworks facilitate comprehensive data collection and analysis, there remains a significant and concerning gap in knowledge within low- and middle-income countries particularly in regions like Palestine. In Palestine, the burden of CVDs is high, with CAD being a leading cause of morbidity and mortality. the healthcare system operates under considerable strain, characterized by limited financial resources, shortages of specialized medical personnel, and disparities in access to specialized care. These challenges are exacerbated by political instability, economic constraints, and a lack of advanced medical infrastructure. These factors collectively complicate the understanding and management of post-PCI complications, including arrhythmias (Collier and Kienzler, 2018; Mkoko et al., 2020; World Bank Group, 2023). Despite these obstacles, PCI is increasingly being performed in Palestine. However, there is a notable lack of localized data on the prevalence and risk factors of

arrhythmias in patients undergoing PCI. This gap in the literature limits the ability to develop develop context-specific interventions, optimize resource allocation, and improve patient care.

Given the paucity of research on this critical issue in Palestine, this study aims to assess the prevalence rateandcontributing risk factors of cardiac arrhythmias in patients with acute myocardial infarction undergoing percutaneous coronary intervention. By conducting a comprehensive analysis of demographic, clinical, and procedural variables, this research seeks to uncover key predictors of arrhythmias, offering valuable insights to inform evidence-based practices. Ultimately, the study aspires to enhance the management and outcomes of PCI patients in Palestine, while contributing to the global body of knowledge on arrhythmia risk in the context of interventional cardiology.

## 1.3Problem Statement

Cardiovascular diseases continue to stands as one of the leading global causes of morbidity and mortality, accounting for significant health and economic burdens. Developing countries, where 80% of cases originate, are disproportionately affected due to the rising prevalence of risk factors and limited access to advanced healthcare systems (Eze & Okorie, 2024). These risk factors vary across age groups, with younger individuals showing a higher prevalence of smoking, dyslipidemia, and a family history of cardiovascular disease, while older populations are more likely to present with diabetes mellitus (DM) and hypertension (HTN) (Byrne et al., 2023).

Ischemic heart disease, largely caused by arrhythmias, is a leading contributor to global morbidity and mortality. Acute myocardial infarction, the most critical form of

ischemic heart disease, requires urgent medical intervention such as PCI to restore blood flow. However, PCI procedures are often complicated by the occurrence of arrhythmias, which pose a significant threat to patient safety. Research indicates that arrhythmias are highly prevalent among patients undergoing PCI. For instance, one study showed that 89% of patients experienced arrhythmias within the first 24 hours, with ventricular arrhythmias (37.3%), sinus tachycardia (36.4%), ventricular tachycardia (22.7%), and complete heart block (20.0%) being the most common types (Shah et al., 2021). Additionally, 64.5% of these cases involved life-threatening arrhythmias, underscoring the urgency of addressing this complication. Male gender and comorbid conditions such asHTN (53.6%) andDM (46.4%) were identified as significant risk factors (Shah et al., 2021).

Other studies highlight additional risk factors for arrhythmias during PCI, including advanced age, elevated body mass index (BMI), smoking, prior PCI history, and marital status (Khederlou et al., 2023; Wongthida et al., 2022). A study on 315 patients found that male gender significantly increased the likelihood of ventricular arrhythmias, with 50.5% of the patients experiencing ventricular arrhythmias, and most cases occurring within the first 12 hours post-PCI (Khederlou et al., 2023). Similarly, Wongthida et al. (2022) identified that 97% of PCI patients had no prior history of coronary artery angiography or PCI, indicating that first-time PCI patients may be at higher risk of arrhythmias.

In Palestine, CVDs represent a growing public health concern, with a high prevalence of risk factors among PCI patients. Studies report that smoking (68.6%), HTN (45.7%), DM (35.7%), and dyslipidemia are widespread among this population, with the majority being male and over 60 years old (JameeShahwan et al., 2019;

Qaddum et al., 2018; Daraghmeh, 2021). However, while significant global research has been carried out on the prevalence and risk factors of arrhythmias during PCI, there is a notable lack of data specific to Palestinian patients. This gap is critical, considering the severe complications associated with arrhythmias, including sudden cardiac arrest, which accounts for 50% of cardiovascular deaths (Myerburg& Lampert, 2024; Perry et al., 2024). Studies confirm that rapid intervention, advanced life support, and preventive measures such as implantable cardioverter-defibrillators can improve survival rates and outcomes (Myerburg& Lampert, 2024).

Addressing this gap is essential to improving patient outcomes in Palestine. By identifying the prevalence and associated risk factors of arrhythmias among PCI patients in this region, this study aims to inform clinical practice and contribute to the development of tailored strategies to reduce the risk of life-threatening complications. Understanding these factors also aid in optimizing PCI procedures, making them safer and more effective for Palestinian patients.

**1.4 Significance of the study**

From my personal experience while working in hospitals, it was observed that some patients were kept under observation due to the occurrence of arrhythmia after percutaneous coronary intervention. Hence the question: Are all patients who undergo percutaneous coronary intervention at risk for arrhythmia? What is the most common type of arrhythmia?

Therefore, thisstudy holds significant importance in advancing cardiovascular health in the region. Arrhythmias, a frequent and potentially life-threatening complication of PCI, are associated with adverse outcomes such as cardiac arrest,

increased mortality, and prolonged hospital stays. Despite the critical implications of arrhythmias, there is a lack of region-specific data in Palestine, where unique demographic, socioeconomic, and healthcare factors may influence disease presentation and outcomes. Understanding the prevalence and risk factors of arrhythmias in the Palestinian population is essential for improving patient care and addressing the growing burden of CVDs in developing countries.

While global studies have explored PCI-related arrhythmias, the absence of localized research leaves a gap in understanding how prevalent cardiovascular risk factors such as smoking, hypertension, diabetes, and dyslipidemia interact with arrhythmia development in Palestinian patients. This study seeks to bridge this gap, offering crucial insights into the demographic, clinical, and procedural characteristics that predispose patients in Palestine to arrhythmias during PCI. Such data enable the development of region-specific strategies to optimize patient management and mitigate risks associated with PCI.

By identifying the prevalence and associated risk factors of arrhythmias, healthcare providers need to be better equipped to implement targeted interventions, ensuring safer and more effective PCI procedures. Furthermore, this research will contribute to the development of personalized risk stratification tools tailored to the Palestinian population, helping clinicians identify high-risk patients and optimize both pre- and post-procedural care.

Beyond clinical applications, the study holds broader implications for healthcare policy and public health. Evidence generated from this research can guide policymakers in allocating resources toward preventive measures, early detection, and treatment of arrhythmias in PCI settings. Additionally, the study contribute to raise awareness about

cardiovascular health, encouraging lifestyle modifications and risk factor management in at-risk populations.

Finally, this research fills a critical gap in the scientific literature by providing much-needed data on PCI-related arrhythmias in Palestine. The findings can serve as a foundation for future studies and comparative analyses with other populations, contributing to the global understanding of cardiovascular health and intervention outcomes. Overall, this study may contribute to improving patient outcomes, and supporting public health initiatives aimed at reducing the burden of cardiovascular diseases in Palestine.

**1.5 Study Purpose**

This study seeks to assess the prevalence rateandcontributing risk factors of cardiac arrhythmias in patients with acute myocardial infarction undergoing percutaneous coronary intervention.

**1.6 Research Questions**

This study conducted to address the following research questions:

1. What is the prevalence of cardiac arrhythmias in acute myocardial infarction patients undergoing PCI in Palestine?

2. What are the specific types of cardiac arrhythmias that manifest in acute myocardial infarction patients following PCI?

3. Are there any significant associations between demographic factors and the occurrence of cardiac arrhythmias post-PCI in acute myocardial infarction patients?

4. Is there a notable correlation between co-existing medical conditions (e.g., hypertension, diabetes) and the occurrence of cardiac arrhythmias following PCI in acute myocardial infarction patients?

## 1.7 Conceptual and Operational Definition

Conceptual and operational definitions of the study variables are listed in Table (1.1).

| Table (1.1): Conceptual and operational definitions of the study variables | | |
|---|---|---|
| Variable | Conceptual Definition | Operational Definition |
| Arrhythmias | Arrhythmias are disorders of the heart's electrical system that cause irregular heartbeats, which may be too fast, too slow, or erratic. These can range from benign variations to life-threatening conditions, such as ventricular fibrillation or complete heart block (Myerburg& Lampert, 2024). | In this study, arrhythmias were measured by documented abnormal heart rhythms during or within 24 hours post-PCI, confirmed through electrocardiographic monitoring or clinical observation, including ventricular tachycardia, sinus tachycardia, and atrial fibrillation. |
| Risk Factors | A risk factor is any attribute, condition, or behavior that increases the likelihood of developing a disease or complication. For cardiovascular diseases, common risk factors include hypertension, diabetes, smoking, obesity, and genetic predisposition (Byrne et al., 2023). | In this study, risk factors refer to demographic, clinical, or lifestyle characteristics such as age, gender, smoking status, hypertension, diabetes mellitus, dyslipidemia, or previous cardiac interventions were recorded in data collection sheet for patients undergoing PCI and analyzed for their association with the occurrence of arrhythmias. |
| Prevelance | Prevalence is the proportion of a population affected by a | In this study, prevalence refers to the percentage of patients |

| | particular disease or condition at a specific point in time. It reflects the overall burden of the condition within the population (Eze & Okorie, 2024). | undergoing PCI in Palestine who develop arrhythmias during or within 24 hours of the procedure, as determined through clinical and electrocardiographic records. Prevelance was measured by number of cases developed arrthemia during study period |
|---|---|---|
| Percutaneous Coronary Intervention (PCI) | Percutaneous coronary intervention is a minimally invasive procedure to treat narrowed or blocked coronary arteries by using a catheter to place a stent, restore blood flow, and prevent myocardial infarction (Byrne et al., 2023). | In this study, PCI refers to any coronary intervention performed on patients using catheter-based techniques, documented through procedural records and defined as the index event for observing the occurrence of arrhythmias. |

## 1.8 Summary

Cardiovascular diseases continue to stands as one of the leading global causes of morbidity and mortality, with CAD treated increasingly through percutaneous coronary intervention. While PCI improves outcomes, it carries risks, including post-procedural arrhythmias such as ventricular tachycardia and atrial fibrillation, which can lead to severe complications and higher healthcare costs.

In Palestine, where CAD is prevalent and healthcare resources are limited, there is a lack of localized data on PCI-related arrhythmias. This study seeks to assess the prevalence rateandcontributing risk factors of cardiac arrhythmias in patients with acute myocardial infarction undergoing PCI to inform clinical practices, improve patient outcomes, and address this critical knowledge gap.

# Chapter Two: Literature Review

## 2.1 Introduction

This chapter seeks to review the current body of research on the prevalence rateandcontributing risk factors of cardiac arrhythmias in patients with acute myocardial infarction undergoing PCI, particularly within the Palestinian context. It investigates the frequency, varieties, and consequences of arrhythmias in PCI patients, pinpointing significant risk factors and addressing existing gaps in the literature. Additionally, it provides a rationale for the current study by mapping the existing research and emphasizing the need for further investigation in this area.

## 2.2 Searching Strategy

A review of the literature was conducted to assess and evaluate the state of the science in the area of prevalence and contributing risk factors of cardiac arrhythmias in patients with acute myocardial infarction undergoing PCI in Palestine. An electronic, computer-database search for relevant studies and resources was conducted utilizing the following key terms: "arrhythmias," "prevalence," "risk factors," "percutaneous coronary intervention," "cardiovascular disease," "Palestine," and "patients." Boolean operators, wildcard, and truncation symbols were used with key terms to expand or delimit the search. Different databases such as PubMed, CINAHL, Science Direct, Scopus, EBSCO, Cochrane Library, and Google Scholar were searched.

The literature review focused on studies published in the past five years (2018–2023) to ensure the inclusion of the most recent and relevant research on the prevalence

and risk factors of arrhythmias in PCI patients in Palestine. Peer-reviewed journal articles in English were considered eligible for inclusion, while editorials, letters, and studies published before 2018 were excluded. Studies involving populations outside of Palestine, or those focusing on non-cardiac interventions, were also excluded. This approach aimed to gather current data on the prevalence and risk factors specific to arrhythmias in PCI patients within the Palestinian context.

## 2.3 PrevelanceofArrhythmiasand Mortality Rate Post-PCI

A study at Pakistan's National Institute of Cardiovascular Diseases (NICVD) found arrhythmias highly prevalent in AMI patients within 24 hours of hospitalization. Among 110 patients (mean age 59.6, 70.9% male), 89.1% experienced arrhythmias, including accelerated idioventricular rhythm (37.3%), sinus tachycardia (36.4%), ventricular tachycardia (22.7%), and complete heart block (20.0%). Life-threatening arrhythmias occurred in 64.5%, mostly during arrival-to-balloon time (65.5%), the procedure (30%), or within 24 hours post-procedure (53.6%). These arrhythmias were linked to higher in-hospital mortality (21.1% vs. 5.1%), emphasizing the need for early monitoring and intervention in STEMI patients undergoing PCI (Shah et al., 2021).

A prospective cohort study conducted in Palestine examined the characteristics and mortality rates of patients undergoing percutaneous coronary intervention (PCI). The study aimed to assess the relationship between PCI outcomes and various factors, including demographic data, medical history, laboratory results, and PCI specifics.Additionally, it tracked 30-day readmissions due to cardiovascular events such as stroke, revascularization procedures, heart failure, and chest pain. The findings of this study provide valuable insights into the risk factors, management strategies, and

outcomes of acute coronary syndrome (ACS) in Palestine.The research underscores the importance of understanding the clinical profiles of ACS patients and highlights the need for improved management protocols to enhance patient outcomes (Qaddum et al., 2018).

## 2.4 Ventricular Arrhythmias Following PCI in STEMI Patients

A cohort study of 174,126 ST-segment elevation myocardial infarction (STEMI) patients treated with percutaneous coronary intervention (PCI) revealed that 2.4% developed late ventricular arrhythmias (VT or VF) occurring at least one day post-procedure. These arrhythmias were linked to a substantial rise in in-hospital mortality, with an adjusted odds ratio of 6.40 for the overall cohort and 8.74 for patients with uncomplicated STEMI. The most significant risk factor for late VT or VF with cardiac arrest was a left ventricular ejection fraction (LVEF) of 40% or lower, showing an adjusted odds ratio of 1.67 for every 5-unit decrease in LVEF. These findings highlight the critical need for close monitoring and timely intervention in STEMI patients, especially those with reduced LVEF, to reduce the risk of late ventricular arrhythmias and enhance outcomes (Rymer et al., 2024).

Sustained VT and VF are critical complications in AMI patients. A study of 1,941 AMI patients treated with primary PCI within 12 hours of symptom onset found that 8.3% experienced VT/VF during hospitalization, with 75% of cases occurring by the end of PCI. Independent predictors included female sex, hemoglobin <12 gm/dL, pre/intra-procedural events (e.g., respiratory failure, pulseless arrest), intra-aortic balloon pump use, procedure duration >60 minutes, and post-PCI desaturation. VT and VF had distinct predictors, and QRS duration during VT suggested Purkinje fiber

involvement in the acute AMI phase. Refractory VT/VF required extracorporeal membrane oxygenation in 12% of cases, but for discharged patients, VT/VF did not impact mid-term outcomes. These findings emphasize the severity of VT/VF in AMI and the need for identifying high-risk patients for close monitoring and timely intervention (Hanada et al., 2024).

A study at Pakistan's National Institute of Cardiovascular Disease investigated ventricular arrhythmias in STEMI patients undergoing PCI. Among 343 patients (mean age 54.72 ±10.75 years; 75.2% male, 24.8% female), 25.9% (89 patients) experienced ventricular arrhythmias. These included accelerated idioventricular rhythm (33.71%), frequent premature ventricular contractions (20.22%), non-sustained ventricular tachycardia (25.84%), and sustained ventricular tachycardia and ventricular fibrillation (10.11% each). The results highlight a notable prevalence of ventricular arrhythmias in STEMI patients treated with PCI (Khani et al., 2020).

A study at a tertiary cardiac center in Zanjan, Iran, investigated the incidence, types, and risk factors of ventricular arrhythmias (VAs) in patients undergoing PCI for STEMI. The study included 315 patients (mean age 62.14±10.11 years; 76.2% male) and found that 50.5% experienced VAs, with 26.4% having sustained VT or VF. Sustained VT/VF was more common in anterior infarctions. Most arrhythmias occurred within the first 12 hours, with frequent premature ventricular contractions (43.3%) and idioventricular rhythm (20.1%) being the most prevalent. A history of PCI and CABG was linked to a significantly lower incidence of arrhythmias, while cardiovascular risk factors did not significantly influence VA type. The study concluded that nearly half of the patients experienced reperfusion-induced VAs, with male gender and no history of PCI or CABG identified as key risk factors. It recommended prophylactic

antiarrhythmictreatment for males and patients without prior PCI or CABG (Khederlou et al., 2023).

A prospective study from the Japanese registry of acute Myocardial Infarction diagnosed by Universal definition (J-MINUET) analyzed 3,283 patients to identify predictors of in-hospital VT/VF after AMI. Patients with VT/VF had higher heart rates, lower systolic blood pressure, and fewer prior chest pain symptoms compared to those without VT/VF. They also had shorter transfer times to the hospital, a higher prevalence of STEMI, and more severe Killip classification scores on admission. Laboratory results showed elevated blood sugar, reduced estimated glomerular filtration rates, and higher maximum creatine kinase levels in the VT/VF group. Coronary angiography revealed more left main trunk stenosis, multi-vessel coronary stenosis, and lower initial Thrombolysis in Myocardial Infarction flow grades, indicating more complex coronary lesions. The study concluded that extensive myocardial damage and chronic kidney disease were independent predictors of in-hospital lethal arrhythmias in AMI patients undergoing percutaneous coronary intervention (Oikawa et al., 2018).

## 2.5 Atrial Fibrillation in STEMI Patients Undergoing PCI and Risk Pridection

A study at ChiangraiPrachanukroh Hospital, Thailand, created a risk score to predict life-threatening arrhythmias (LTA) within 72 hours post PCI in ST-elevated acute coronary syndrome (STEACS) patients. Analyzing 273 patients from 2012–2016, 15.8% experienced LTA, defined as malignant arrhythmias requiring advanced life support. Seven predictors were identified: female sex, hemoglobin <12 gm/dL, pre/intra-procedural events (e.g., respiratory failure, pulseless arrest), intra-aortic balloon pump use, procedure duration >60 minutes, and post-PCI desaturation. The

LTA score had strong predictive accuracy (AUC 0.93, 95% CI: 0.90–0.97), classifying patients as low (<2.5), moderate (2.5–4), or high (>4) risk. This tool aids clinicians in identifying high-risk patients for timely intervention (Wongthida et al., 2022).

A study examined the frequency and impact of new-onset atrial fibrillation (AF) in ST-segment elevation myocardial infarction (STEMI) patients undergoing percutaneous coronary intervention (PCI). Among 1,603 patients monitored for at least 48 hours post-PCI, 6.1% developed new-onset AF. Independent predictors included a CHADs-VASc score >2, Killip class >2, and increased left atrial diameter. The AF-positive group had significantly higher all-cause and in-hospital mortality rates, with new-onset AF identified as an independent predictor of in-hospital mortality. The study found lower new-onset AF rates compared to previous reports but emphasized its association with early mortality. Close monitoring in the initial period and reassessment of AF burden once stabilized are crucial for improving outcomes (Arslan et al., 2021).

A multicenter observational study across 15 Japanese institutions explored the link between BMI and clinical outcomes in AF patients undergoing PCI for CAD. The study included 720 AF patients treated with drug-eluting stents, divided into two groups: BMI <21.3 kg/m² (Group 1) and BMI ≥21.3 kg/m² (Group 2). The primary endpoint was net adverse clinical events (NACE), a composite of major adverse cardiovascular events (MACE) and major bleeding within one-year post-PCI. Results showed 25.0% of patients had a BMI <21.3 kg/m². Group 1 had significantly higher rates of NACE (21.1% vs. 11.9%, p = 0.003) and MACE (17.2% vs. 8.9%, p = 0.004) compared to Group 2, but no significant difference in major bleeding (5.6% vs. 4.3%, p = 0.54). Multivariable analysis confirmed BMI <21.3 kg/m² as an independent predictor of increased NACE and MACE, but not major bleeding. The study concluded that in AF

patients undergoing PCI and requiring oral anticoagulants, a BMI <21.3 kg/m² is a valuable predictor of major adverse clinical events (Yamazaki et al., 2024).

**2.4 Summary**

In Palestine, however, there are limited studies exploring the prevalence and risk factors of arrhythmias specifically in PCI patients. This gap underscores the need for further research to better understand the arrhythmic complications following PCI in Palestinian populations. With the rising burden of cardiovascular disease in Palestine, such studies are essential for developing targeted interventions and improving patient outcomes in this clinical setting.

# Three: Methedology

## 3.1 Introduction

This chapter presents the methodology underpinning this study. It outlines the research design and its rationale, detailing participant and setting recruitment strategies. The chapter further delineates sampling procedures, ethical considerations, and measures to protect participant rights. Finally, it provides a comprehensive overview of research instruments, data collection methods, and the planned data analysis.

## 3.2 Study design

A quantitative, descriptive cross-sectional design was utilized to assess the prevalence rateandcontributing risk factors of cardiac arrhythmias in patients with acute myocardial infarction undergoing percutaneous coronary intervention. This type of research design was appropriate when the independent variable is not manipulated, and no treatment or intervention was provided for the participants (Polit and Beck, 2017).

This approach aims to establish foundational data on these aspects within the Palestinian context. Cross-sectional studies are advantageous for their efficiency and cost-effectiveness, as they involve collecting data from participants at a single point in time or over a short period. This design allows for the comparison of variables of interest, providing valuable insights into the prevalence and associated risk factors of cardiac arrhythmias in this population (Polit and Beck, 2017).

## 3.3 Setting

The study wasconducted within the healthcare facilities located in the north West Bank, Palestine, encompassing both private and educational hospitals. More

specifically, the study was carried out in hospitals equipped to perform Percutaneous Coronary Intervention.Among the hospitals in the West Bank that include this study are: Hospitals in the northern West Bank, which include:

1.  Al-Razi Hospital – Jenin This private hospital provides its services through multiple departments, most notably: emergency, intensive care, maternity, orthopedics, radiology, laboratory, endoscopy and catheterization. In addition to eye surgery and lithotripsy, its clinical capacity is about 45 beds, according to the annual Palestinian health report for 2022.

2.  An-Najah University Hospital – Nablus An-Najah National University Hospital (NNUH) opened in 2014.  More than 1400 male and female students from various medical specialties, along with 88 specialists and more than 55 resident physicians joined forces to provide medical services in nephrology, oncology, cardiology, cardiac surgery, internal medicine, general and specialized surgery, and emergency.The hospital is considered one of the leading health care institutions in Palestine. It is a non-profit hospital with 135 beds, and plans to increase the number to approximately 500 beds.

3.  3. Al-Arabi Specialized Hospital – Nablus. A private hospital in the city of Nablus. The hospital provides many services through its various departments, which are: emergency, operations, intensive care, intensive cardiac care, men's and women's pajamas, childbirth, children's, laboratory and blood bank, radiology, pharmacy, outpatient clinics, in addition to the Razan Center for Infertility Treatment and IVF and the Al Nour Center for Eye Treatment and Surgery, Various medical specialties are required at Al-Arabi Hospital to obtain

the best health care using the latest diagnostic and therapeutic devices for a subscription card of up to 300.

## 3.4 Population andSample

Population is defined as the entire set of individuals or objects having some common characteristics (Polit and Beck, 2017). The target population for the current study includesallacute myocardial infarction patientsundergoing PCI in Palestine. The accessible population includedpaitentswithacute myocardial infarction undergoing PCI at selected hospitals in the northenWestBank, Palestine.

## 3.4.1Sampling method

Sampling involves selecting a subset of a population to represent the entire population (Polit & Beck, 2017). This study used a convenience sampling where the entire population with specific characteristics is examined (Sekaran & Bougie, 2013). Specifically, all acute myocardial infarction patients undergoing percutaneous coronary intervention at selected hospitals in the West Bank between March 1st and May 1st, 2024, were included. This approach was chosen to comprehensively investigate the prevalence of arrhythmias and associated risk factors among patients with acute myocardial infarction undergoing PCI.

## 3.4.2 Inclusion Criteria

Patients included in the current study met the following inclusion criteria: (a) adult patients aged 18 years and older;(b) Patients with confirmed diagnoses of acute myocardial infarction based on established clinical criteria, such as ECG changes,

elevated cardiac biomarkers, or other relevant diagnostic tests; (c) Patients scheduled or undergone Percutaneous Coronary Intervention (PCI) as a intervention for acute myocardial infarction; (d) Patients who provide informed consent to participate in the study; (e) Patients who can effectively communicate, to ensure accurate reporting of symptoms, medical history, and other relevant information.

### 3.4.3 Exclusion Criteria

Patients were excluded from the study if they met any of the following criteria: (a) individuals diagnosed with chronic stable angina or other non-acute coronary syndromes. (b) patients who have undergone CABG surgery instead of PCI for their intervention in acute myocardial infarction, (c) patients undergoing PCI for reasons unrelated to AMI, and (d) patient with a documented history of severe arrhythmias or arrhythmogenic disorders before the occurrence of the acute myocardial infarction episode.

### 3.5 Study instruments

Study instruments consisted of the following data collection tools(see Appendix A).

### 3.5.1 Demographic Risk Factors and Arrhythmia

The study instruments consisted of a Demographic Characteristics and Risk Factors Sheet and a STEMI and Cardiac Arrhythmias Sheet, both developed based on a literature review (Shah et al., 2021; Rymer et al., 2024). The Demographic Characteristics and Risk Factors Sheet included information on patients' characteristics such as age, gender, marital status, BMI, current smoking status, diabetes mellitus,

family history of coronary artery disease, prior percutaneous coronary intervention, current medication use, and hypertension.

### 3.5.2 The STEMI and Cardiac Arrhythmias Sheet

The STEMI and Cardiac Arrhythmias Sheet contained data on indications for PCI were categorized as stable angina, unstable angina, STEMI, or Non-STEMI. ECG findings were documented, including ST-segment elevation or depression and T-wave inversion. Infarct locations were classified based on ST-segment elevation on ECG as anterior, inferior, right ventricular inferior, or lateral acute myocardial infarction (AMI). Vessel involvement, STEMI, and arrhythmias were diagnosed via ECG, and patients were continuously monitored during hospitalization. Ventricular arrhythmias, including accelerated idioventricular rhythm (AIVR), frequent premature ventricular contractions (PVCs) occurring more than six times per minute, non-sustained ventricular tachycardia (NSVT) defined as more than three beats at ≥120 bpm lasting less than 30 seconds, sustained ventricular tachycardia (VT) lasting more than 30 seconds, and ventricular fibrillation (VF) were recorded. AIVR was identified as more than three consecutive ventricular beats at a rate of less than 120 bpm.

Atrial arrhythmias, also referred to as supraventricular arrhythmias, originate in the upper chambers of the heart and include various types. Supraventricular tachycardia (SVT) is characterized by a rapid heart rate (100–300 bpm) due to out-of-sync electrical impulses at or above the atrioventricular node; although it is usually not dangerous, it can cause discomfort. Atrial fibrillation (AF), a common arrhythmia, results in a disorganized heart rhythm that affects blood flow, increasing the risk of blood clots and stroke. Atrial flutter is a similar condition but with a more consistent frequency. Sinus

tachycardia occurs when the heart rate increases due to fast electrical signals from the sinus node, whereas sinus bradycardia occurs when these signals slow down or become blocked. Bradyarrhythmia is diagnosed when the heart rate is lower than 60 bpm with an irregular rhythm.

Atrioventricular (AV) blocks result from conduction system disruptions and are diagnosed via ECG. First-degree AV block involves delayed electrical signals between the atria and ventricles, identified by a prolonged PR interval (>200 msec) without skipped beats. Second-degree AV block can be further classified into Mobitz I (Wenckebach), where there is progressive PR interval prolongation leading to occasional dropped beats, and Mobitz II, where His-Purkinje conduction failure causes random missed beats, posing a severe risk of progression to complete heart block or asystole. Third-degree AV block (complete heart block) is a severe condition where there is no communication between the atria and ventricles, requiring emergency intervention such as a pacemaker.

### 3.5.3 STEMI classification sheet

STEMI classification was based on ST-segment elevation in specific ECG leads. Anteroseptal STEMI was identified in leads V1–V4, anterior STEMI in leads V3–V4, extensive anterior STEMI in V1–V6, anterolateral STEMI in V1–V6, I, aVL, lateral STEMI in I, aVL, inferior STEMI in II, III, aVF, inferolateral STEMI in I, II, III, aVF, aVL, inferoposterior STEMI in II, III, aVF, V8, V9, inferoposterolateral STEMI in II, III, aVF, aVL, V8, V9, and inferior STEMI with right ventricular involvement in II, III, aVF, V3–V6 right.

## 3.6 Ethical consideration

The ethical approval was obtained from the Institutional Review Board of Arab American university committee (See Appendex B) and the research ethics committee of the Palestinian Ministry of Health (MOH). Participants that receive both verbal and written explanations about the study's need, aims, methods, and value. Consent forms that obtained from participants before their involvement, assuring them that the data is confidential and anonymous. Moreover, participants informed about their righto withdraw from the study at any point without providing an explanation or facing negative consequences. They are assured that participation or provided information that not be used against them. Only the research team and main author that have access to the data, which that stored securely in a designated location at the university until the research's conclusion. Following the research purpose, the data that destroyed.

## 3.7 Data collection procedures

Data that collected after obtaining ethical approval from the Institutional Review Board of Arab American university committee, the research ethics committee of the Palestinian Ministry of Health (MOH) and selected private hospitals. Participants that receive detailed explanations about the study's objectives, methods, and value before providing informed consent. Screening for inclusion criteria that conducted to ensure participant eligibility.

Demographic and clinical data including age, weight, height, body mass index, gender, obesity, smoking, diabetic mellitus, family history of CAD, Previous percutaneous coronary intervention, lab test that recorded. Blood pressure and cardiac

arrhythmias that monitored, with continuous electrocardiogram (ECG) readings used for diagnosis. All patients that under continuous cardiac monitoring for the initial 24 hours post-PCI, and the prevalence of cardiac arrhythmias and related outcomes that systematically recorded.

## 3.8 Statistical analysis

The data that analyzed using SPSS software version 26. Descriptive statistics report using Mean and standard deviation for continuous variables. The categorical variable that reported using Frequency and percentage. Also, Chi-square and Fisher's exact test were used to find the association between dependent and independent variables. the P-value $<0.05$ was considered statistically significant.

# Chapter Four: Results

## 4.1 Introduction

This chapter summarizes the data distribution and demographic profile of participants, analyzing findings to address the study's objectives. It also examines how age, gender, and clinical history may impact arrhythmia prevalence and risk factors in PCI patients in Palestine.

## 4.2 Demographic characteristics of participants

The sample comprised 484 patients with a mean age of 47.45 years (SD = 16.01), ranging from 18 to 86 years. The sample was nearly evenly distributed by Sex, with 50.4% males and 49.6% females. Regarding marital status, 58.9% were married, 21.9% were single, 11.2% were divorced, and 8.1% were widowed. Treatment was evenly distributed across public and private hospitals, with 51.9% receiving care at private hospitals and 48.1% at educationalhospitals.

Among study participants, 34.7% of patients were current smokers, with a mean smoking history of 4.55 years (SD= 7.87), ranging from 2 to 35 years. A family history of coronary artery disease was reported in 41.5% of patients, while 58.5% (n=283) had no such history. Regarding BMI, 67.1% were overweight, 21.1% had a normal BMI, 10.7% were in obesity class 1, and 1.0% were in obesity class 2 Table (4.2).

Table (4.2): Demographic characteristics of the participants
(N=484)

| Variable | (n) |
| --- | --- |
| Age, M (SD) | 47.45 (16.01) |
| Gender | |
| Male | 50.4 (244) |
| Female | 49.6 (240) |
| Marital Status | |
| Single | 21.9 (106) |
| Married | 58.9 (285) |
| Divorced | 11.2 (54) |
| Widowed | 8.1 (39) |
| Hospital Type | |
| Private | 51.9 (251) |
| Educational | 48.1 (233) |
| Smoking | |
| Yes | 34.7 (168) |
| No | 65.3 (316) |
| Family History of CAD | |
| Yes | 41.5 (201) |
| No | 58.5 (283) |
| Previous Catheterization | |
| Yes | 25.4 (123) |
| No | 74.6 (361) |
| Body mass index category | |
| Normal | 21.1 (102) |
| Overweight | 67.1 (325) |
| Obesity Class 1 | 10.7 (52) |
| Obesity Class 2 | 1.0 (5) |

## 4.3 Clinical Characteristics and Outcomes of Patients Undergoing PCI

A total of 34.3% of patients reported continuous use of prescription medication.

Regarding blood pressure, 39.9% had stage II hypertension, 22.3% were classified as

normotensive, 22.3% (n=108) had stage I hypertension, and 15.5% (n=75) were in the

elevated blood pressure category. Among those with a previous medical history, 13.6%

had hypertension, 10.4% had diabetes mellitus, and 6.8% had hyperlipidemia. Some

participants had multiple conditions: 5.6% (n=27) had both hypertension and

hyperlipidemia, and 9.9% had both hypertension and diabetes. Notably, 53.7% reported

no prior medical history. 25.4% of patients had undergone a previous catheterization

procedure, while 74.6% (n=361) had not. Among those who underwent previous

catheterization, 12.0% were found to be healthy, and 13.4% were diagnosed with

coronary artery disease and received a stent Table (4.3).

Table( 4.3) :Clinical Characteristics and Outcomes of Patients Undergoing PCI (N=484)

| Variable | % (n) |
|---|---|
| Medication Use | |
|    Yes | 34.3 (166) |
|    No | 65.7 (318) |
| Mean arterial Pressure Category | |
|    Normotension | 22.3 (108) |
|    Elevated Blood Pressure | 15.5 (75) |
|    Stage I Hypertension | 22.3 (108) |
|    Stage II Hypertension | 39.9 (193) |
| Previous Medical History | |
|    None | 53.7 (260) |
|    Hypertension | 13.6 (66) |
|    Diabetes Mellitus | 10.4 (50) |
|    Hyperlipidemia | 6.8 (33) |
|    Hypertension and Hyperlipidemia | 5.6 (27) |
|    Hypertension and Diabetes Mellitus | 9.9 (48) |
| Previous Catheterization | |
|    Yes | 25.4 (123) |
|    No | 74.6 (361) |
| Catheterization Results | |
|    Healthy | 12.0 (58) |
|    Coronary artery disease with stent | 13.4 (65) |

## 4.4 Indications, Access Routes, and Arrhythmia Prevalence in PCI Patients

The primary indications for PCI among the 484 study participants were stable

angina (52.5%), ST-segment elevation myocardial infarction (28.5%), unstable angina

(14.7%), and non-ST-elevation myocardial infarction (4.3%). Radial artery access was

utilized in 78.9% of procedures, while femoral artery access was employed in 21.1%.

Coronary artery disease was observed in 50.4% of patients. Among those with

CAD, 34.9% exhibited single-vessel disease, 12.4% had two-vessel disease, and 2.3%

had three-vessel disease. The left anterior descending artery was the most frequently affected vessel (12.8%), followed by the left circumflex artery (11.6%) and the right coronary artery (4.1%).

Among study participants, 75.4% of participants experienced no myocardial infarction. In cases of MI, the anterior region was most commonly affected (7.4%), followed by the lateral region (6.2%) Table (4.4).

Table ( 4.4): Indications, Access Routes, and Arrhythmia Prevalence in PCI Patients(N=484)

| Variable | % (n) |
| --- | --- |
| Reason for PCI | |
| Stable Angina | 52.5 (254) |
| Unstable Angina | 14.7 (71) |
| STEMI | 28.5 (138) |
| Non-STEMI | 4.3 (21) |
| PCI Access Route | |
| Radial Artery | 78.9 (382) |
| Femoral Artery | 21.1 (102) |
| Affected Arteries | |
| Single-vessel disease | 34.9 (169) |
| Two-vessel disease | 12.4 (60) |
| Three-vessel disease | 2.3 (11) |
| None | 50.4 (244) |
| Affected Artery | |
| Left anterior descending artery | 12.8 (62) |
| Left circumflex artery | 11.6 (56) |
| Right coronary artery | 4.1 (20) |
| Left main coronary artery | 6.4 (31) |
| None | 50.4 (244) |
| STEMI Location | |
| Anterior | 7.4 (36) |
| Lateral | 6.2 (30) |
| None | 75.4 (365) |
| Arrhythmia Post-Catheterization | |
| Atrial Fibrillation | 2.3 (11) |
| Supraventricular Tachycardia | 1.7 (8) |
| Ventricular Fibrillation | 1.2 (6) |
| Sinus tachycardia | 1 (5) |
| Sinus bradycardia | 0.6 (3) |
| Atrial flutter | 0.4 (2) |
| Accelerated idioventricular rhythm | 0.2 (1) |
| More than two types of arrhythmias after PCI | 2.7 (13) |

**4.5Prevalence and Types of Arrhythmias in AMI Patients Undergoing PCI**

This study investigated the prevalence of cardiac arrhythmias and their

association with demographic and clinical factors in patients with acute myocardial

infarction undergoing percutaneous coronary intervention in Palestine. Among the 484

patients, the post-PCI arrhythmia prevalence was 10.1%. Atrial fibrillation (2.3%) was

the most common arrhythmia, followed by supraventricular tachycardia (1.7%),

ventricular fibrillation (1.2%), and sinus tachycardia (1.0%). Less frequent arrhythmias

included sinus bradycardia (0.6%), atrial flutter (0.4%), and accelerated idioventricular

rhythm (0.2%). Notably, 2.7% of patients experienced multiple arrhythmias following

PCI  Table (4.5).

Table (4.5):Prevalence and Types of Arrhythmias post PCI among Patients(N=484)

| Variable | % (n) |
|---|---|
| Prevelance of arrythemia | |
|    Yes | 10.1 (49) |
|    No | 89.9 (435) |
| Arrhythmia Post-Catheterization | |
|    Atrial Fibrillation | 2.3 (11) |
|    Supraventricular Tachycardia | 1.7 (8) |
|    Ventricular Fibrillation | 1.2 (6) |
|    Sinus tachycardia | 1 (5) |
|    Sinus bradycardia | 0.6 (3) |
|    Atrial flutter | 0.4 (2) |
|    Accelerated idioventricular rhythm | 0.2 (1) |
|    More than two types of arrhythmias after PCI | 2.7 (13) |

**4.6Demographic and Clinical Risk Factors for Arrhythmias**

the studys' results revealed a statistically significant association between gender

and post-PCI arrhythmia occurrence ($\chi^2$ = 11.594, p < 0.001). Males exhibited a

significantly higher likelihood of developing arrhythmias compared to females. This

result suggest that male sex may be associated with an increased risk of post-PCI arrhythmias.

Regarding hospital type, the current study did not find a statistically significant association between hospital type (private vs. educational) and the prevelance of post-PCI arrhythmias (p = 0.279). This finding suggests that the hospital type did not significantly influence arrhythmia risk.

Smoking status revealed a strong and statistically significant association with arrhythmia occurrence (p < 0.001). Smokers exhibited a substantially higher arrhythmia prevalence (26.8%) compared to non-smokers (1.3%). The Phi and Cramer's V values of 0.403 indicate a moderate strength of association between smoking and post-PCI arrhythmias.

In term of family history, a strong and statistically significant association (p < 0.001) was observed between a family history of coronary artery disease (CAD) and the occurrence of post-PCI arrhythmias. All 49 patients with a family history of CAD experienced arrhythmias, while none were observed in patients without such a history. The Phi and Cramer's V values of 0.398 indicate a moderate-to-strong relationship, suggesting a potential genetic predisposition to arrhythmias in individuals with a family history of CAD.

The results revealed that there was a moderate association between BMI category and arrhythmia prevalence was observed (p = 0.138), although it did not reach statistical significance. The Linear-by-Linear Association test was significant (p = 0.022), indicating that higher BMI categories may be more likely to be associated with arrhythmias, particularly among patients in the obesity class 2 category.

Regarding to hypertension, a strong and statistically significant association (p < 0.001) was found between elevated MAP and arrhythmia occurrence. Patients with higher MAP values, particularly in the highest category, exhibited a significantly increased risk of arrhythmias. The Phi and Cramer's V values of 0.255 indicate a moderate-to-strong relationship between MAP and arrhythmia prevalence.

The number of affected coronary arteries showed a highly significant relationship with arrhythmia occurrence post-PCI (p < 0.001). Patients with multiple-vessel disease exhibited a higher prevelance of arrhythmias. The Phi and Cramer's V values of 0.479 indicate a moderate-to-strong relationship, suggesting that multiple-vessel disease may increase the likelihood of post-PCI arrhythmias.

In term of reason for undergoing PCI, a significant association was found between the reason for undergoing PCI (e.g., STEMI, unstable angina) and arrhythmia occurrence (p <0.001). Arrhythmias were more commonly observed in patients undergoing PCI for STEMI. The Phi and Cramer's V values of 0.214 suggest a moderate association, indicating that the type of coronary event influences arrhythmia prevalence.

A significant relationship was observed between arrhythmias and previous medical history (p < 0.001). A history of hypertension, diabetes mellitus, and hyperlipidemia, particularly in combination, was strongly associated with an increased likelihood of arrhythmia post-PCI. The Phi and Cramer's V values of 0.428 indicate a moderate to strong association between arrhythmias and medical conditions such as hypertension, diabetes, and hyperlipidemia, particularly when these conditions occur together. This suggests that prior medical history, especially the combination of

hypertension with hyperlipidemia or diabetes, plays a significant role in arrhythmia

occurrence following PCI  Table (4.6)

| Table(4.6 ):Differences Between Arrhythmias and Clinical Factors | | | |
|---|---|---|---|
| Variable | Arrhythmia (Yes) n (%) | Arrhythmia (No) n (%) | p-value |
| **Gender** | | | |
| Male | 36 (14.8%) | 208 (85.2%) | 0.001 |
| Female | 13 (5.4%) | 227 (94.6%) | |
| **Hospital Type** | | | |
| Public | 29 (11.5%) | 222 (88.5%) | 0.279 |
| Private | 20 (8.6%) | 213 (91.4%) | |
| **Smoking Status** | | | |
| Yes | 45 (26.8%) | 123 (73.2%) | 0.001* |
| No | 4 (1.3%) | 312 (98.7%) | |
| **Family History of CAD** | | | |
| Yes | 49 (24.4%) | 152 (75.6%) | 0.001* |
| No | 0 (0%) | 283 (100%) | |
| **BMI Category** | | | |
| Normal BMI | 6 (5.9%) | 96 (94.1%) | 0.138 |
| Overweight | 33 (10.2%) | 292 (89.8%) | |
| Obesity Class 1 | 9 (17.3%) | 43 (82.7%) | |
| Obesity Class 2 | 1 (20%) | 4 (80%) | |
| **MAP Category** | | | |
| Normotension | 8 (7.4%) | 100 (92.6%) | 0.001* |
| Elevated Blood Pressure | 0 (0%) | 75 (100%) | |
| Stage I Hypertension | 4 (3.7%) | 104 (96.3%) | |
| Stage II Hypertension | 37 (19.2%) | 156 (80.8%) | |
| **Number of Affected Arteries** | | | |
| Single-vessel disease | 15 (8.9%) | 154 (91.1%) | 0.001* |
| Two-vessel disease | 25 (41.7%) | 35 (58.3%) | |
| Three-vessel disease | 6 (54.5%) | 5 (45.5%) | |
| **Reason for PCI** | | | |
| Stable Angina | 11 (4.3%) | 243 (95.7%) | 0.001* |
| Unstable Angina | 10 (14.1%) | 61 (85.9%) | |
| STEMI | 26 (18.8%) | 112 (81.2%) | |
| Non-STEMI | 2 (9.5%) | 19 (90.5%) | |
| **Previous Medical History** | | | |
| HTN | 3 (4.5%) | 63 (95.5%) | 0.001* |
| DM | 9 (20%) | 36 (80%) | |
| Hyperlipidemia | 3 (9%) | 30 (91%) | |
| HTN & Lipid | 9 (33%) | 18 (67%) | |
| HTN & DM | 7 (46.7%) | 8 (53.3%) | |

*P < 0.001

**4.7 Summary**

This study found a 10.1% prevalence of post-PCI arrhythmias, with atrial fibrillation being the most commonly observed arrhythmia. The findings identified significant associations between arrhythmia prevalence and factors such as smoking, family history of CAD, BMI, MAP, and the number of affected arteries. Additionally, gender, smoking, and specific medical conditions like hypertension and diabetes were significant predictors of arrhythmia risk in acute MI patients undergoing PCI.

# Chapter Five: Discussion

## 5.1 Introduction

This chapter contextualizes the study's findings within existing literature and clinical practice, examining the links between demographic, clinical, and procedural factors and arrhythmia prevalence in acute myocardial infarction patients undergoing PCI. It underscores the results' significance, discusses limitations, and offers recommendations for future research and clinical strategies to enhance patient outcomes.

## 5.2 Prevalence and Types of Arrhythmias among Patients Undergoing PCI

Acute myocardial infarction is a debilitating condition that often leads to a range of complications, one of the most common being arrhythmias. PCI is the primary treatment for AMI, but it can sometimes exacerbate these complications. A study of 484 patients demonstrated that the prevalence of arrhythmias following PCI was 10.1%. This finding is consistent with the results of a study on arrhythmias in the first 48 hours following AMI, which reported a similar rate of 9.1% (Singhet al., 2020).

In contrast, a study by Bhatti et al. (2021) found a much higher incidence of arrhythmias, with a rate of 53.6% in patients undergoing PCI. This notable discrepancy underscores the importance of evaluating arrhythmia rates in different populations and settings. Our study's rate of 10.1% suggests an improvement in patient outcomes, possibly reflecting advances in the quality of medical care and the expertise of medical staff at hospitals in the West Bank.

Atrial fibrillation was the most commonly observed arrhythmia, affecting 2.3% of patients in our study. This aligns with the findings of a study by Savaie et al., (2023), which reported atrial fibrillation as the most prevalent non-sinus arrhythmia in a noncardiac intensive care unit (12.9%). Additionally, Suttonet al. (2016) noted that AF is becoming more common, particularly in patients undergoing PCI.

Lethal ventricular arrhythmias, while less frequent, are a known complication of PCI, with an incidence rate of 1.5% to 4.4% reported in other studies (Rymer et al., 2024; Wegermann et al., 2020). The results of our study are consistent with these findings, reinforcing the conclusion that atrial fibrillation remains the most common arrhythmia observed during PCI. These results highlight the ongoing need for careful monitoring and management of arrhythmias in patients undergoing PCI.

## 5.3 Demographic and Clinical Associations with Cardiac Arrhythmias

The study identified a statistically significant association between gender and the occurrence of arrhythmias post-PCI. It was found that male patients, representing 50.4% of the sample, had a higher prevalence of arrhythmias compared to female patients, who comprised 49.6%. This gender disparity has been consistently observed in previous research. For example, a study by Bhatti et al. (2021) reported that 41.0% of male patients experienced arrhythmias, compared to only 9.5% of females. Similarly, Singh et al. (2020) found that males represented 61.7% of arrhythmia cases, while females accounted for 38.3% (Khederlou et al., 2023; Noubiap et al., 2024), reported an even higher male prevalence at 76.2%. A study by Xu et al. (2024) found that 87.3% of arrhythmic cases were male, reinforcing the conclusion that male gender is a significant risk factor for arrhythmias following PCI (Khederlou et al., 2023).

Smoking status also demonstrated a significant association with arrhythmia occurrence. Smokers experienced a higher incidence of arrhythmias (26.8%) compared to non-smokers (1.3%). This aligns with previous research indicating that smoker patients have a higher risk of developing arrhythmias following PCI. (Khederlou et al., 2023; Mehta et al., 2009. Moreever, the presence of a family history of CAD was strongly associated with arrhythmias post-PCI, with 24.4% of patients with a family history experiencing arrhythmias. In contrast, no arrhythmias were observed in patients without a family history of CAD. This finding aligns with the study by Khederlou et al. (2023), which showed a 31.1% arrhythmia incidence in patients with a family history of CAD. A study by Bhatti et al. (2021) also demonstrated a significant link between a family history of CAD and arrhythmias within the first 24 hours post-PCI (3.6%).

Obesity was found to be another risk factor, as patients with a higher BMI were more likely to experience arrhythmias. Bhatti et al. (2021) observed that 9.1% of patients with a BMI greater than 27.5 kg/m² experienced arrhythmias. Additionally, Khederlou et al. (2023) reported that 46.7% of patients with a BMI of 25 or higher experienced arrhythmias, confirming the strong association between obesity and arrhythmia risk (Yamazaki et al., 2024).

Mean Arterial Pressure was another significant factor, with a high MAP being linked to a higher incidence of arrhythmias. Khederlou et al. (2023) reported that 49.5% of patients with high MAP developed arrhythmias, while Singh et al. (2020) found a 36.3% incidence of arrhythmias in patients with elevated MAP.

The number of affected coronary arteries also played a crucial role in arrhythmia risk. Patients with multi-vessel disease had a significantly higher proportion of arrhythmias post-PCI. Albanese et al. (2018) found that 31.9% of patients with 3VD

experienced arrhythmias following PCI, and Bhatti et al. (2021) reported a 43.6%

incidence in patients with 3VD.

Regarding the indication for PCI, a significant association was found between

the type of myocardial infarction (e.g., STEMI vs. unstable angina) and arrhythmias.

Arrhythmias were more common in patients undergoing PCI for STEMI, with 18.8% of

these patients' experiencing arrhythmias. This aligns with findings by Wongthidaet al.

(2022), who reported that 15.8% of STEMI patients experienced arrhythmias, compared

to a lower incidence in non-STEMI patients. Rao et al. (2012) found a similar trend,

with 4.9% of STEMI patients experiencing arrhythmias, compared to 1.8% of NSTEMI

patients. Rymer et al. (2024) noted that 57.4% of STEMI patients were at risk for

arrhythmias, specifically VT/VF, while Albanese et al. (2018) reported a 55.6%

incidence of arrhythmias in STEMI patients post-PCI. These findings collectively

highlight the importance of considering gender, smoking status, family history, obesity,

MAP, coronary artery involvement, and the reason for PCI when assessing the risk of

arrhythmias in patients undergoing PCI.

## 5.4 Association with Previous Medical History

A significant relationship was identified between arrhythmia and the patient's

previous medical history. Specifically, a history of HTN, DM, and hyperlipidemia,

especially when these conditions coexisted, was strongly associated with an increased

likelihood of developing arrhythmias post-PCI. In a prior study titled Characteristics

and Mortality of Percutaneous Coronary Intervention Patients in Palestine, hypertension

was observed in 45.7% of patients, diabetes in 35.7%, and a previous history of PCI in

38.6% of patients (Qaddum et al., 2018).

Similarly, a study by Yang et al. (2024) found that the incidence of arrhythmias was higher in patients with these comorbid conditions. Among patients with hypertension, 9.7% experienced arrhythmias, compared to 7.5% of those without hypertension. Diabetes also showed a notable association, with 13.1% of diabetic patients experiencing arrhythmias, compared to 6.8% of non-diabetic patients (Agarwal and Singh, 2017; Lip et al., 2017; Rawshanie et al., 2023). Additionally, patients with a family medical history of cardiovascular diseases had a 9.1% incidence of arrhythmias, compared to 8.2% in patients without such a family history. These findings further emphasize the importance of managing these underlying conditions to reduce the risk of arrhythmias in patients undergoing PCI.

## 5.5 Study Limitation

**1-**It provides a snapshot of the prevalence and risk factors of arrhythmias at a specific point in time, limiting the ability to analyze long-term trends or causality.

**2**-The data collection period was limited to March to May 2024, potentially introducing temporal biases.

**3**-The sample was collected primarily from hospitals in the northern West Bank, limiting the study's geographical representation due to the refusal of some hospitals to participate and difficulties accessing others.

**4-**This may affect the generalizability of the findings to the broader Palestinian population. Future studies should aim for a more geographically diverse sample, including hospitals from other regions such as Jerusalem, Bethlehem, Ramallah, and Hebron, to ensure more comprehensive representation.

**5.6 Strength of The Study**

**1-**The study, the first of its kind in Palestine, investigates the prevalence and risk factors of cardiac arrhythmias in patients undergoing percutaneous coronary intervention.

**2-**The study, conducted in West Bank hospitals, offers valuable local data on the region's healthcare context, making it crucial for local providers and policymakers.

**3-**As a reference for future research, the study serves as a baseline for comparison in similar studies, advancing the understanding of arrhythmias in Palestine and the broader Middle Eastern region.

**4-**Identifying risk factors like smoking, CAD family history, BMI, and multi-vessel coronary artery disease can aid in developing targeted interventions to reduce arrhythmia risks in PCI patients.


**5.7Conclusion**

This study provides valuable insights into the prevalence and risk factors of post-PCI arrhythmias in patients with acute myocardial infarction undergoing percutaneous coronary intervention in Palestine. The study found a 10.1% prevalence of arrhythmias, with atrial fibrillation being the most common. Several demographic and clinical factors were significantly associated with arrhythmia occurrence, including male gender, smoking, family history of coronary artery disease, higher BMI, elevated mean arterial pressure, the number of affected coronary arteries, and the reason for undergoing PCI. Notably, patients with a history of hypertension, diabetes, and hyperlipidemia, especially when combined, exhibited a higher likelihood of arrhythmias post-PCI. These findings suggest that targeted interventions, including lifestyle modifications and more vigilant monitoring, are crucial to mitigate arrhythmia risks in

this patient population. The study also highlights the need for further research to explore the long-term impact of these risk factors on arrhythmia development and outcomes in the Palestinian population.

**5.7 Recommendations**

**1-**Healthcare providers should incorporate comprehensive assessments for factors like smoking, family history of CAD, BMI, mean arterial pressure, and multi-vessel disease in pre-PCI evaluations to identify high-risk individuals.

**2**-Smoking cessation programs should be integrated into care plans, and aggressive management of pre-existing conditions like hypertension and diabetes is essential.

**3-**Patient education on lifestyle modifications, including diet and exercise, can help reduce modifiable risk factors.

**4-**Continuous post-PCI monitoring and regular ECG assessments are vital for early detection of arrhythmias.

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# **Appendices**

## Appendix 1: Study Instruments

**استبانة المعلومات الشخصية والتاريخ المرضي**

اننا نقدر تطوعك بإكمال المعلومات الواردة ادناها واعادتها مع غيرها من الاستبيانات. الصفحة الأولى من هذا الاستبيان سيتم فصلها بشكل كلي ودائم عن بقية الاستبيان. المعلومات الشخصية التي تجمع بهذه الطريقة سوف تستخدم فقط لأغراض البحث العلمي من خلال استخدام الرقم التسلسلي. ولن يطلب منك الكشف عن اي معلومات شخصية.

1. العمر بالسنوات: _____

2. الجنس: ☐ ذكر ☐ أنثى

3. الحالة الاجتماعية:

   ☐ أعزب ☐ متزوج ☐ مطلق ☐ أرمل

4. نوع المستشفى:

   ☐ حكومي ☐ خاص ☐ تعليمي

5. الوزن (Kg): _____

6. الطول (M): _____

7. هل انت مدخن:

   ☐ نعم ☐ لا ☐ اذكر مدة التدخين بالسنوات: _____

8. هل لديك تاريخ عائلي للإصابة بمرض الشريان التاجي :

   ☐ نعم ☐ لا

9. هل تم اجراء عملية قسطرة مسبقا:

   ☐ نعم ☐ لا

   إذا كانت الإجابة بنعم، ما هي نتائج القسطرة:

   ☐ الشرايين التاجية سليمة ☐ وجود تضيق في الشرايين التاجية وتم وضع شبكة

   ☐ غير ذلك اذكرها _____

10. التاريخ الطبي (**Medical History**)

    ☐ **HTN** ☐ **DM** ☐ **Hyperlipidemia**

    ☐ غير ذلك اذكرها _____

11. هل تتناول ادوية بوصفة طبية باستمرار:

    ☐ نعم ☐ لا

    ☐ **Aspirin** ☐ **Statin** ☐ **Beta-blocker**

    ☐ **ACE-I** ☐ **CCB** ☐ **ARB**

    ☐ **Plavix**

12. الفحوصات المخبرية ونتائجها:

| | | | |
|---|---|---|---|
| HDL: _____ ☐ | | Troponin: _____ ☐ | |
| LDL _____ ☐ | | CK: _____ ☐ | |
| Total chole: _____ ☐ | | CK-MB: _____ ☐ | |
| Creatinine: _____ ☐ | | Urea: _____ ☐ | |
| Glucose: _____ ☐ | | Potassium: _____ ☐ | |
| | | Triglyceride: _____ ☐ | |

☐ غير ذلك: اذكرها: _____

13. العلامات الحيوية:

BP: _____ ☐

HR: _____ ☐

☐ غير ذلك: اذكرها: _____

14. السبب لإجراء PCI

Non-STEMI ☐     STEMI ☐     Unstable Angina ☐     Stable Angina ☐

15. الشريان التي تم من خلاله عمل PCI

Other: _____ ☐     Radial Artery ☐     Femoral Artery ☐

16. عدد الشرايين التاجية المتضررة:

3VD ☐     2VD ☐     SVD ☐

17. أسماء الشرايين التاجية المتضررة:

PDA ☐     LMCA ☐     LCX ☐     LAD ☐     RCA ☐

☐ غير ذلك، اذكرها: _____

18. STEMI location:

Lateral ☐     Anterior ☐

Inferior ☐     Posterior ☐

19. نوع Arrythmias التي حدثت بعد القسطرة

A. Flut ☐   A. Fib ☐   SVT ☐   V. Fib ☐   S. Tacky ☐   S. Brady ☐

Junc. Brady ☐     AVB: ____ ☐     VT: ____ ☐     Asystole ☐

AIVR ☐

Appendix2: Ethical Approval Letter

**Arab American University**
*Institutional Review Board - Ramallah*

الجامعــــة العربيـــــة الأمريكيـــة
مجلس اخلاقيات البحث العلمي – رام الله

## IRB Approval Letter

**Study Title:** "Prevalence and Risk Factors of Arrhythmias in Patients Undergoing Percutaneous Coronary Intervention in Palestine".

**Submitted by: Maryam Emad Ahmad Abahra**

**Date received:**      30th January 2024

**Date reviewed:**      5th February 2024

**Date approved:**      5th February 2024

Your Study titled **"Prevalence and Risk Factors of Arrhythmias in Patients Undergoing Percutaneous Coronary Intervention in Palestine** with the code number **"R-2024/A/22/N"** was reviewed by the Arab American University Institutional Review Board - Ramallah and it was approved on the 5th of February 2024.

**Sajed Ghawadra, PhD**
**IRB-R Chairman**
**Arab American University of Palestine**

الجامعة العربية الأمريكية . فلسطين
مجلس اخلاقيات البحث العلمي . رام الله
**IRB-R**
ARAB AMERICAN UNIVERSITY-PALESTINE
INSTITUTIONAL REVIEW BOARD - RAMALLAH

**General Conditions:**
1. Valid for 8 months from the date of approval.
2. It is important to inform the IRB-R with any modification of the approved study protocol.
3. The Bord appreciates a copy of the research when accomplished.

## الملخص

الخلفية: تُعد أمراض القلب سببًا رئيسيًا للوفاة عالميًا، حيث شكلت النوبات القلبية 11.7% من الوفيات المسجلة في فلسطين عام 2021. تُعتبر التدخلات التاجية عن طريق الجلد التدخل الأساسي، إلا أن هناك احتمالية لحدوث مضاعفات، بما في ذلك اضطرابات النظم القلبي.

الهدف: تهدف هذه الدراسة إلى تقييم مدى انتشار وعوامل الخطر المرتبطة باضطرابات النظم القلبي لدى مرضى احتشاء عضلة القلب الحاد الذين يخضعون للتدخل التاجي الأولي عن طريق الجلد.

الطرق: اعتمدت هذه الدراسة على تصميم مقطعي، وتم جمع البيانات باستخدام استبيان ذاتي الإدارة. تم استخدام تقنية العينة الشاملة لتجنيد المشاركين. تم جمع البيانات في الفترة من 1 اذار 2024 إلى 1تموز 2024.

النتائج: من بين 484 مشاركًا (متوسط العمر 47.45 عامًا)، عانى 10.1% من اضطرابات النظم القلبي بعد التدخل التاجي، وكانت الرجفان الأذيني الأكثر شيوعًا (2.3%). وُجدت ارتباطات هامة بين اضطرابات النظم والتدخين، التاريخ العائلي لأمراض الشرايين التاجية، مؤشر كتلة الجسم، الضغط الشرياني المتوسط، وعدد الشرايين التاجية المتأثرة. كما ارتبطت عوامل مثل الجنس، التاريخ الطبي السابق، وسبب التدخل بزيادة خطر اضطرابات النظم، مما يؤكد طبيعتها متعددة العوامل لدى مرضى احتشاء عضلة القلب الحاد الذين يخضعون للتدخل التاجي.

الخلاصة: تسلط هذه الدراسة الضوء على انتشار اضطرابات النظم القلبي بنسبة 10.1% بعد التدخل التاجي، مع كون الرجفان الأذيني الأكثر شيوعًا. تشمل عوامل الخطر الرئيسية التدخين، التاريخ العائلي لأمراض الشرايين التاجية، مؤشر كتلة الجسم، الضغط الشرياني المتوسط، وأمراض الشرايين التاجية المتعددة. كما يساهم الجنس والحالات الطبية السابقة، مثل ارتفاع ضغط الدم والسكري، في زيادة خطر اضطرابات النظم. تؤكد هذه النتائج أهمية التعرف المبكر

وإدارة المرضى ذوي الخطورة العالية الذين يخضعون للتدخل التاجي للحد من مضاعفات اضطرابات النظم وتحسين النتائج السريرية.

الكلمات المفتاحية:عوامل الخطر، الانتشار، عدم انتظام ضربات القلب، المرضى، التدخل التاجي، فلسطين.