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Knowledge and Prehospital Delay for Elderly Patients Presenting with Acute Myocardial Infarction Undergoing Primary Percutaneous Coronary Intervention.

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Abstract
Background: Myocardial infarction is the leading cause of global morbidity and mortality. More than 3 million individuals develop ST-segment elevation myocardial infarction yearly. Timely management of myocardial infarction is curious to improve survival and outcomes. **Aim:** To assess knowledge and prehospital delay for elderly patients presenting with acute myocardial infarction undergoing primary percutaneous coronary intervention. **Research design:** Descriptive research. **Setting:** The study was conducted in cardiac catheterization and coronary care unit at Assuit University Heart Hospital. **Sample:** A convenient sample of 208 patients. **Tools**, **Tool I:** Demographic and medical data questionnaire. **Tool (II):** A questionnaire for assessing patient's knowledge about myocardial infarction was collected for all patients. **Results:** 208 patients were included (71.6% males, age 70.1±4.4). 65.9% of patients had poor knowledge about myocardial infarction (< 50%). Also, (85.9%) of patients with poor knowledge reached hospital after more than 6hours from symptoms onset. However, 44.4% of patients with fair or good knowledge reached hospital in less than 2hours. Patients with longer prehospital delays had longer hospital stay and more complications (p-value = 0.045) compared with those who presented earlier. **Conclusion:** The study underscores the critical role of patient knowledge about myocardial infarction in reducing prehospital delay and its impact on hospital stay and clinical outcomes. **Recommendation:** Organize regular awareness programs to educate elderly people about myocardial infarction symptoms and seek prompt medical treatment.

Keywords: Knowledge, Myocardial infarction & Prehospital delay

Introduction:
Globally, myocardial infarction (MI) is a leading cause of human mortality **(Salari et al., 2023)**. Cardiovascular diseases (CVDs), encompassing a spectrum of conditions, pose a significant global health burden, claiming an estimated 17.9 million lives annually **(WHO, 2024).** CVDs represent 32% of all global deaths, 85% were due to MI and stroke. MI is a primary manifestation of CVD, significantly impacts global health, with an estimated 3 million people affected worldwide and over a million deaths annually in the United States alone **(Katari et al., 2023).**

Myocardial infarction arises from an interruption of blood flow to a section of the heart muscle. Coronary artery disease, a leading cause of mortality in the United States, is the primary culprit. Prolonged oxygen deprivation can result in the death and degeneration of myocardial cells **(Shaqran et al., 2024).** The interval between symptom onset and the initiation of medical treatment significantly influences patient prognosis. However, this timeframe is influenced by age. Studies have demonstrated that older patients (aged > 65 years) experience longer delays in seeking pre-hospital care compared to younger individuals **(Bauer et al., 2023).**

Promptly initiating medical interventions is critical for minimizing myocardial damage and optimizing patient outcomes following a myocardial infarction. However, research indicates substantial delays in the pre-hospital recognition and management of MIs **(Holanda et al., 2023)**. Pre-hospital delay, a significant predictor of adverse MI outcomes, represents the period during which myocardial tissue undergoes uncontrolled damage. Recent studies have identified pre-hospital delay as a primary contributor to delayed treatment initiation **(Hussain et al., 2023).** Knowledge of the symptoms of MI is crucial for reducing pre-hospital delays. Increased public awareness facilitates early symptom recognition, prompting prompt action and reducing misinterpretation. This ultimately leads to improved outcomes by minimizing the time before seeking medical assistance **(Novita et al., 2023)**. Accurate symptom recognition and appropriate response significantly decrease the time between symptom onset and reperfusion therapy, contributing to lower MI mortality rates and improved clinical outcomes **(Nadja et al., 2022)**. A lack of knowledge regarding MI symptoms is a primary cause of pre-hospital delays **(Hussain et al., 2023).**

Nurses assume a critical role in the management of acute myocardial infarction (AMI). Prompt and efficient responses are paramount when attending to patients presenting with AMI symptoms. Nurses must swiftly conduct patient assessments, obtain 12-lead electrocardiograms (ECGs), and promptly notify the attending physician. A crucial aspect of the nursing role involves actively engaging patients in their care by promoting and enhancing their adherence to medical instructions. This includes facilitating self-image adjustments, revising daily living routines, and assisting patients in coping with the health implications of the condition through comprehensive patient education **(Ibrahim et al., 2023).**

Significance of the study:

Between 2005 and 2014, the estimated annual incidence of MI in the United States was 605,000 cases (190 cases per 100,000 population), with an additional 200,000 recurrent attacks. On average, a myocardial infarction occurs approximately every 40 seconds in the United States. The average age at the time of the first heart attack was 65.6 years for males and 72.0 years for females **(Heart Association, 2022).** More than 3 million individuals experience ST-elevation myocardial infarction annually **(Salari et al., 2023).**

Research indicates a higher prevalence of MI in individuals over the age of 60. This finding underscores the critical importance of this age group for health policymakers in terms of diagnosis and screening initiatives **(Salari et al., 2023).** In patients experiencing ST-segment elevation myocardial infarction, prolonged pre-hospital delays exceeding two hours have been associated with an increased risk of in-hospital mortality and major adverse cardiovascular events (MACEs) **(Hu et al., 2022)**.

Inadequate public knowledge and awareness regarding the symptoms of MI constitute a significant contribution to pre-hospital delays **(Hussain et al., 2023).** Conversely, accurate symptom recognition and appropriate responses to these symptoms can significantly reduce the time elapsed between symptom onset and reperfusion therapy, thereby decreasing MI mortality rates and positively influencing overall clinical outcomes (**Nadja et al., 2022).**

Aim of the study: To assess knowledge and prehospital delay for elderly patients presenting with acute myocardial infarction undergoing primary percutaneous coronary intervention.

Research question: What is the relation between knowledge and prehospital delay for elderly patients presenting with acute myocardial infarction undergoing primary percutaneous coronary intervention?

Patients and Methods:

Research design: Descriptive research design was used to conduct this study.

Setting: The study was conducted in the cardiac catheterization unit and coronary care unit at Assiut University Heart Hospital.

Sampling: The total number of elderly patients admitted to cardiac catheter unit at Assiut University Heart Hospital with ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention during 2022 were 450.

Sample: The study included a convenient sample of 208 patients (males and females)

Using **Steven K. Thompson's** equation to calculate sample size which includes:

$$n = \frac{N \times p(1-p)}{\left[\left[N-1 \times \left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

N = total number of elderly patients.

Z = confidence level is 0.95.

D =the error ratio is =0.05.

P = the property availability ratio and neutral =0.05

Tools of data collection:

Two tools were utilized to collect data for this study:

Tool (I): Structured Interview Questionnaire: This tool developed by a researcher based on a national and international literature review **(Li & Yu, 2018), (Hu et al., 2022), (Rafi et al., 2020) (Nielsen et al., 2017), (Poorhosseini et al., 2019)** and included the following:

Part I: demographic data: This part included patients' demographic data such as age, gender, marital status, residence, job, educational level, address, length of time to reach hospital and distance from hospital. This tool was developed by a researcher based on a national and international literature review and included the following:

Part II:

A. **Medical history**: (It included history (past& present) such as hypertension, diabetes, smoking, hyperlipidemia, history of cardiovascular disease, peripheral vascular disease, history of stroke, MI, previous PCI and Family history of cardiovascular disease.
B. Clinical outcomes including length of hospital stay, any complications, in hospital cardiovascular mortality were recorded

Tool II: Developed by a researcher based on literature review **(Peng et al., 2014), (Khaled et al., 2019), (Li & Yu, 2018), (Fang,2019)** and included:

a- Symptoms of myocardial infarction:
Chest pain or discomfort, shortness of breath, fatigue, nausea or vomiting, palpitation, dizziness, pain in arm or neck or jaw or back, sweating.

b- Recommended action for chest pain or discomfort that lasts for more than a few minutes or comes and goes repeatedly.
c- Method of seeking medical help if suspects of myocardial infarction.
d- Does MI only affect older individuals and is not common in younger people?
e- Lifestyle changes recommended to reduce the risk of MI future events:

Keep regular exercise regimen, limit fats and salts in diet, smoking cessation, taking prescribed medication regularly, regular follow up in outpatient clinic.

The answers to all previous questions were recorded as correct, incorrect or don't know. Knowledge score was calculated based on 18 point scale and reported in different delay groups as poor knowledge if < 50% (score less than 9), fair knowledge 50-70% (score from 9 to13) and good knowledge if > 70% (score more than 13).

preparatory phase: Official permission was accomplished from the Dean faculty to the Director of the University Heart Hospital to conduct the study.

Tools development: It was structured by an investigator based on national literature review and adopted from international literature review. **(Hu et al., 2022), (b; Rafi et al., 2020) (Nielsen et al., 2017), (Poorhosseini et al., 2019), (Khaled et al., 2019), (Li & Yu, 2018), (Fang,2019) (Peng et al., 2014)**

Content validity and reliability

Tools validity and reliability were tested by panel of five professional health care providers including four faculty members of gerontological nursing Nursing Faculty of Nursing, Assiut University, and an Lecturer of Cardiovascular Medicine

of Faculty of Medicine, Assiut University who reviewed the tool, for clarity, relevance comprehensive, understanding, applicability and easiness.

Reliability of the tools was measured by Cronbach's alpha which was (0.837).

Pilot study: A pilot study was conducted on 10% of patients (21 patients) to evaluate the clarity, feasibility and applicability of tools. Carrying out the pilot study gave the investigator experience to deal with the included subjects, and the data collection tools. Subjects who were shared in the pilot study were included in the actual study sample.

Ethical considerations:

- The research proposal was approved by the Ethical Committee in the Faculty of Nursing, Assiut University in October 2023 with ethical number (1120230685)
- There were no risks involved in studying patients during the application of the research.
- The study followed common ethical principles in clinical research.
- The study carried out after obtaining the official permissions from the heads of the selected hospital and department.
- Oral consent was obtained from patients or their legal guardians who were willing to participate in the study, after explaining the nature and purpose of the study.
- Confidentiality and anonymity were assured.
- Study patients had the right to refuse to participate and/or withdraw from the study without any justification.
- Study patients' privacy was considered during the collection of data.

Fieldwork phase

The investigator attended the mentioned setting four days per week during the morning and afternoon shifts to collect relevant data from studied elderly patients from the 1st of January 2024 and ended on the 30th of June 2024; data were collected from the previous mentioned setting for six months. The approximate time spent during the filling of sheet was around 30-40 minutes. The investigator greeted patients, introduced self, explained the purpose of study to studied elderly patients prior to any data collection and received verbal consent to take part in study on a voluntary basis. The data were obtained through patients' interviewing preoperatively and postoperatively after translating sheet into Arabic language. Assessment of demographic characteristics of studied elderly patients was done by using tool one (part1). Assessment of medical data was completed by using tool I (part 2). Assessment of patient's symptoms of myocardial infarction, patient's knowledge about symptoms of MI, the recommended action for chest pain, method of seeking medical help and lifestyle changes recommended to reduce the risk of MI was done by using tool II. All patients monitored for the occurrence of complications and length of stay through visiting coronary care unit. After finishing the assessment, the investigator clarified to all patients any wrong or missing information about MI and how to reduce prehospital delay. Also emphasized the importance of immediately seeking medical help and follow up as scheduled.

Statistical analysis:

The collected data was organized, categorized, coded, tabulated and analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Data was presented in tables and figures using numbers, percentages, means, standard deviation and Chi-square and Pearson test was used in order to find an association between variables. Statistical significant was considered at P-value < 0.05.

Results:

Table (1): Distribution of demographic and medical data for elderly patients with myocardial infarction. (n=208)

Demographic data	No	%
Age group		
From 60 - >70 years	132	63.5
From 70 -75 years	50	24.0
More than 75 years	26	12.5
Mean ± SD(range)	**70.14±4.4(62-87)**	
Gender		
Male	149	71.6
Female	59	28.4
Marital status		
Single	2	1.0
Married	128	61.5
Widowed or widower	68	32.7
Divorced	10	4.8
Educational level		
University or postgraduate	18	8.7
Secondary school	74	35.6
Basic education	30	14.4
Read and write	29	13.9
Uneducated	57	27.4
Occupation		
Employee	85	40.9
Worker	48	23.1
Freelancer	17	8.2
Farmer	15	7.2
Housewife	43	20.7
Residence		
Urban	119	57.2
Rural	89	42.8
Living with		
Alone	4	1.9
with wife /husband	20	9.6
with family	184	88.5
Distance from hospital /KM		
Less than 25 K.M	97	46.6
More than 25 K.M	111	53.4
Hypertension	98	47.1
Diabetes	85	40.9
Hyperlipidemia	88	42.3
History PCI	29	13.9
Stroke	4	1.9
Smoking		
Not smoker	85	40.9
Currently smoker	79	38.0
Stopped smoking	44	21.2
COPD	19	9.1
IHD	51	24.5
peripheral vascular disease	10	4.8
History of acute myocardial infarction (AMI)	28	13.5
Family history of cardiovascular disease	101	48.6

COPD: chronic obstructive pulmonary disease, IHD: ischemic heart disease, PCI: percutaneous coronary intervention

Table (2): Distribution of elderly patients' level of knowledge about MI symptoms and lifestyle changes recommended to reduce the risk of future MI events. (n=208)

	No.	%
recognizing the symptoms of myocardial infarction		
Chest pain or discomfort		
Incorrect	15	7.2
Correct	193	92.8
Shortness of breath		
Incorrect	60	28.8
Correct	148	71.2
Fatigue or weakness		
Incorrect	168	80.8
Correct	40	19.2
Nausea or vomiting		
Incorrect	163	78.4
Correct	45	21.6
Palpitations or irregular heartbeat		
Incorrect	184	88.5
Correct	24	11.5
Dizziness or lightheadedness		
Incorrect	182	87.5
Correct	26	12.5
Pain in the arms, neck, jaw, or back		
Incorrect	64	30.8
Correct	144	69.2
Diaphoresis		
Incorrect	143	68.8
Correct	65	31.3
Recommended action for chest pain or discomfort that lasts for more than a few minutes or comes and goes repeatedly		
Incorrect	73	35.1
Correct (seek immediate medical help)	135	64.9
Method of seeking medical help if suspects of a myocardial infarction		
Incorrect	4	1.9
Incomplete correct	183	88
Complete correct	21	10.1
MI only affects older individuals and is not common in younger people.		
Incorrect	73	35.1
Correct	135	64.9
lifestyle changes recommended to reduce the risk of MI future events		
Keep regular exercise regimen		
Incorrect	186	89.4
Correct	22	10.6
Limit fats and salts		
Incorrect	101	48.6
Correct	107	51.4
Follow up with outpatient clinic		
Incorrect	134	64.4
Correct	74	35.6
Smoking cessation		
Incorrect	179	86.1
Correct	29	13.9
Take prescribed medication regularly		
Incorrect	46	22.1
Correct	162	77.9
Don't know	32	15.4

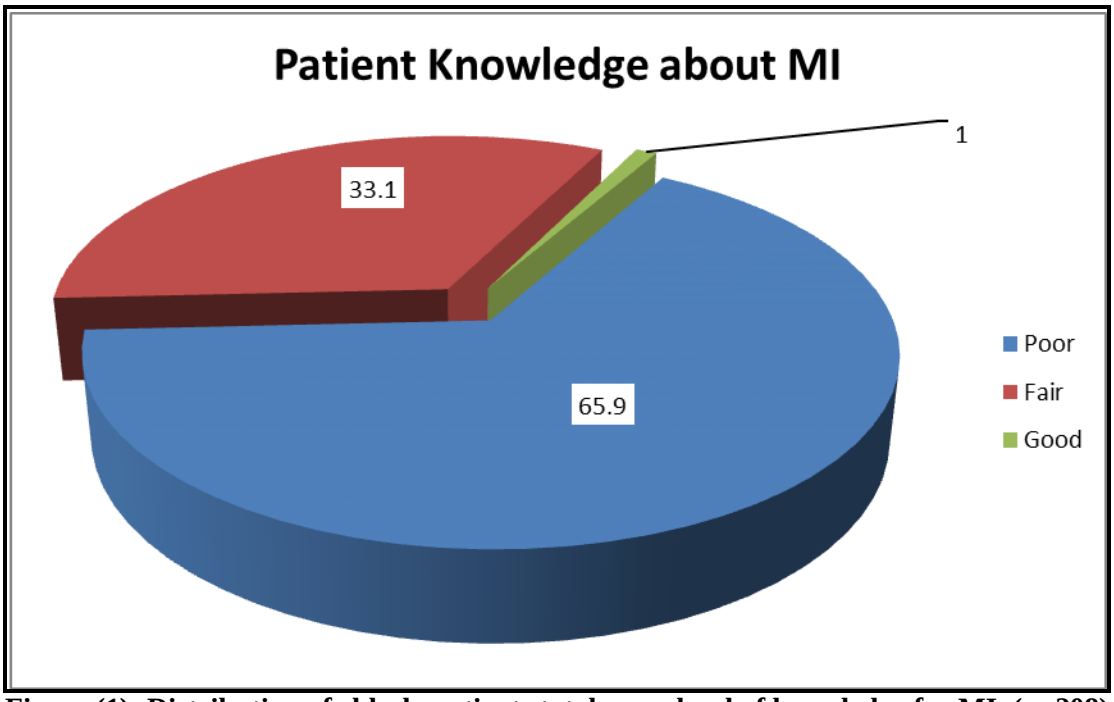

Figure (1): Distribution of elderly patients total score level of knowledge for MI. (n=208)

Table (3): Relations between patient knowledge and prehospital delay for elderly patients with myocardial infarction (n=208)

	Less than or Equal 2h (n=36)		from 2-6 h (n=108)		More than 6h (n=64)		X2	P.value
	No	%	No	%	No	%		
Patient Knowledge about MI								
Poor	20	55.6	92	85.2	55	85.9	20.53	0.000***
Faire	16	44.4	14	13.0	9	14.1		
Good	0	0.0	2	1.9	0	0.0		

Significant level at P value < 0.05. ***Significant level at P value < 0.01.*

Table (4): Relations between post-operative data and prehospital delay for elderly patients with myocardial infarction(n=208)

	Less than or Equal 2 h (n=36)		from 2-6 h (n=108)		More than 6h (n=64)		X2	P. value
	No	%	No	%	No	%		
Length of hospital stay								
Less than 48 h	33	84.6	64	57.7	2	4.8	2.80	**0.000*** **
More than or equal 48 h	6	15.4	47	42.3	40	95.2		
Complications 2								
No Complication	33	91.7	94	87.0	48	75.0	7.97	0.093 ns
One Complication	3	8.3	8	7.4	8	12.5		
More than 1 Complication	0	0.0	6	5.6	8	12.5		
Complications 3								
Yes	3	8.3	14	13.0	16	25.0	6.21	0.045*
No	33	91.7	94	87.0	48	75.0		
Cardiac death								
Yes	6	16.7	10	9.3	11	17.2	2.76	0.252 ns
No	30	83.3	98	90.7	53	82.8		

Significant level at P value < 0.05.
***Significant level at P value < 0.01.*
ns: no statistically significant difference

Table (1): Shows that this study was conducted on 208 patients with a mean ± SD of age 70.14±4.4 years old. Regarding gender about 71.6 % of the studied elderly patients were male. Regarding marital status 61.5% of studied elderly patients were married. Concerning their educational level, 55.7 % of the elderly patients studied were uneducated or had basic education. As regards residence, 57.2% of studied elderly patients were living in urban areas. Regarding distance from hospital 53.4% of studied elderly patients were more than 25 K.M. Regarding hypertension 47.12% are hypertensive. Regarding diabetes 40.87% of studied elderly patients are diabetic. Regarding hyperlipidemia 42.31% have history of hyperlipidemia. Regarding smoking, about 60% of elderly patients were smokers or stopped smoking less than 1 year.

Table (2): Shows that most of studied elderly patients 92.8% exhibited correct answer that chest pain or discomfort is common symptoms of MI. Regarding seeking of medical help 88% of studied elderly patients' answers was Incomplete correct.

Figure (1): Presents in total 65.9% of elderly patients had poor knowledge about MI, 33.1 % had fair knowledge however only 1% had good knowledge. This has been reflected clearly on prehospital delay length. 85.9 % of elderly patients with poor knowledge arrived to hospital after more than 6hrs, however 78% elderly patients with fair or good knowledge arrived in less than 6hr.

Table (3): Reflects that there were statistical significance differences between prehospital delay time and patients' poor knowledge.

Table (4): Illustrates that there were statistical significance differences between prehospital delay time and Length of hospital stay (LOS), presence of complications with P value (0.000, 0.045) respectively. This means that the longer the prehospital delay the longer the hospital stay and the more complications.

Discussion

This study highlights the importance of elderly patients' knowledge about MI on prehospital delay which reflects on outcomes of these patients' management. In the current study we included two hundred and eight patients. Their demographic characteristics revealed mean age around seventy years. This result is consistent with earlier research by **Ogushi et al. (2022)**, which found that the average participant age was approximately sixty-seven years.

Risk of MI increases with age due to the accumulation of risk factors such obesity, diabetes, high blood pressure, and atherosclerosis, or plaque deposition in the arteries. Heart disease can occur as a result of these conditions, which are more common in older people. In current study, almost half of patients had history of hypertension, two fifths had history of DM and dyslipidemia. These results are consistent with those of **Rafi et al. (2020) & Seung et al. (2020)**, who mentioned that almost half of the sample under study had hypertension and two-fifths had diabetes and dyslipidemia.

Other risk factors, such as smoking, may also be involved. Nearly two-fifths of the sample under investigation were current smokers, according to the current study. These results are comparable to **Hussain et al. (2023)**, who stated that about 40% of patients were smokers.

About three-quarters of the sample in this study were men, and half of them were employed. A study by **Cha et al. (2022), Abd Elfattah et al. (2022) & Hussain et al. (2023)** supports this observation by stating that around three quarters of the patients under study were male and that half of the patients were employed.

Risky habits that raise the risk of heart disease, such as smoking and eating an unhealthy diet, are more common among men than women. Men are also more likely than women to work in stressful occupations, which increases the risk of myocardial infarction. Additionally, work-related lifestyle factors may have an impact on food, exercise, and sleep patterns-all of which have a significant impact on heart health.

About two thirds of the patients in the current study had poor knowledge about MI, which is consistent with findings from **Hertz et al. (2019), Banharak & Prasankok (2020) & Ibrahim et al. (2023)** who found that more than 60% of the patients had poor knowledge.

Most patients were fully aware of the need for prompt medical attention and were able to identify typical signs of MI, such as shortness of breath and chest pain. This was also noted by **Park (2020) & Alsaab et al. (2023)**, who mentioned that the majority of the sample under study had strong understanding of the common symptoms of MI and how to manage them. However, the majority of the population under study knew very little or nothing about the atypical symptoms of MI, which include diaphoresis, palpitations, nausea and vomiting, lethargy, and dizziness.

This result was also noted by **Birnbach et al. (2020)**, who mentioned that most of the studied elderly patients were unaware of the atypical symptoms of MI. These results were in contrast with **Alsaab et al. (2023)**, who mentioned that over two-thirds of the group under study were aware of the unusual symptoms of MI. This is due to differences in education and cultures of different populations.

In current study, the majority of the studied elderly patients showed poor knowledge about regular exercise and quitting smoking as lifestyle changes to lower the risk of MI. This finding is consistent with that of **Kamal et al. (2019)**, who stated that roughly three quarters of the sample studied had poor knowledge about these changes to lower the risk of MI. However, the majority of studied sample, showed good knowledge about lifestyle changes that reduce the risk of MI, such as limiting salt and fat in the diet and taking prescribed medications on a regular basis. This finding is similar to that of **Kadhim et al. (2022)**, who also found that more than half of the studied sample had good knowledge about these lifestyle modifications.

In current study, poor knowledge has led to longer prehospital delay (85.9% of patients with poor knowledge arrived at the hospital more than six hours after the onset of symptoms). However, 64.4% of patients with fair or good knowledge reached to hospital in less than 2hrs. (p-value = 0.000). These results were consistent with a study by **Ibrahim et al. (2023)** that found that prehospital delay duration was significantly influenced by participants' knowledge.

In our study patients with longer prehospital delay had longer hospital stay (p-value = 0.000), and more complications (p-value = 0.045) compared with those who presented earlier. This finding was in agreement with **Sugiharto et al., (2023)** who reported that about half of their study participants stayed in hospital more than 48hrs. **Mackay et al., (2022)** also reported a significant relation between patient's prehospital delay time and length of hospital stay.

Patients with delayed presentation may have more complications that require extended treatment and monitoring, leading to a longer hospital stay. Moreover, delayed treatment initiation can result in more significant damage, requiring longer recovery periods and increased care needs**. Hu et al., (2022)**, **Oh et al., (2024**) reported a statistically significant difference between the patient's prehospital delay and complications.

Conclusion:

Based on the results of current study; it can be concluded that knowledge has critical role of myocardial infarction (MI) in reducing prehospital delay (PHD) among MI patients. The findings demonstrate a significant correlation between poor MI knowledge and prolonged PHD that increasing the risk of complications and cardiac death. This, emphasizing the need for targeted educational interventions. Improving patients' understanding of MI symptoms, risk factors and treatment options can facilitate timely recognition and prompt medical attention. Healthcare providers should prioritize patient education, focusing on high-risk populations. Public awareness campaigns and community-based initiatives can also enhance MI knowledge, ultimately reducing PHD and improving outcomes.

Recommendations:

- Organize regular awareness programs to educate people about AMI symptoms and the need to seek prompt medical treatment.
- Assess and correct the knowledge and practices of nurses regarding the management of risks in myocardial infarction patients who delayed seeking medical treatment.
- Use the findings of the study by the nurse educator in planning and organizing continuous nursing educational program for the nurses working in clinical as well as the community areas.

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