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FACTORS AND BARRIERS AFFECTING DELAYED HOSPITAL ARRIVAL OF PATIENTS WITH ST-ELEVATED MYOCARDIAL INFARCTION FOR PCI IN TERTIARY CARE HOSPITAL PESHAWAR

Hassan Nawaz
Students of BS-Cardiology Technology, Institute of Paramedical Sciences Khyber Medical University Peshawar
Email: hassannawaz0018@gmail.com
Bashir Ullah
Faculty of Cardiology and Cardiac Perfusion Technology Institute of paramedical Sciences Khyber Medical University Peshawar
Email: bashir.ipms@kmu.edu.pk
Fatima Gul
Students of BS-Cardiology Technology, Institute of Paramedical Sciences Khyber Medical University Peshawar
Email: fg48121@gmail.com
Sara Shahid
Students of BS-Cardiology Technology, Institute of Paramedical Sciences Khyber Medical University Peshawar
Email: sarashahid15973@gmail.com
Urooj Niaz
Students of BS-Cardiology Technology, Institute of Paramedical Sciences Khyber Medical University Peshawar
Email: uroojniaz3848@gmail.com
Saeed Ahmad*
Lecturer Cardiology Technology Institute of paramedical Sciences Khyber Medical University Peshawar
Email: saeed.ipms@kmu.edu.pk

Abstract

This study looks at the causes and obstacles that delay patients with ST-elevation myocardial infarction (STEMI) in Peshawar from arriving at the hospital for primary percutaneous coronary intervention (PCI). It was carried out in a Peshawar tertiary care hospital and was cross-sectional in nature. 227 patients who received an acute myocardial infarction (AMI) diagnosis between July and November of 2024 made up the study population. For the in effect effective programs to spike public awareness about symptom recognition and the importance of timely medical intervention, particularly among the elderly Various socio-demographic, physiological, psychological, and clinical factors contribute to delayed treatment-seeking behavior. Socio-demographic determinants include advanced age, male gender, low education level, and low income. Physiological and environmental factors such as reliance on private transportation, living alone, and

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Corresponding E-mail & Author*:
Mr. Saeed Ahmad*
Lecturer Cardiology Technology Institute of paramedical Sciences Khyber Medical University Peshawar
Email: saeed.ipms@kmu.edu.pk

residing in impoverished or rural areas further exacerbate delays. Psychological and behavioral factors, including hesitation, uncertainty, reluctance, and self-management tendencies, also play a significant role. Additionally, clinical factors such as the absence of prior cardiac history, the existence of hypertension or diabetic mellitus, and the occurrence of mild, atypical, or inconsistent symptoms contribute to treatment delays.

These findings emphasize the need for comprehensive public health interventions, improved ambulance services, and educational campaigns to enhance awareness of acute myocardial infarction symptoms. Strengthening these measures is essential for ensuring timely medical care and improving patient outcomes.

INTRODUCTION:

Cardiovascular diseases (CVDs) represent a global health crisis, encompassing abnormalities of the heart and blood vessels, including stroke, congestive heart failure (CHF), and ischemic heart disease (IHD). As the leading cause of death worldwide, CVDs contribute significantly to morbidity and disability, with cases rising from 271 million in 1990 to 523 million in 2019, and related deaths increasing from 12.1 million to 18.6 million over the same period. This escalating burden persists despite advancements in prevention and therapy, underscoring the need for targeted interventions to mitigate their impact on systemic homeostasis and myocardial function (1).

Coronary artery disease (CAD), also known as ischemic heart disease (IHD), is the most prevalent form of CVD, characterized by atherosclerotic plaque buildup in the arterial lumen, which restricts blood flow and oxygen delivery to the myocardium. In 2019, IHD alone accounted for 197 million cases and 9.14 million deaths globally. Manifestations include acute coronary syndrome (ACS), silent myocardial ischemia, and stable angina, with ACS often presenting as unstable angina or myocardial infarction (MI) (2).

The aortic root, featuring three sinuses (right coronary, left coronary, and non-coronary), gives rise to the coronary arteries: the right coronary artery (RCA) from the right sinus, perfusing the right atrium, right ventricle, SA and AV nodes, and one-third of the interventricular septum; and the left coronary artery (LCA) from the left sinus, branching into the left anterior descending (LAD) and left circumflex (LCX) arteries, which supply the left atrium and ventricle. These vessels course along the coronary sulcus, ensuring essential perfusion for cardiac muscle maintenance (3).

Myocardial infarction (MI), primarily triggered by coronary artery obstruction, leads to heart muscle death due to an oxygen supply-demand imbalance, resulting in cardiac ischemia. Diagnosis involves elevated cardiac troponin levels (at least one above the 99th percentile upper reference limit) alongside indicators such as ischemic symptoms, new ECG changes, Q-wave progression, imaging evidence of wall motion abnormalities, or coronary thrombus detection. The Killip Classification assesses MI-related heart failure severity: Class I (no symptoms), Class II (mild-moderate failure), Class III (pulmonary edema), and Class IV (cardiogenic shock) (4,5).

Coronary artery disease (CAD) remains the world's leading cause of death, defined by the gradual accumulation of atherosclerotic plaques in the coronary arteries, often asymptomatic in early stages. This narrowing or obstruction disrupts the balance between myocardial oxygen supply and demand, leading to inadequate perfusion and clinical manifestations such as silent myocardial ischemia, acute coronary syndrome (ACS), and stable angina (6).

ACS, typically symptomatic, includes unstable angina and myocardial infarction (MI). Risk factors for CAD are bifurcated into non-modifiable (age, sex, genetic predisposition, ethnicity) and modifiable (hypertension, dyslipidemia, diabetes mellitus, obesity, tobacco use, poor diet, sedentary lifestyle, chronic stress). Globally,

modifiable factors like elevated body mass index (BMI), hypertension, high fasting plasma glucose, and tobacco use drive years of life lost from CVD. In 2019, tobacco accounted for 8.7 million deaths, one-third attributable to CVD, while hypertension prevalence has nearly doubled since 1990, affecting over 4 billion people. Obesity, now epidemic, heightens risks for comorbidities including MI, stroke, type 2 diabetes, and dementia, curtailing life expectancy and quality of life (7).

CAD continues as the primary contributor to global mortality and disease burden, causing an estimated 7-8.9 million deaths annually, with 8.9 million recorded in 2015 alone. Survivors of MI face a five- to six-fold higher annual mortality risk and elevated chances of recurrent cardiovascular events compared to those without CAD. Classification includes stable angina, caused by myocardial ischemia from transient oxygen supply-demand imbalance, often due to coronary stenosis limiting perfusion during exertion or stress. Stable angina presents as substernal chest pain, pressure, or discomfort lasting 30-60 seconds, triggered by physical or emotional stress and relieved by rest or nitroglycerin. It predicts adverse cardiac events, with myocardial oxygen demand influenced by heart rate, systolic blood pressure, wall tension, and contractility, while supply depends on heart rate, perfusion pressure, collateral flow, and vessel diameter. Beyond stenosis, vasospasm, embolism, dissection, and microvascular dysfunction can impair supply. ACS and MI represent acute escalations, emphasizing CAD's progressive nature and the imperative for early detection (8,9).

Understanding modifiable factors and barriers delaying hospital arrival in STEMI patients offers substantial benefits for clinical practice and public health. By identifying socioeconomic influences (e.g., low financial status, education level), demographic elements (e.g., marital status, living alone), and logistical challenges (e.g., distance from hospitals, transportation issues), interventions can be tailored to high-risk groups. This could include community education campaigns on recognizing atypical symptoms like non-classic chest pain, enhancing awareness of STEMI urgency, and optimizing emergency response systems to reduce pre-hospital delays, ultimately improving reperfusion times and survival rates (10).

In conclusion the rising prevalence of CAD and STEMI, driven by modifiable risk factors and treatment delays, highlights an urgent need for research into barriers affecting timely hospital arrival. This study aims to pinpoint these factors to enable targeted interventions, optimizing emergency care, patient education, and public awareness. By addressing delays, we can enhance PCI and thrombolytic efficacy, mitigate mortality and morbidity, and alleviate the global CVD epidemic, paving the way for healthier populations and reduced healthcare disparities (11).

Materials and methods:

Study design:

Descriptive Cross-Sectional Study

Study settings:

Lady Reading Hospital-MTI, Hayatabad Medical Complex-MTI

Study duration:

6 months after approval of synopsis.

Sample size:

The sample size was 227at 95% confident level, 5% margin of errors and previous frequency of the acute myocardial infarction is 18% (12)

Sampling technique:

Nonprobability convenient Sampling Technique

Sample selection:

Inclusion criteria:

Age 18 to 75

Both genders
Diabetic patient with silent MI
Patients presenting with chest pain diagnosed to have STEMI (13).

Exclusion criteria:
Patient who treated with PCI within 90 minutes
Patients who don't sign consent

Data collection:
After approval from the Ethical Board of Khyber Medical University, Permission will be obtained from hospital ethical review committee. The whole research protocol will be explained to the patients and written consent for the treatment will be obtained (Annexure I). The participants will be ensured for their confidentiality. Detailed history followed by relevant clinical examinations will be done for participants meeting our inclusion criteria. The questions will be translated into Urdu and Pashto. Bias and confounders in the study will be controlled by strictly following inclusion criteria and stratification. Different factors and barriers are assessing delayed hospital arrival of patients with acute myocardial infarction through proper questionnaire (Annexure II)

Data Analysis:
Data analysis will be conducted in SPSS 22. Mean and SD will be computed for continuous data like age, etc. Frequencies and percentages will be calculated for categorical variables like gender, educational level, and socioeconomic, family history of CAD. The Chi-Square test will be employed after stratification or to evaluate important aspects pertaining to patients' arrival. Logistic regression will be run to calculate odds ratios with 95% CIs.

RESULTS
The study included a total of 227 patients, with a mean age of 58.0 ± 11.32 years. Among them, 130 (57.3%) were older than 58 years. A significant proportion of patients, 156 (68.7%), had no formal education, while the majority, 197 (86.8%), were married, and 222 (97.8%) resided with their families. Additionally, 74% of patients arrived at the emergency department using private transportation. Regarding clinical presentation, 131 (57.7%) were diagnosed with anterior myocardial infarction (AMI).
In terms of chronic illness status, 131 people (57.7%) had diabetes mellitus and 129 people (56.8%) had a history of hypertension. Notably, all patients included in this study arrived at the emergency department more than six hours after symptom onset. Table 1 lists the fundamental sociodemographic and clinical traits in detail. Variables such as marital status, family living conditions, and mode of transportation to the hospital showed little variation, with most cases clustered in a single category. As a result, chi-square tests and inferential statistical analysis were not performed.
Analyzing gender differences in delayed hospital arrival, 57.7% of female patients experienced delays exceeding six hours, compared to 42.3% of male patients. Additionally, an age-related trend was observed, with 57.3% of patients older than 58 years arriving at the emergency department after more than six hours. Educational background also influenced delays in seeking treatment. Among patients with prolonged arrival times, 68.7% were illiterate, while 27.3% had completed 10 years of schooling, and only 4% had attained higher education. Regarding myocardial infarction type, among patients with delayed arrival times, 57.7% had anterior MI, while 21.6% presented with inferior MI, and 20.7% had posterior MI, as shown in

Table 1 These findings highlight the influence of age, education, and socioeconomic factors on treatment delays in acute myocardial infarction cases.Reasons for delays are shown in Table 2 and Fig 1-4 among the delayed patients, about 134(59%) patients were not familiar with the symptoms of MI having poor or
no understanding of it, while 13.2% and 11% were having lack of transportation and traffic issues respectively. However, some of them were facing financial difficulties.

	N	
Gender		
Male	131	57.7
Female	96	42.3
Age	Mean ±SD=58.0 ±11.32	
<58	97	42.7
>58	130	57.3
Educational Level		
Illiterate	156	68.7
Matric Level	62	27.3
Higher Education	9	4.0
Marital Status		
Married	197	86.8
Single	30	13.2
Living with family		
Y	222	97.8
N	5	2.2
Socioeconomic Status		
Low	40	17.6
Middle	159	70.0
High	28	12.3
Occupation		
Employed	41	18.1
Unemployed	182	80.2
Retired	4	1.8
AMI type		
Anterior	131	57.7
Inferior	49	21.6
Posterior	47	20.7
History Of CAD/CABG/PCI		
Y	78	34.4
N	149	65.5
Familiarity Of MI Symptoms		
Not at All Familiar	134	59.0
Slightly Familiar	62	27.3
Moderately Familiar	11	4.8
Very Familiar	20	8.8
Visit to ER		
Self	168	74.0
Ambulance	59	26.0
Hypertension		
Y	129	56.8
N	98	43.2
Diabetes Miletus		
Y	131	57.7
N	96	42.3

Table 1

Table. 2

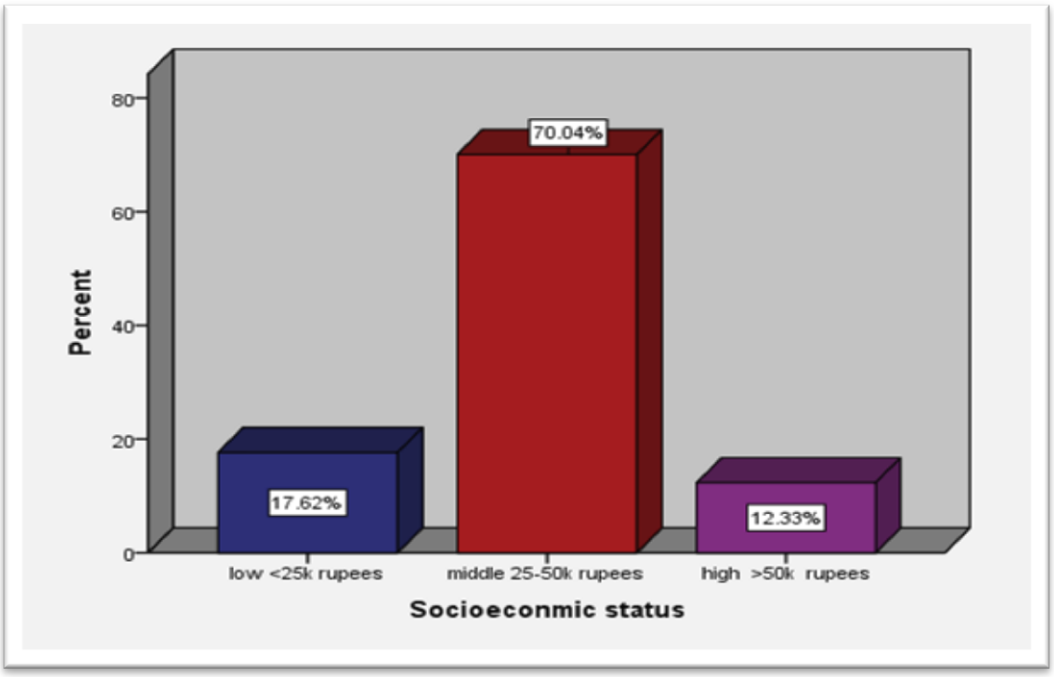

Fig:1

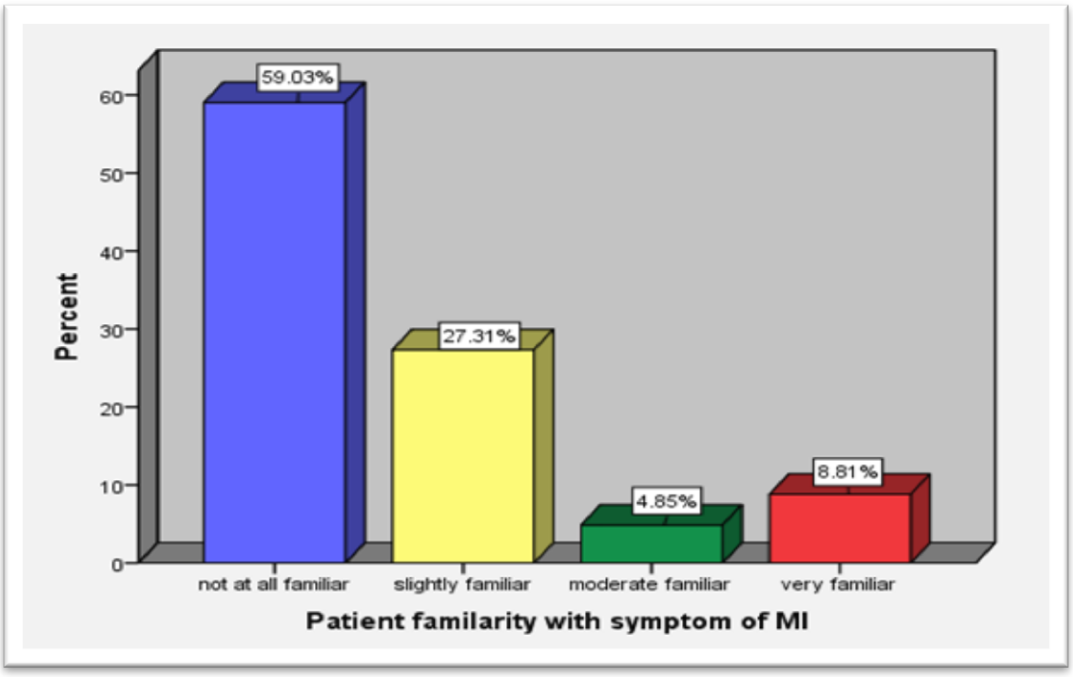

Fig: 2

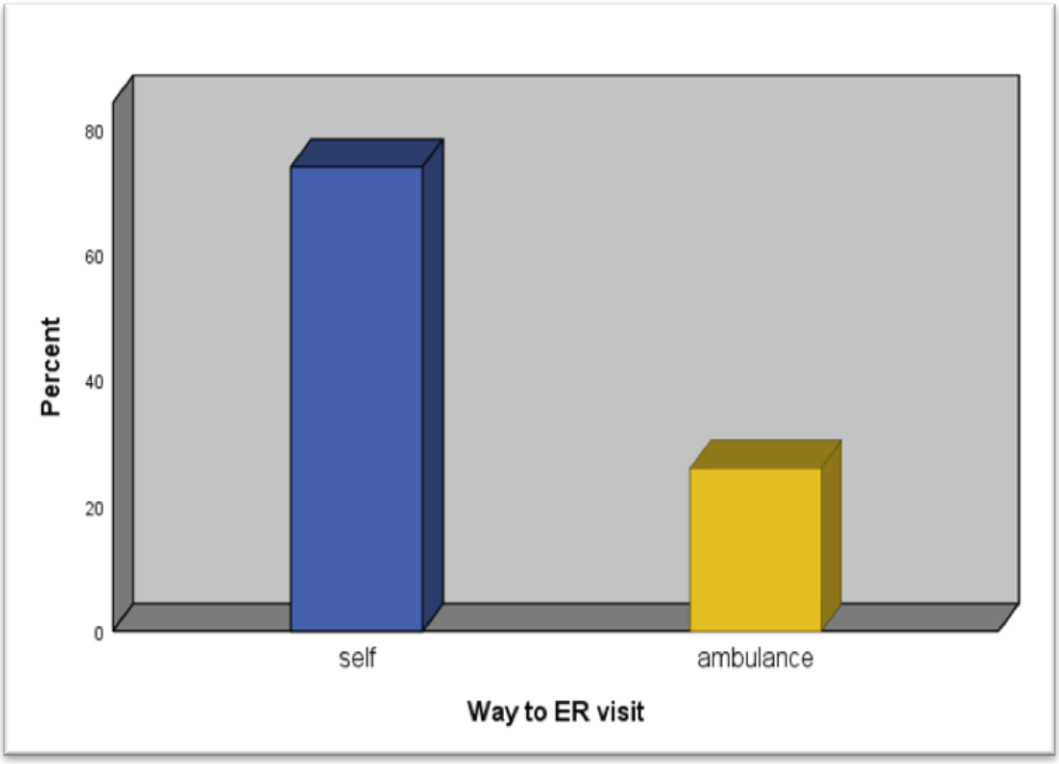
Percent
80
60
40
20
0
self
ambulance
Way to ER visit

Fig: 3

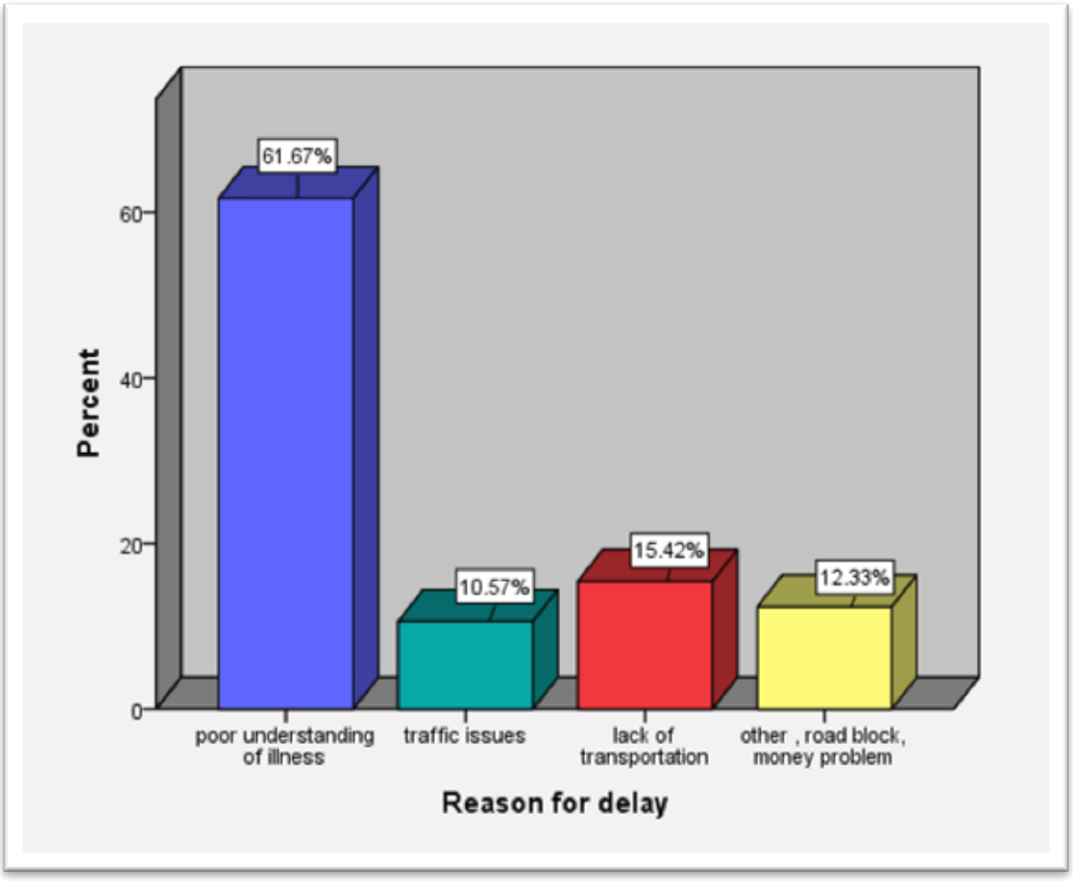
Percent
60
40
20
0
61.67%
10.57%
15.42%
12.33%
poor understanding of illness
traffic issues
lack of transportation
other , road block, money problem
Reason for delay

Fig. 4

DISCUSSION

The findings of this study offer crucial insights into the demographic profile, health status, and healthcare accessibility of the patient population. The results indicate that a significant proportion of acute myocardial infarction (AMI) patients experienced delayed arrival at the emergency department, primarily due to a lack of awareness regarding myocardial infarction (MI) symptoms. Given that timely intervention is essential for reducing mortality, implementing targeted educational programs to enhance symptom recognition and promote prompt medical care is imperative (14).

Given that the majority of the population in this study involves older persons, it is expected that chronic illnesses including diabetes, hypertension, and cardiovascular disorders are more common in these age groups. Given that older populations are generally at greater risk for these conditions, it is crucial to ensure that healthcare systems are adequately prepared to meet their needs, especially in terms of preventive care, timely diagnoses, and treatment options (15).

Additionally, the slight male dominance (57.7% male vs. 42.3% female) mirrors broader trends in cardiovascular disease prevalence, where men tend to be diagnosed at earlier ages, but women catch up after menopause, highlighting the need for gender-specific health interventions. The high proportion of illiterate participants (68.7%) and those with only a matric-level education (27.3%) points to a significant gap in educational attainment within the sample. This is concerning, as lower education levels are often associated with reduced health literacy, which can hinder the understanding of medical conditions, preventive health measures, and the importance of treatment adherence. This finding aligns with the 59% of participants who reported poor understanding of the symptoms of myocardial infarction (MI), emphasizing the need for targeted health education and awareness programs, particularly for those with limited formal education. Furthermore, the socioeconomic status of the sample is predominantly middle-income, with 70% earning between 25,000 and 50,000 rupees (16,17).

A relatively small proportion of participants are in the high-income category, suggesting that many respondents may face economic barriers in accessing healthcare. This could impact their ability to afford regular medical checkups, medications, and other necessary treatments. About 17.2% of respondents reported delays due to lack of transportation further reinforce the idea that economic constraints and logistical issues may significantly affect healthcare access in this group (18,19).

A notable finding is the high prevalence of chronic conditions in this population, with 57.7% of participants reporting a history of diabetes and 56.8% a history of hypertension. These conditions are well-known risk factors for cardiovascular diseases and could partly explain the high incidence of myocardial infarction (MI) observed in the study, with 57.7% of participants having experienced an anterior wall MI. The fact that 34.4% of participants have a history of CAD, PCI, or CABG further underscores the high burden of cardiovascular diseases in this population. These findings suggest that ongoing management of chronic conditions is critical, and interventions focused on controlling risk factors such as hypertension, diabetes, and lipid levels could significantly reduce the incidence of acute cardiovascular events (20,21).

The data on familiarity with the symptoms of MI is particularly concerning, as 59% of participants were not at all familiar with the signs of an impending heart attack. This lack of awareness is troubling, as early recognition of MI symptoms is essential for seeking timely medical care, which can improve outcomes. The relatively low level of familiarity suggests that targeted health education campaigns, particularly for older adults with limited formal education, are urgently needed to improve health literacy in this group (22,23).

In terms of healthcare access, the fact that 74% of participants reached the emergency room (ER) by themselves, while 26% required an ambulance, suggests that most patients either did not recognize the severity of their symptoms or faced barriers to timely transportation. Delays in seeking medical care are a significant concern, with poor understanding of the illness (59%) and lack of transportation (17.2%) cited as the most common reasons for delays. These findings highlight the critical need for public health interventions that both educate patients about the early warning signs of MI and improve access to emergency medical services, particularly for those in rural or economically disadvantaged areas (24,25).

The data also suggests several structural barriers to timely medical intervention. Aside from the mentioned lack of awareness and transportation issues, the 11% of participants who reported traffic-related delays and the 12.8% citing roadblocks or financial problems suggest that external factors can also contribute to delayed care. These barriers are exacerbated in low-income populations, where transportation infrastructure may be inadequate, and financial constraints can prevent people from seeking medical help promptly. These findings align with the growing body of research suggesting that delays in seeking care, especially in acute cases like MI, are linked to poorer health outcomes and higher mortality rates (26,27).

The results of this study underscore several key areas for policy and healthcare system improvements. First, enhancing health literacy is crucial, particularly for older adults with lower educational levels. Public health campaigns focused on MI symptoms, diabetes, hypertension, and other cardiovascular risk factors should be prioritized. These campaigns should be tailored to the literacy levels of the target population and use multiple channels of communication, such as community outreach, radio, and visual aids, to ensure widespread understanding (28).

Second, addressing transportation and economic barriers to care is essential. This could involve improving emergency medical services in underserved areas, as well as providing subsidies or low-cost transportation options for low-income patients. Additionally, integrating mobile health services, telemedicine, and community health workers could help bridge the gap in healthcare access. Lastly, the high prevalence of diabetes and hypertension in this group suggests the need for enhanced management of these conditions. Primary care providers should focus on early screening, regular monitoring, and comprehensive care plans that address both lifestyle modifications and medication adherence. Integrating mental health support and addressing financial barriers to care could also play a significant role in improving health outcomes in this population (29,30).

CONCLUSION

The study determines that the primary reasons for delays in seeking care include a poor understanding of the MI symptoms and a lack of transportation. Overall, the data highlights significant gaps in health awareness and barriers to timely healthcare access. Improving education about health conditions, especially MI, and addressing transportation can reduce delays in treatment and improve health outcomes for this population. This study has certain limitations. The sample was drawn from two tertiary care hospitals in Peshawar. Due to time constraints and the refusal of some patients to provide informed consent, the sample size remained limited. This restriction reduced the feasibility of applying more advanced inferential statistical methods, potentially affecting the robustness of the results. Additionally, as a cross-sectional study, it does not establish causality, and the long-term impact of factors influencing delayed emergency department arrival requires further investigation through longitudinal research.

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