Assessing Nurses' Knowledge of Acute ST-Elevation Myocardial Infarction Management in Cardiac-Related Wards: A Survey Study

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Research Article

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Abstract

Introduction:

Cardiovascular diseases (CVDs) are responsible for 1 in 5 deaths in the US and are a leading cause of mortality worldwide. Risk factors for CVDs include age, gender, race, lifestyle choices, and health conditions such as hypertension and diabetes. Acute ST-elevation myocardial infarction (STEMI), caused by the blockage of coronary arteries, is an acute critical manifestation of CVDs, with symptoms including chest pain, nausea, and arrhythmia. Nurses are crucial in managing patients with MI and reducing the associated morbidity and mortality. Their knowledge should be regularly updated to align with WHO and AHA guidelines. Herein, we tried to evaluate nurses' level of information regarding myocardial infarction.

Methods

A survey assessing the level of knowledge among nurses working in cardiac-care-related wards about acute ST-elevation myocardial infarction was conducted at Tehran University of Medical Sciences hospitals. We used a questionnaire reviewed and validated by cardiology professors after calculating the CVR (content validity ratio) and CVI (content validity index).

Results

347 nurses (68.9% females and 31.1% males) were included in the survey. Most of the participants had Bachelor's degrees (87.1%). The mean duration of employment and total score were 10.5 years and 10.08, respectively. After scoring the questionnaire, 162 nurses (46.7%) had average scores, while 20 nurses (5.8%) had very poor scores. Those older and with more experience scored better ($P < 0.001$). Nurses of the Cath-Lab department had a statistically significant better score compared to other cardiac-related medical wards. Additionally, post-CCU (coronary care unit) nurses demonstrated the lowest level of knowledge. We identified no statistically significant difference between the level of knowledge and gender, shift time, and academic degree ($p = 0.722$, $p = 0.051$, $p = 0.494$). Additionally, Cath-lab and CCU nurses had a better understanding of door-to-balloon time.

Conclusion

The study evaluated nurses' scientific knowledge and ability regarding acute STEMI care in Tehran University of Medical Sciences hospitals. The results showed that overall, the nurses' knowledge level was average and acceptable. Nurses with more experience and age had better knowledge and ability, especially those working in Lab Cath and CCU departments, than the emergency room and post-CCU nurses. However, a concerning finding was that 27.1% of all nurses scored poorly in this area, indicating a need for further training to improve patient outcomes.

Introduction

Cardiovascular diseases (CVDs) account for one in five deaths in the united states and are the leading cause of mortality in most countries worldwide (1). Various risk factors such as age, male sex, race, unhealthy lifestyle, smoking, diabetes mellitus, hypertension, hyperlipidemia, and positive family history have been associated with CVDs (2). Notably, one of the most critical acute manifestations of CVDs is acute ST-elevation myocardial infarction (MI) which is caused by occlusion of coronary arteries due to the formation of a culprit clot leading to the sudden cessation of blood flow to the myocardium (2, 3). Depending on the extent and location of the injury, complications could vary from mechanical phenomena to electrical abnormalities, such as ventricular tachycardia (VT) and ventricular fibrillation (VF), which are determined as the most common cause of death among patients experiencing a heart attack (4). Symptoms may include chest discomfort or pain, nausea, arrhythmia, diaphoresis, and dyspnea (5). Approximately 18 million deaths per year are due to CVD globally.

Additionally, 46% of all deaths in Iran occur due to CVD (6). Aspirin, Morphine, oxygen, and nitrates are among the primary drugs administered for acute management of STEMI. An optimal reperfusion strategy based on patients' arrival time to the hospital forms the fundament of managing patients with STEMI Patients are treated based on the door-to-needle and door-to-balloon time, with the intention of performing PCI within 120 minutes of their arrival time to the hospital, or administering a fibrinolytic within 30 minutes of their arrival time. It has been proven that shorter time intervals lead to better outcomes. (2) (7).

As nurses are among the primary health care providers encountering patients, they must have sufficient knowledge about the initial management of MI, especially about the door-to-needle and the door-to-balloon time and ensuing complications. Also, nurses have a pivotal place in managing symptoms related to the disease and minimizing the difficulties associated with MI.

Nurses' conformance to treatment protocols and guidelines has led to a fall in the mortality and morbidity associated with CVD (2, 8–10). World Health Organization (WHO) and American Heart Association (AHA) have delineated the role of nurses in reducing CVD by 25% by the year 2025; therefore, nurses' knowledge should be updated regularly (11). Since there is a paucity of studies with a large sample size, we conducted a survey study assessing nurses' knowledge of myocardial infarction in cardiac-care-related divisions in Iran.

Material and methods

Participants and data collection

We conducted a multi-centered, cross-sectional, descriptive-analytic survey study to assess the level of knowledge about ST-elevation myocardial infarction among nurses working in cardiac-care-related departments of Tehran University of Medical Sciences hospitals. Three hundred forty-seven nurses enrolled in our study. We included nurses who worked in Cath-lab (Catheterization laboratory), CCU

(coronary care unit), post-CCU, and emergency department (ED). Unwillingness to participate in the study was our exclusion criterion. All nurses were informed of the study objective, and that participation was voluntary and anonymous. Additionally, verbal consent was obtained from individuals participating in the study.

The Survey

The questionnaire was comprised of two sections (Appendix 1). The first part of which included nurses' demographics such as age, sex, level of academic education (Bachelor's, Master's, Ph.D.), duration of employment (years), working division (CCU, post-CCU, Cath-lab, ED), and shift time (morning, evening, night). The second part included 15 questions measuring the scientific and executive capabilities of the subjects regarding diagnosis and management of ST-elevation MI. Each question was given one score, while one had a score of two. After scoring the questionnaires, the empowerment of the participants was categorized as follows: (very poor = 0–4, poor = 5–8, average = 9–12, good = 13–16).

A group of 10 distinguished cardiology professors from the Tehran University of Medical Sciences reviewed the questions in person after an initial monitoring process to assess the questionnaire's validity and reliability. They evaluated the questions' appropriateness and relevance using a specific table (Table 1). The sentences related to each question included "necessary," "helpful but not necessary," and "not necessary." Then, the content validity ratio (CVR) and content validity index (CVI) was determined using the Aloushe method for each question (12, 13). The following formula was utilized for CVR, and 0.49 was defined as the cut-off number based on Hajizade's study (12). In this formula, N is the total number of experts. Ne is the number of experts who answered the option "necessary." All questions had a CVR of more than 0.49, so no question was deleted.

$$CVR = Ne - \frac{N}{2} / \frac{N}{2}$$

Table 1
The table provided to experts to check the validity of questions

Question number	CVR[a]			CVI[b]			
	Necessary	Useful but not necessary	Not necessary	Relevant	Relevant but needs review	Needs serious review	Irrelevant
Question							

a: content validity ratio; b: content validity index

To calculate CVI, based on Table 1, each statement was calculated by dividing the number of experts who agreed with the statement ranked 3 and 4 by the total number. Based on Yaghmaei's study (13), a CVI of more than 0.79 was accepted. All questions had a CVI of more than 0.79, so no inquiry needed to be deleted.

Statistical Analysis

We utilized the SPSS version 26 software package to conduct the statistical analysis. The normality of numerical variables was assessed using the Shapiro-Wilk test. Parametric tests such as the Independent T-test and ANOVA were employed for normal variables to compare groups. In contrast, n tests, including the Mann-Whitney and Kruskal-Wallis test, were used for non-normal variables. We used the Chi-squared and Fisher's exact tests to investigate the relationship between categorical variables. Categorical variables were presented as percentages and proportions. At the same time, continuous data were summarized using mean and standard deviation (SD) for normal variables and median and interquartile range (IQR) for non-normal variables. We considered a p-value of less than 0.05 to be statistically significant.

Results

Three hundred forty-seven consecutive nurses were recruited in the study. Most nurses were women (68.9%) compared to men, comprising 31.1% of the participants. Also, most of the nurses in the study had Bachelor’s degrees (85.9%). The average age and length of employment were found to be 34.58 ± 8.18 and 10.50 ± 7.79 years, respectively. Regarding the overall score, 5.8% had a very weak score, 21.3% weak, 46.7% average, and 26.2% good. Table 2 demonstrates nurses’ demographics and overall score range across participants’ characteristics.

Table 2
Nurses' demographics

		Frequency	*Percent*	*Score Range (0–4)*	*Score Range (4.1-8)*	*Score Range (8.1–12)*	*Score Range (12.1–16)*
Sex	Male	108	31.1	10	20	44	34
	Female	239	68.9	10	54	118	57
	Total	347	100	20	74	162	91
Academic Degree	Bachelor's	298	85.9	18	69	129	82
	Master's	43	12.4	1	4	29	9
	PhD	1	0.3	-	-	-	-
	Total	342	98.6	-	-	-	-
	Missing	5	1.4	-	-	-	-
Working division	ED[a]	119	34.3	14	31	40	34
	Cath-Lab[b]	51	14.7	0	7	20	24
	Post-CCU[c]	79	22.8	5	29	31	40
	CCU	98	28.2	1	7	71	19
	Total	347	100	20	74	162	91
Shift Time	Morning	100	28.8	2	21	48	29
	Evening	19	5.5	3	2	10	4
	Night	69	19.9	4	16	27	22
	Morning and evening	58	16.7	0	12	32	14
	Morning and Night	2	6	-	-	-	-
	Evening and Night	47	13.5	7	12	19	9
	Morning and Evening and Night	40	11.5	2	9	18	11
	Total	335	96.5	-	-	-	-
	Missing	12	3.5	-	-	-	-

a: Emergency department; b: Catheterization–Laboratory; c: Critical Care Unit

Table 3 shows the median score comparison between different groups. The overall score was not considered statistically significant between males and females (P = 0.72). Also, no statistically significant difference was identified between nurses with Bachelor's and Master's degrees. Concerning working division, our study showed a statistically significant difference across nurses working in different medical wards (p < 0.001). Table 4 demonstrates a head-to-head comparison of the overall scores in different working divisions. While there was a non-significant difference between nurses working in ED and CCU (p = 0.779) and those who worked in post-CCU (p = 0.99), nurses who worked in Cath-Lab had a statistically significant higher score compared to nurses in ED and Post-CCU (p < 0.001). As depicted in Table 3, the difference in mean score between different shift times trended toward the borderline p-value but did not reach statistical significance (p = 0.051).

Table 3
Mean and Median score comparison across different demographics

	Number	**Median (IQR)**	**P-Value**
Male	239	10 (8–12)	0.722
Female	108	10.5 (8–13)	
Bachelor's	298	10.5 (8-12.5)	0.494
Master's	44	10.5 (8-12.5)	
ED[a]	105	10 (6-12.5)	< 0.001
Cath-lab[b]	51	12 (10–14)	
Post-CCU[c]	70	9 (7-11.5)	
CCU	98	10.5 (9.5–12)	
	Number	**Mean ± SD**	**P-Value**
Morning	100	10.60 (2.96)	0.051
Evening	19	9.52 (3.23)	
Night	69	10.08 (3.08)	
Morning and Evening	58	10.42 (2.73)	
Evening and Night	47	8.92 (3.41)	
Morning and Evening and Night	40	10.06 (2.94)	

Table 4
Head-to-head comparison of the overall score between different medical divisions

Dunn's multiple comparisons tests	*Mean rank diff*	*P-Value*
Emergency vs Cath-Lab[a]	−65.9	< 0.001
Emergency vs Post CCU[b]	19.9	> 0.999
Emergency vs CCU	−20.7	0.779
Cath-lab vs post-CCU	85.8	< 0.001
Cath-Lab vs CCU	45.2	0.053
Post-CCU vs CCU	−40.6	0.044

a: Catheterization Laboratory; b: Critical Care Unit

Table 5
Comparison of the mean age and duration of employment across different score ranges

	Score Range	Number	Mean	Standard Deviation	P-Value
Age (years)	0–4	20	29.85	4.626	< 0.001
	5–8	74	34.09	8.545	
	9–12	160	35.31	7.832	
	13–16	91	34.74	8.829	
Duration of employment (years)	0–4	20	6.075	4.1367	< 0.001
	5–8	73	10.062	8.2052	
	9–12	161	10.643	7.4780	
	13–16	90	10.850	8.4066	

Moreover, we observed a statistically significant difference between the mean age of nurses and duration of employment with their overall score (Table 5). Those older and with more work experience scored better than those without ($p < 0.001$*). Head*-to-head comparison is shown in Table 6.

Table 6
Head-to-head comparison of age and duration of employment across different score ranges

Dependent Variable	Score Range (I)	Score range (J)	Mean Difference (I-J)	P-Value
Age (years)	0–4	5–8	-4.245	0.026
		9–12	-5.462	0.000
		13–16	-4.886	0.005
	5–8	9–12	-1.218	0.879
		13–16	-0.642	0.998
	9–12	13–16	.0576	0.996
Duration of employment (years)	0–4	5–8	-3.9866	0.023
		9–12	-4.5679	0.001
		13–16	-4.7750	0.003
	5–8	9–12	-0.5812	0.996
		13–16	-0.7884	0.991
	9–12	13–16	-0.2071	1.000

Tables 7 and 8 compare knowledge about door-to-balloon time and door-to-needle time among various divisions. According to these results, Cath-Lab nurses had better knowledge about door-to-balloon time than CCU nurses (OR = 2.10), and post-CCU nurses had less understanding than CCU nurses (OR = 0.44). Furthermore, we identified no difference between divisions regarding the knowledge about door-to-needle time (P-Value = 0.166).

Table 7
Knowledge about door-to-balloon time among divisions

	True	False	OR (95%CI)	P-Value
ED	35	84	1.15 (0.63–2.09)	0.639
Cath-Lab	22	29	2.10 (1.03–4.28)	0.041
Post-CCU	11	68	0.44 (0.20–0.97)	0.043
CCU	26	72	1	

Table 8
Knowledge about door-to-needle time among divisions

	True	False	P-Value
ED	53	66	0.166
Cath-Lab	24	27	
Post-CCU	34	45	
CCU	31	67	

Discussion

This survey-based, cross-sectional study evaluated the knowledge of 347 cardiac-care-related nurses at Tehran University of Medical Sciences hospitals regarding ST-elevation myocardial infarction. Our study highlighted that 26.2% of nurses had “good knowledge” while 46.7% had “average knowledge,” 21.3% had “poor knowledge” and 5.8% had “very poor knowledge.” Additionally, those older and with more years of experience scored better than the younger ones and those with less experience. Regarding work division, Cath-lab, and CCU nurses were considered more knowledgeable and demonstrated better knowledge about door-to-balloon time. Moreover, we identified no differences between the level of knowledge and gender, academic degree, and shift time.

These results align with several studies which demonstrated a significant difference between age, duration of employment, and level of knowledge (1, 8, 10). This implies the importance of experience as a specific factor when allocating nurses to various medical wards. Therefore, junior nurses should start working in general wards rather than more specialized ones like CCU and Cath-Lab. Then as they get more experienced, they can pursue a career in critical wards demanding sound knowledge and skill.

Our study yielded results consistent with two prior studies, indicating a notable disparity in nurses' knowledge across various wards. According to these studies, CCU and Emergency nurses demonstrated a better understanding of myocardial infarction than fellow nurses (1, 10). To our knowledge, our study was the first to assess and compare the level of knowledge in cardiac-care-related divisions. Based on our results, nurses in Cath-lab scored better than ED and post-CCU nurses. Besides, CCU nurses were more knowledgeable than post-CCU nurses. In the Cath-Lab's critical atmosphere, nurses are tasked with an essential duty to possess an expert understanding of clinical cardiac assessment and rhythm analysis. Any nurse working in divisions caring for patients with cardiac conditions must also be intimately acquainted with the routine management of STEMI patients. Such knowledge is indispensable for providing top-notch patient care and ensuring positive outcomes.

In contrast to our findings, another study by Nasiri et al. reported a statistically significant difference between sex and level of knowledge, showing women had better knowledge. This result might be due to

several factors. First, their sample was mostly comprised of women; second, they did not have a large sample size, which could undermine the generalizability of their results.

Minimizing CVD mortality and morbidity by 25% by 2025 is a global objective (14). Nurses and advanced practice nurses have played significant roles for over 40 years in managing single and multiple risk factors like hypertension, smoking, lipids, and diabetes. They have also been involved in dealing with the after-effects of chronic diseases like coronary artery disease and heart failure through specialized clinics and programs in primary care, worksites, and the cardiac rehabilitation (15); It is imperative to acknowledge the significance of having well-informed nurses with adequate awareness of myocardial infarction, and hence, it should not be overlooked, We recommend mandatory supervised rotations for less experienced and junior nurses in Cath-lab settings to enhance their technical proficiency and overall competency. Given this environment's complexities and high-stakes nature, hospitals must implement protocols for training nurses in this critical area.

Limitations:

Our study has several limitations. First, although it was conducted among several well-known cardiology hospitals affiliated with the Tehran University of Medical Sciences, it was limited to only one university, which could undermine the generalizability of the findings. Second, some data were missing, which may have biased the results. Additionally, our study was survey-based, which is not considered a high level of evidence among different study types

Conclusion

Cardiac-care-related nurses' scientific ability (knowledge level) in Tehran University of Medical Sciences hospitals concerning acute ST-elevation myocardial infarction care was generally acceptable and average. Nurses with more significant experience and age tend to exhibit better scientific knowledge and ability than their less-experienced colleagues, particularly those working in Lab Cath and CCU departments, compared to the emergency room and post-CCU nurses. However, it is a matter of concern that 27.1% of all nurses scored very poorly and poorly in this area. Therefore, healthcare professionals must receive more training to improve patient outcomes.

Abbreviations

CVD
Cardiovascular disease
MI
Myocardial Infarction
STEMI
ST-elevation myocardial infarction
VT

Ventricular Tachycardia
VF
Ventricular Fibrillation
PCI
Percutaneous coronary intervention
WHO
World Health Organization
AHA
American Heart Association
CCU
Critical care unit
Cath-lab
Catheterization laboratory
ED
Emergency Department
CVI
Content validity Index
CVR
Content Validity Ratio.

Declarations

Ethics approval and consent to participate: All the methods in this study were performed under the Declaration of Helsinki and the relevant guidelines and regulations. All participants had informed consent to participate in the study. The ethics committee approved this study and its methods at the Tehran University of Medical Sciences, Tehran, Iran (IR.TUMS.IKHC.REC.1400.153).

Consent for publication: Not applicable.

Availability of data and materials: All data generated or analyzed during this study are available from the corresponding author upon request.

Competing interests: The authors declare that they have no competing interests.

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Authors' contribution: B.G. designed and conducted the study. F.L. collaborated in the conceptualization and critically edited the first and final drafts. B.F. was involved in data gathering and data processing. A.S. wrote the first and final draft. All authors read and approved the final manuscript.

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