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Systematic review

Prehospital Delay and its Associated Factors in Time-Sensitive Emergencies (Myocardial Infarction and Stroke) Among Residents of Bisha, Saudi Arabia: A Cross-Sectional Study

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Abstract

Background: Early recognition and timely response to myocardial infarction (MI) and stroke are critical for reducing morbidity and mortality. Public awareness and behavioral factors play a key role in prehospital delay. This study aims to assess awareness, intended response toward MI and stroke, and identify sociodemographic and behavioral predictors of delayed decision to seek urgent medical care among adult residents of Bisha, Saudi Arabia. Methods: A community-based analytic cross-sectional study was conducted in Bisha, Saudi Arabia, among 476 adults using convenience sampling with age and gender stratification. Data were collected using a structured questionnaire covering demographics, knowledge of warning symptoms, perceived confidence, behavioral attitudes, and intended help-seeking practices. Chi-square tests were used to identify factors associated with delayed care and intention to call emergency medical services (EMS). Results: Most participants recognized MI 416 (87.4%) and stroke symptoms 398 (83.6%). Immediate help-seeking was reported for MI by 412 (86.6%) and stroke by 420 (88.2%). Although 411 (86.3%) intended to call an ambulance, 129 (27.1%) preferred private transport. Knowledge of the stroke therapeutic window was limited 246 (51.7%). Confidence in symptom recognition was modest. Comorbidity was the only factor significantly associated with EMS use ($p<0.001$). For MI, delayed decision-making was mainly predicted by the belief in waiting for symptom improvement ($p<0.001$). For stroke, female gender ($p=0.046$) and the same behavioral belief ($p<0.001$) were significant predictors, while knowledge and most sociodemographic variables were not. In regression model, male gender reduced delay heartcare seeking for both conditions; comorbidities predicted stroke delay. Waiting for symptom improvement strongly increased delayed decision-seeking in MI and stroke ($p<0.05$). Conclusion: Our study shows that despite good general awareness, gaps in detailed knowledge and delay-promoting beliefs persist. Behavioral factors, rather than knowledge alone, were the main determinants of delayed care. Targeted interventions addressing attitudes toward ambulance use and the risks of waiting are essential to reduce prehospital delay and improve outcomes.

Keywords: Prehospital Delay, Myocardial Infarction, Stroke, Residents, Saudi Arabia

Introduction

Acute myocardial infarction (AMI) and stroke are among the most serious medical crises that require immediate attention. Early treatment has a significant impact on clinical outcomes, and the level of tissue damage grows quickly after symptoms appear. Prompt reperfusion is crucial in myocardial infarction to maintain cardiac muscle viability. This idea is sometimes summed up as "time is muscle," highlighting the fact that treatment delays increase myocardial damage and mortality [1]. Similarly, in stroke care, each minute of untreated cerebral ischemia results in significant neuronal death; this is summed up in the adage "time is brain," which emphasizes the importance of prompt intervention [2] Prehospital delay, which affects treatment eligibility and outcomes for both AMI and stroke, is the time between the start of symptoms and arrival at a medical facility that can provide definitive treatment. It has been shown that prehospital interval delays lengthen the total time to treatment and decrease the efficacy of reperfusion techniques such as thrombolytic therapy for acute ischemic stroke and percutaneous coronary intervention for AMI.[3] For instance, in patients with ST elevation myocardial infarction

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(STEMI), delays in emergency medical services (EMS) have been associated with increased short-term mortality and a longer total time to reperfusion [3,4]. Prehospital delay includes a number of stages, including as the patient's identification and interpretation of symptoms, choice to seek medical attention, EMS activation, and transportation to a suitable institution. Obstacles at any of these stages, such misjudging the intensity of symptoms, not being aware of them, or being reluctant to call emergency medical services, lead to extended delays and less access to life-saving care [5]. Reducing prehospital time intervals has been linked to the use of organized symptom recognition tools and EMS notification protocols in stroke especially, reiterating the need of early detection and rapid emergency response [2]. Public awareness of typical and atypical symptoms of AMI and stroke plays a critical role in decreasing prehospital delay, as recognition of warning signs can prompt rapid activation of EMS and help optimize outcomes. Identification of these determinants and understanding how individuals intend to respond when confronting such emergencies is essential for informing public health strategies aimed at reducing response delays. Studies of intended prehospital behavior provide insight into knowledge gaps, decision making processes, and perceived barriers that may influence care seeking actions in populations at risk. Accordingly, this study aimed to assess awareness, intended response, and factors associated with delayed decision-making in suspected myocardial infarction and stroke among residents of Bisha, Saudi Arabia.

Methods and Materials

Study Design

An analytic cross-sectional study was conducted to assess the level of awareness and intended response toward time-sensitive emergencies (myocardial infarction and stroke) and to identify factors associated with potential prehospital delay among adult residents of Bisha, Saudi Arabia.

Study Area and Period

The study was conducted in Bisha Province, Kingdom of Saudi Arabia between January and February 2026.

Study Population

Adults aged 18 years or older residing in Bisha during the study period were eligible. Healthcare professionals and incomplete responses were excluded. Participants were recruited through online distribution of the questionnaire using convenience sampling stratified by age and gender.

Study Variables

Outcome variables

Intention to call EMS

Delayed decision seeking care for MI

Delayed decision seeking care for stroke

Independent variables

Age

Gender

Education

Income

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Knowledge of MI symptoms

Knowledge of stroke symptoms

Behavioral perceptions

Bias

Several measures were taken to reduce potential bias. The questionnaire was adapted from previously validated instruments to improve measurement validity. Anonymous participation was used to minimize social desirability bias. However, as the study relied on self-reported responses, recall bias and response bias cannot be fully excluded.

Sampling

Sample Size

The minimum required sample size was calculated as 384 participants by using Roasoft calculator (202,096 population size, 95% confidence level, 5% margin of error). To increase statistical power and compensate for incomplete responses, 476 participants were included.

Sampling Technique

A non-probability convenience sampling technique with stratification by age and gender was used to enhance representation across key demographic groups.

This approach aimed to improve representation of different demographic groups compared to simple convenience sampling.

Data Collection

Data were collected using a structured, self-administered questionnaire adapted from previously validated instruments. The questionnaire included:

1. Sociodemographic characteristics
2. Knowledge of MI and stroke symptoms
3. Intended help-seeking behavior
4. Attitudes and perceived barriers

Statistical Analysis Plan

Data were analyzed using IBM SPSS 29. Descriptive statistics were used to summarize sociodemographic characteristics, knowledge, perceptions, and intended behaviors as frequencies and percentages. Multiple-response items were reported as proportions of the total sample.

For bivariate analysis, the association between independent variables and key outcomes (intention to call EMS, delayed help-seeking for MI and stroke) was assessed using the Chi-square test or Fisher's exact test when appropriate. Statistical significance was set at $p < 0.05$.

Ethical approval

Ethical approval was obtained from the Institutional Review Board of Bisha University (Approval No. UB-RELOC H-06-BH-087/(04/09/47). Participation in the survey was voluntary, and informed consent was obtained electronically from all participants before completing the questionnaire.

Results

A total of 526 responses were initially received. After excluding 50 incomplete questionnaires or health professionals' response, 476 participants were included in the final analysis (Figure 1). The age distribution was relatively balanced with 18–30 years 140 (29.4%), 31–45 years 113 (23.7%), 46–60 years 109 (22.9%), and >60 years 114 (23.9%).

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Gender was evenly distributed, with males 238 (50.0%) and females 238 (50.0%). Most of the participants resided in Bisha city 372 (78.2%), while 104 (21.8%) lived in villages. Regarding education, the majority had a Bachelor's/Diploma 257 (54.0%), followed by up to high school 136 (28.6%), postgraduate 50 (10.5%), and no formal education 33 (6.9%). Monthly income varied: <5000 SAR 193 (40.5%), 5000–10,000 SAR 126 (26.5%), and >10,000 SAR 157 (33.0%). Comorbidities were reported by 159 (33.4%), while 317 (66.6%) had none *(Table 1)*.

Table 2 shows that most participants demonstrated good awareness of cardiovascular emergencies. Knowledge of heart attack warning signs was reported by 416 (87.4%), and knowledge of stroke warning signs by 398 (83.6%). A majority correctly recognized that early medical care within two hours improves myocardial infarction survival 377 (79.2%), whereas only 246 (51.7%) correctly identified the 4.5-hour therapeutic window for stroke, with 181 (38.0%) indicating they did not know. Regarding intended action, 321 (67.4%) would call an ambulance immediately, while 129 (27.1%) preferred private transport. Immediate help-seeking was reported for myocardial infarction by 412 (86.6%) and for stroke by 420 (88.2%). Furthermore, 411 (86.3%) stated they would call emergency medical services if symptoms occurred.

Figure 2 shows the distribution of comorbidities among participants. High blood pressure was the most common condition, reported by 43.1%, followed by diabetes in 40.0%. Heart disease was present in 14.2% of participants, while previous stroke was the least frequent comorbidity, observed in 2.7%.

Figure 4 shows participants' awareness of stroke warning symptoms. Slurred speech was the most frequently recognized symptom 57.6%, followed by blurred vision 54.0% and facial drooping 53.2%. Arm weakness was identified by 47.1% of participants, while stuttering was the least recognized symptom 19.5%.

Figure 3 shows participants' awareness of myocardial infarction warning symptoms. Chest pain was the most recognized symptom, identified by 87.0%, followed by shortness of breath 72.7%. Awareness of other symptoms was considerably lower, including nausea 27.9%, sudden headache 22.1%, and jaw pain 14.9%.

Table 3 shows that confidence in recognizing cardiovascular emergencies was modest. For myocardial infarction, 153 (32.1%) agreed/strongly agreed that they were confident, while 167 (35.1%) disagreed/strongly disagreed and 156 (32.8%) were neutral. A similar pattern was observed for stroke recognition, with 142 (29.8%) expressing confidence, 178 (37.4%) lacking confidence, and 156 (32.8%) neutral. Perceived access barriers were notable, as 245 (51.5%) agreed/strongly agreed that distance to hospital could delay care. Preference for private transport was common, with 187 (39.3%) agreeing/strongly agreeing that it is faster than an ambulance, whereas 179 (37.6%) disagreed/strongly disagreed. Encouragingly, most participants rejected delaying care, as 260 (54.6%) disagreed/strongly disagreed with waiting for symptom improvement, although 107 (22.4%) still agreed/strongly agreed.

Table 4 shows that 411 (86.3%) participants intended to call an ambulance, while 65 (13.7%) did not. Intention to use emergency medical services

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was not significantly associated with age (p=0.351), gender (p=0.505), residence (p=0.301), educational level (p=0.192), monthly income (p=0.387), knowledge of myocardial infarction signs (p=0.378), or knowledge of stroke signs (p=0.900). However, comorbidity status demonstrated a strong and statistically significant association (p<0.001); all participants with comorbidities 159 (100.0%) reported willingness to call an ambulance compared with 252 (79.5%) of those without comorbidities.

Table 5 shows that most participants reported seeking immediate care for myocardial infarction symptoms, 412 (86.6%), while 64 (13.4%) demonstrated a delayed decision. No significant associations were observed between delay and age (p=0.339), accommodation (p=0.332), educational level (p=0.285), monthly income (p=0.624), comorbidities (p=0.498), knowledge of myocardial infarction signs (p=0.666), or knowledge of stroke signs (p=0.589). Gender showed a borderline association, with females more likely to delay than males (16.4% vs. 10.5%, p=0.060). Confidence in recognizing myocardial infarction (p=0.539) or stroke (p=0.404) was not significantly related to delay. Perceiving distance as a barrier (p=0.095) and preferring private transport (p=0.102) were also not statistically significant. However, participants who agreed with waiting for symptom improvement had the highest delay 27 (25.2%) compared with those who disagreed 19 (7.3%) (p<0.001), identifying this belief as the strongest predictor of delayed care.

Table 6 shows that most participants sought immediate care for stroke symptoms 420 (88.2%), while 56 (11.8%) reported delayed action. Delay was significantly associated with gender (p=0.046), with females showing higher delay 35 (14.7%) compared with males 21 (8.8%). No significant associations were observed with age (p=0.322), residence (p=0.935), monthly income (p=0.990), comorbidities (p=0.414), knowledge of myocardial infarction signs (p=0.650), or knowledge of stroke signs (p=0.946). Educational level showed a borderline association (p=0.070), with the highest delay among postgraduates 11 (22.0%). Confidence in symptom recognition was not significant. Perceiving distance as a barrier (p=0.085) and preference for private transport (p=0.061) were borderline. The strongest predictor of delay was the belief in waiting for symptom improvement, where delay reached 26 (24.3%) (p<0.001).

Table 7 shows the result of multivariable logistic regression which identified several predictors of delayed decision-seeking for myocardial infarction (MI) and stroke. Gender (male) was significantly associated with lower odds of delay for both conditions (MI: OR = 0.42, 95% CI 0.21–0.86, p = 0.018; Stroke: OR = 0.35, 95% CI 0.17–0.75, p = 0.007). Comorbidities were significantly associated with stroke delay (OR = 0.42, 95% CI 0.19–0.93, p = 0.032) and showed a borderline association for MI (OR = 0.48, 95% CI 0.23–1.01, p = 0.052). The strongest predictor of delayed decision-seeking was the behavioral factor “waiting to see if symptoms improve,” which significantly increased the likelihood of delay in both MI (OR = 1.51, 95% CI 1.24–1.84, p < 0.001) and stroke (OR = 1.59, 95% CI 1.28–1.97, p < 0.001).

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Figure 1. Flow diagram of participant selection and inclusion in the study.

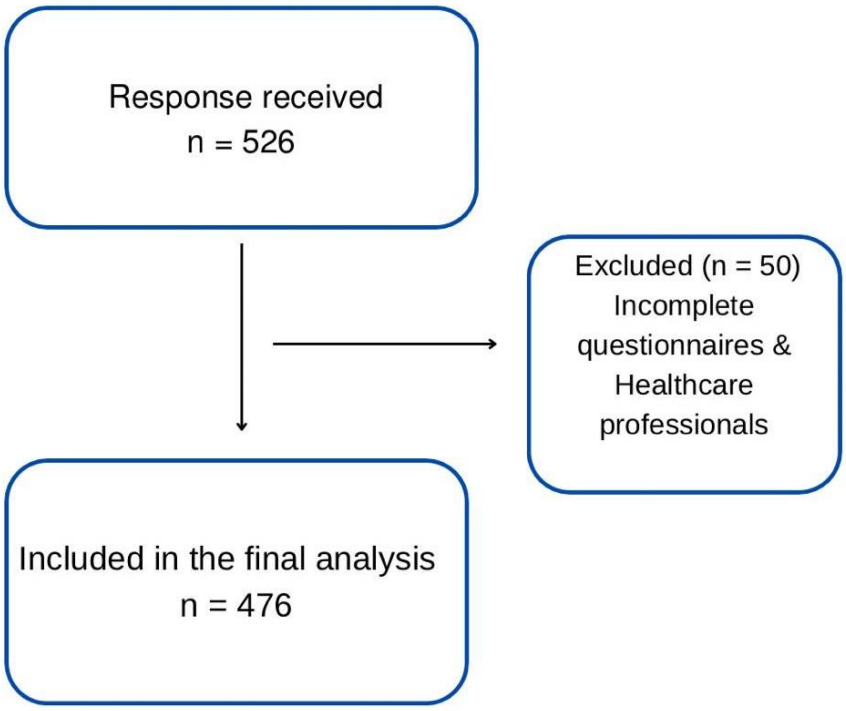

Table 1. Demographic parameters of participants (N=476)

		Frequency N (%)
Age	18–30 years	140 (29.4%)
	31–45 years	113 (23.7%)
	46–60 years	109 (22.9%)
	>60 years	114 (23.9%)
Gender	Male	238 (50.0%)
	Female	238 (50.0%)

Accommodation	Bisha city	372 (78.2%)
	Bisha village	104 (21.8%)
Educational Level	No Formal education	33 (6.9%)
	Up to high school	136 (28.6%)
	Bachelor's/Diploma	257 (54.0%)
	Postgraduate	50 (10.5%)
Monthly Income	<5000 SAR	193 (40.5%)
	5000–10,000 SAR	126 (26.5%)
	>10,000 SAR	157 (33.0%)
Presence of Comorbidities	No	317 (66.6%)
	Yes	159 (33.4%)

(N) Frequency, (%) Percentages

Figure 2. Distribution of different comorbidities among participants

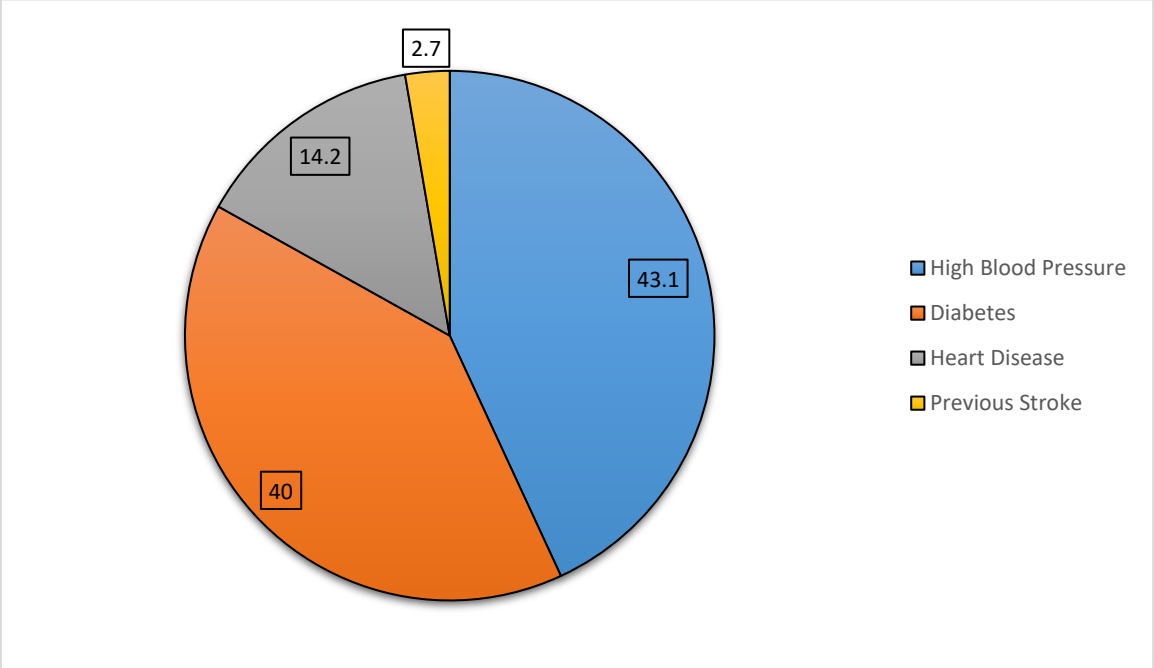

Table 2: Knowledge and Intended Response Toward MI and Stroke (n = 476)

		Frequency N (%)
Knowledge of heart attack warning signs	Yes	416 (87.4%)
	No	60 (12.6%)
Knowledge of stroke warning signs	Yes	398 (83.6%)
	No	78 (16.4%)
Early medical care improves MI survival (≤2 hours)	Correct	377 (79.2%)
	Incorrect	19 (4.0%)
	Do not know	80 (16.8%)
Stroke treatment effective within 4.5 hours	Correct	246 (51.7%)
	Incorrect	49 (10.3%)
	Do not know	181 (38.0%)
Intended first action for MI/stroke symptoms	Call an ambulance immediately	321 (67.4%)
	Go to hospital by private car	129 (27.1%)
	Take medication at home first	9 (1.9%)
	Search symptoms online first	6 (1.3%)
	Contact family/friend for advice	5 (1.1%)
	Wait for symptoms to improve	6 (1.3%)
Time to seek help for MI symptoms	Immediately	412 (86.6%)

	Within 30 minutes	54 (11.3%)
	30–60 minutes	7 (1.5%)
	>60 minutes	3 (0.6%)
Time to seek help for stroke symptoms	Immediately	420 (88.2%)
	Within 30 minutes	47 (9.9%)
	30–60 minutes	7 (1.5%)
	>60 minutes	2 (0.4%)
Would call an ambulance if symptoms occur	Yes	411 (86.3%)
	No	65 (13.7%)

(N) Frequency, (%) Percentages

Figure 3. Awareness about Warning Symptoms of MI

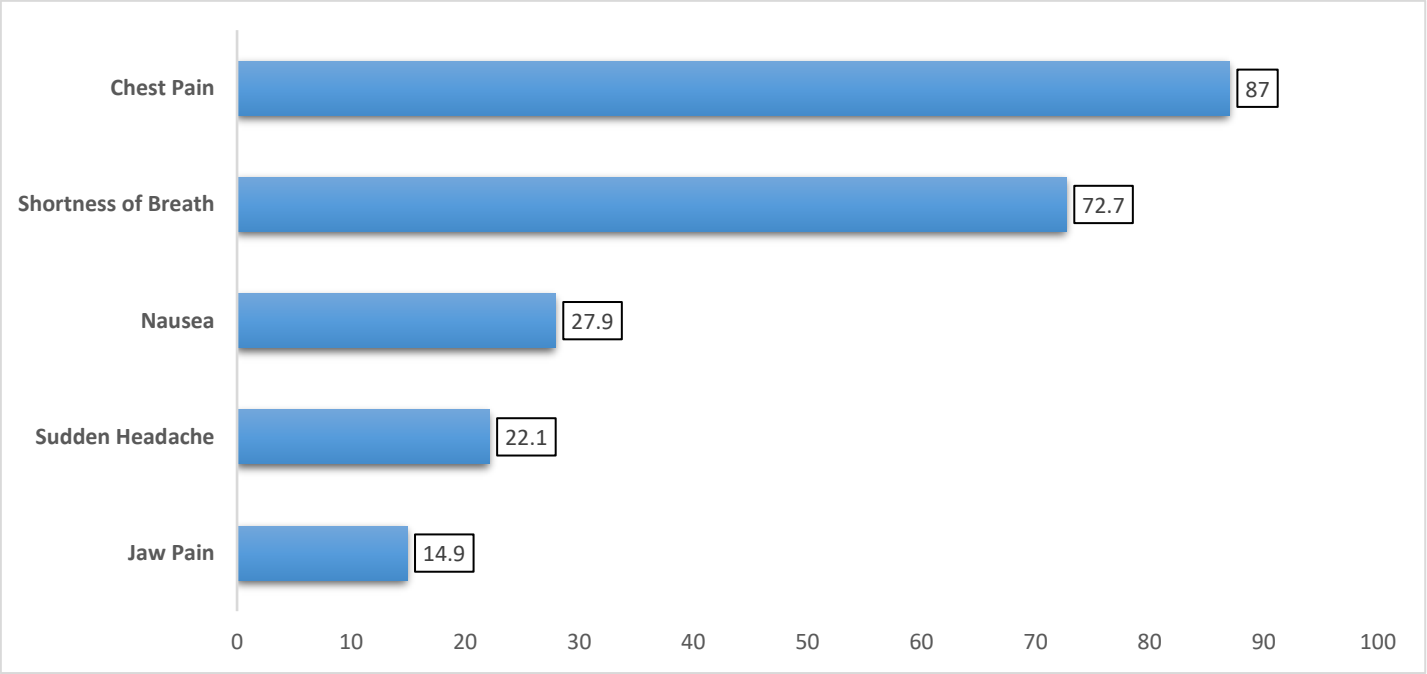

Figure 4. Awareness about Warning Symptoms of Stroke

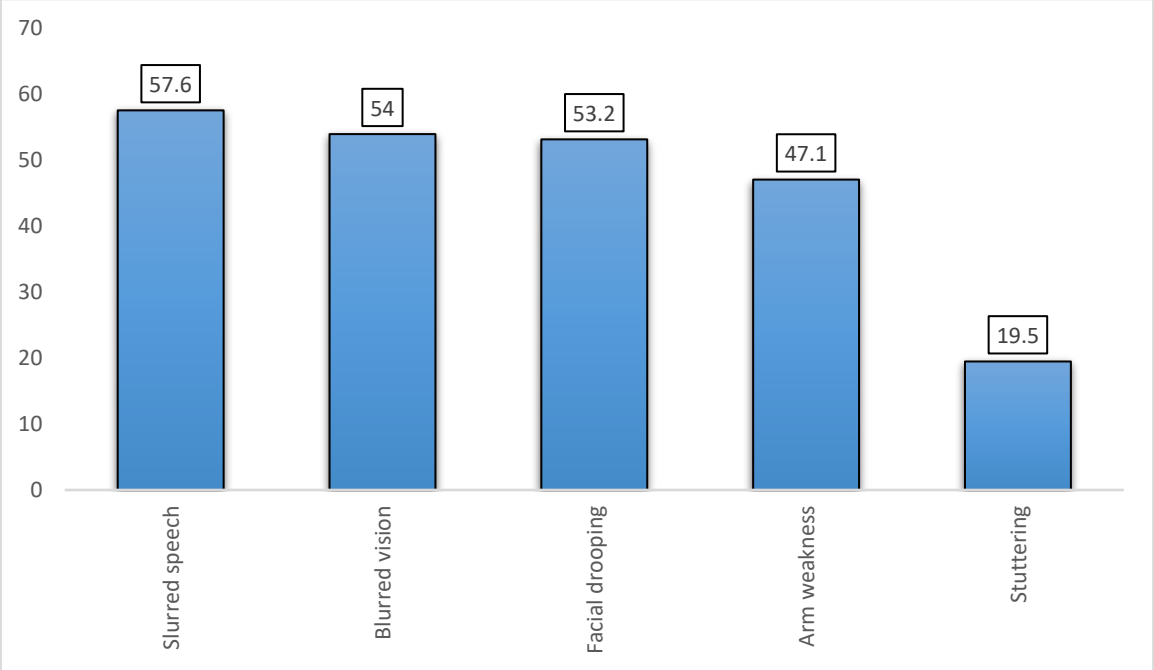

Table 3: Perceptions and Confidence Toward Recognition and Care-Seeking for MI and Stroke (n = 476)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Confident in recognizing a heart attack	67 (14.1%)	100 (21.0%)	156 (32.8%)	122 (25.6%)	31 (6.5%)
Confident in recognizing a stroke	70 (14.7%)	108 (22.7%)	156 (32.8%)	110 (23.1%)	32 (6.7%)
Distance to hospital is a barrier to immediate care	41 (8.6%)	75 (15.8%)	115 (24.2%)	159 (33.4%)	86 (18.1%)
Prefer private car because it is faster than ambulance	80 (16.8%)	99 (20.8%)	110 (23.1%)	122 (25.6%)	65 (13.7%)
Would wait for symptoms to improve before seeking help	143 (30.0%)	117 (24.6%)	109 (22.9%)	74 (15.5%)	33 (6.9%)

(N) Frequency, (%) Percentages

Table 4: Factors Associated with Intention to Call Emergency Medical Services (n = 476)

		Intention to Call Ambulance		χ^2	Sig. Value
		No n (%)	Yes n (%)		
Age	18–30 years	14 (10.0%)	126 (90.0%)	3.27	0.351
	31–45 years	20 (17.7%)	93 (82.3%)		
	46–60 years	16 (14.7%)	93 (85.3%)		
	>60 years	15 (13.2%)	99 (86.8%)		
Gender	Female	30 (12.6%)	208 (87.4%)	0.45	0.505
	Male	35 (14.7%)	203 (85.3%)		
Accommodation	Bisha city	54 (14.5%)	318 (85.5%)	1.07	0.301
	Bisha village	11 (10.6%)	93 (89.4%)		
Educational Level	Up to high school	12 (8.8%)	124 (91.2%)	4.74	0.192
	Bachelor's/Diploma	38 (14.8%)	219 (85.2%)		
	Postgraduate	10 (20.0%)	40 (80.0%)		
	No formal education	5 (15.2%)	28 (84.8%)		
Monthly Income	<5000 SAR	25 (13.0%)	168 (87.0%)	1.90	0.387
	5000–10,000 SAR	14 (11.1%)	112 (88.9%)		
	>10,000 SAR	26 (16.6%)	131 (83.4%)		
Comorbidities Present	No	65 (20.5%)	252 (79.5%)	37.76	<0.001
	Yes	0 (0.0%)	159 (100.0%)		
Knowledge of MI signs	No	6 (10.0%)	54 (90.0%)	0.78	0.378
	Yes	59 (14.2%)	357 (85.8%)		
Knowledge of Stroke signs	No	11 (14.1%)	67 (85.9%)	0.02	0.900
	Yes	54 (13.6%)	344 (86.4%)		

Table 5: Sociodemographic and behavioral factors associated with delayed decision to seek urgent medical care for MI (n = 476)

		Decision Seeking in MI		χ^2	Sig. Value
		Immediate N (%)	Delayed N (%)		
Age	18–30 years	116 (82.9%)	24 (17.1%)	3.36	0.339
	31–45 years	98 (86.7%)	15 (13.3%)		
	46–60 years	99 (90.8%)	10 (9.2%)		
	>60 years	99 (86.8%)	15 (13.2%)		
Gender	Female	199 (83.6%)	39 (16.4%)	3.54	0.060
	Male	213 (89.5%)	25 (10.5%)		
Accommodation	Bisha city	319 (85.8%)	53 (14.2%)	0.94	0.332
	Bisha village	93 (89.4%)	11 (10.6%)		
Educational Level	Up to high school	120 (88.2%)	16 (11.8%)	3.79	0.285
	Bachelor's/Diploma	221 (86.0%)	36 (14.0%)		
	Postgraduate	40 (80.0%)	10 (20.0%)		
	No formal education	31 (93.9%)	2 (6.1%)		
Monthly Income	<5000 SAR	164 (85.0%)	29 (15.0%)	0.94	0.624
	5000–10,000 SAR	109 (86.5%)	17 (13.5%)		
	>10,000 SAR	139 (88.5%)	18 (11.5%)		
Comorbidities Present	No	272 (85.8%)	45 (14.2%)	0.46	0.498
	Yes	140 (88.1%)	19 (11.9%)		
Knowledge of MI signs	No	53 (88.3%)	7 (11.7%)	0.19	0.666
	Yes	359 (86.3%)	57 (13.7%)		

Knowledge of Stroke signs	No	69 (88.5%)	9 (11.5%)	0.29	0.589
	Yes	343 (86.2%)	55 (13.8%)		
Behavioral Parameters					
Confident in recognizing a heart attack	Disagree	144 (86.2%)	23 (13.8%)	1.24	0.539
	Neutral	132 (84.6%)	24 (15.4%)		
	Agree	136 (88.9%)	17 (11.1%)		
Confident in recognizing a stroke	Disagree	150 (84.3%)	28 (15.7%)	1.81	0.404
	Neutral	135 (86.5%)	21 (13.5%)		
	Agree	127 (89.4%)	15 (10.6%)		
Distance to hospital is a barrier	Disagree	96 (82.8%)	20 (17.2%)	4.71	0.095
	Neutral	106 (92.2%)	9 (7.8%)		
	Agree	210 (85.7%)	35 (14.3%)		
Prefer private car over ambulance	Disagree	162 (90.5%)	17 (9.5%)	4.56	0.102
	Neutral	95 (86.4%)	15 (13.6%)		
	Agree	155 (82.9%)	32 (17.1%)		
Wait for symptom improvement before seeking help	Disagree	241 (92.7%)	19 (7.3%)	22.08	<0.001
	Neutral	91 (83.5%)	18 (16.5%)		
	Agree	80 (74.8%)	27 (25.2%)		

Table 6: Sociodemographic and behavioral factors associated with delayed decision to seek urgent medical care for Stroke (n = 476)

	Decision Seeking in Stroke		χ^2	Sig. Value
	Immediate N (%)	Delayed N (%)		

Age	18–30 years	119 (85.0%)	21 (15.0%)	3.49	0.322
	31–45 years	104 (92.0%)	9 (8.0%)		
	46–60 years	98 (89.9%)	11 (10.1%)		
	>60 years	99 (86.8%)	15 (13.2%)		
Gender	Female	203 (85.3%)	35 (14.7%)	3.97	0.046
	Male	217 (91.2%)	21 (8.8%)		
Accommodation	Bisha city	328 (88.2%)	44 (11.8%)	0.01	0.935
	Bisha village	92 (88.5%)	12 (11.5%)		
Educational Level	Up to high school	125 (91.9%)	11 (8.1%)	7.07	0.070
	Bachelor's/Diploma	226 (87.9%)	31 (12.1%)		
	Postgraduate	39 (78.0%)	11 (22.0%)		
	No formal education	30 (90.9%)	3 (9.1%)		
Monthly Income	<5000 SAR	170 (88.1%)	23 (11.9%)	0.02	0.990
	5000–10,000 SAR	111 (88.1%)	15 (11.9%)		
	>10,000 SAR	139 (88.5%)	18 (11.5%)		
Comorbidities Present	No	277 (87.4%)	40 (12.6%)	0.67	0.414
	Yes	143 (89.9%)	16 (10.1%)		
Knowledge of MI signs	No	54 (90.0%)	6 (10.0%)	0.21	0.650
	Yes	366 (88.0%)	50 (12.0%)		
Knowledge of Stroke signs	No	69 (88.5%)	9 (11.5%)	0.01	0.946
	Yes	351 (88.2%)	47 (11.8%)		
Behavioral Parameters					
Confident in recognizing a heart attack	Disagree	144 (86.2%)	23 (13.8%)	1.68	0.431
	Neutral	137 (87.8%)	19 (12.2%)		

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	Agree	139 (90.8%)	14 (9.2%)		
Confident in recognizing a stroke	Disagree	152 (85.4%)	26 (14.6%)	2.43	0.297
	Neutral	139 (89.1%)	17 (10.9%)		
	Agree	129 (90.8%)	13 (9.2%)		
Distance to hospital is a barrier	Disagree	97 (83.6%)	19 (16.4%)	4.94	0.085
	Neutral	107 (93.0%)	8 (7.0%)		
	Agree	216 (88.2%)	29 (11.8%)		
Prefer private car over ambulance	Disagree	164 (91.6%)	15 (8.4%)	5.60	0.061*
	Neutral	99 (90.0%)	11 (10.0%)		
	Agree	157 (84.0%)	30 (16.0%)		
Wait for symptom improvement before seeking help	Disagree	244 (93.8%)	16 (6.2%)	24.20	<0.001
	Neutral	95 (87.2%)	14 (12.8%)		
	Agree	81 (75.7%)	26 (24.3%)		

Table 7. Multivariable Logistics for Predictors of Delayed Decision Seeking in MI and Stroke

	Decision Seeking in MI		Decision Seeking in Stroke	
	MI OR (95% CI)	Sig. Value	Stroke OR (95% CI)	Sig. Value
Age	0.93 (0.72–1.21)	0.599	0.96 (0.72–1.27)	0.773
Gender (Male)	0.42 (0.21–0.86)	*0.018*	0.35 (0.17–0.75)	*0.007*
Accommodation (City vs Village)	0.75 (0.36–1.58)	0.451	1.11 (0.52–2.37)	0.791
Higher Educational Level	1.01 (0.71–1.45)	0.938	1.25 (0.87–1.80)	0.235
Higer Monthly Income	0.82 (0.58–1.18)	0.293	0.95 (0.65–1.39)	0.807
Comorbidities (Yes)	0.48 (0.23–1.01)	0.052	0.42 (0.19–0.93)	*0.032*

Knowledge of heart attack signs	1.00 (0.36–2.76)	1.000	1.28 (0.43–3.80)	0.652
Knowledge of stroke signs	1.51 (0.60–3.80)	0.377	1.18 (0.46–3.03)	0.732
Confident recognizing heart attack	1.06 (0.79–1.44)	0.689	0.91 (0.66–1.26)	0.583
Confident recognizing stroke	0.80 (0.58–1.10)	0.163	0.91 (0.65–1.26)	0.556
Distance to hospital barrier	0.93 (0.77–1.11)	0.415	0.86 (0.71–1.04)	0.118
Prefer private car over ambulance	1.01 (0.82–1.24)	0.949	1.01 (0.81–1.26)	0.934
Wait to see if symptoms improve	1.51 (1.24–1.84)	*<0.001*	1.59 (1.28–1.97)	*<0.001*

Discussion

Acute myocardial infarction and stroke are time-critical emergencies in which early reperfusion markedly improves the outcomes of patients [6]. This critical nature of these emergencies has reflected in the concepts such as “time is muscle” and “time is brain” [7]. Prehospital delays such as the interval from onset of symptoms to the arrival at a definitive care facility reduces the eligibility for thrombolysis and percutaneous coronary intervention which lead to increases risk of mortality [8]. This delay is influenced by several factors which included recognition of symptoms, interpretation, decision to seek care, EMS activation, and transportation. Misinterpretation of these symptoms, poor awareness, and reluctance to call EMS are key barriers [9]. This study aimed to assess the awareness, intended response, and factors associated with prehospital delay for myocardial infarction (MI) and stroke among adults in Bisha.

Notably, the sociodemographic profile showed a balanced age and gender distribution, with most participants living in urban areas and having at least secondary or higher education. Despite this relatively favorable educational background, only about half of the participants correctly identified the therapeutic time window for stroke. This finding is consistent with previous studies from Saudi Arabia by Aedh et al. (2025), which report that while the public often recognizes stroke as a medical emergency, awareness of the narrow thrombolysis window remains limited [10]. Similar patterns have been described in other studies where knowledge of MI symptoms exceeds knowledge of stroke treatment timelines [11]. This gap is clinically important because delayed recognition of the time-dependent nature of stroke directly reduces eligibility for reperfusion therapy [12].

The recognition of classic MI symptoms such as chest pain and shortness of breath was high, which aligned with the international literature which showed that these symptoms are widely known by the public as reported by Aljubran et al. (2025) [13]. However, the awareness of the atypical symptoms such as jaw pain and nausea was low. The poor recognition of the atypical symptoms is associated with the delayed presentation, particularly among women and older adults, and may contribute to underestimation of symptom severity.

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Notably, in term of the stroke, awareness of FAST-related symptoms was moderate rather than optimal. While more than half of the participants recognized slurred speech, blurred vision, and facial drooping, less than half identified arm weakness. Similarly, previous study by Zeinalzadeh et al. (2025) have shown that public knowledge of individual stroke symptoms is often fragmented, even when general awareness of stroke as an emergency is high [14]. This indicates that public health campaigns should focus not only on naming of the disease but also on promoting simple, memorable symptom clusters.

Although most of the participants reported that they would call an ambulance and seek care immediately, actual behavioral attitudes suggested potential barriers. A substantial proportion believed that private transport is faster than ambulance services, and more than one-fifth agreed that they would wait for symptom improvement. This "wait-and-see" behavior was the strongest predictor of delay for both MI and stroke. Similar findings have been reported by Rafi et al. (2020), where symptom misinterpretation, hope for spontaneous resolution, and preference for self-transport are among the most common causes of prehospital delay [15]. These beliefs often persist even in populations with adequate knowledge which highlighted the gap between knowledge and action.

Notably, the confidence in recognizing MI and stroke symptoms was modest, with a large proportion of participants being neutral or lacked confidence. Previous research by Tejeiro et al. (2024) showed that low self-efficacy is associated with slower decision-making during acute events [16]. Individuals who are unsure about their ability to identify symptoms are more likely to consult family members, search for information, or wait for symptoms to progress, all of which increase delay time.

Furthermore, the comorbidity status was the only factor significantly associated with intention to call an ambulance. Participants with chronic conditions were more likely to choose emergency medical services. This finding is consistent with studies which showed that individuals with previous exposure to healthcare systems or prior cardiovascular disease have better emergency response behavior, likely due to repeated counseling and greater perceived personal risk [17].

In term of delayed decision seeking MI, no sociodemographic factors were significantly associated with delay, although female gender showed a borderline association. For stroke, female participants were significantly more likely to delay seeking care. This gender difference has been reported in several studies and may be related to differences in symptom perception, caregiving roles, and decision-making patterns [18]. Postgraduates also showed a higher proportion of delay, a finding that has been described in some studies and may reflect overconfidence, misinterpretation of symptoms, or reliance on self-assessment [19].

Furthermore, the perceived distance to the hospital showed a borderline association with delay. Geographic and transportation barriers have been consistently linked to delayed presentation in both urban and rural settings, even when ambulance services are available. However, in the present study, behavioral factors had a stronger influence than structural factors. One of the important observations is that knowledge variables were not significantly associated with delay for either MI or

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stroke. This supports the concept reported in previous literature that awareness alone does not guarantee appropriate action [20]. Emotional response, symptom appraisal, perceived severity, and social context play a critical role in the decision to seek care.

Implications

These findings suggest that public health strategies should move beyond traditional knowledge-based education and focus on behavioral change. Campaigns should emphasize the urgency of symptoms, the risks of waiting, and the benefits of ambulance use. Interventions that improve self-efficacy, such as scenario-based education and community simulations, may help bridge the gap between knowledge and action.

Limitations and Future Directions

This study has several limitations. Its cross-sectional design assesses intended rather than actual behavior, which may not reflect real responses during emergencies. Self-reported data are subject to recall and social desirability bias. The study was conducted in a single governorate, which may limit generalizability to other regions. In addition, clinical history and access-to-care variables were not explored in depth. Future multicenter studies with larger and more diverse populations are recommended. The prospective designs will assess the actual prehospital time intervals and evaluating the impact of targeted educational and behavioral interventions on EMS utilization and delay reduction would provide stronger evidence.

Conclusion

Our study shows that the general awareness of myocardial infarction and stroke is relatively high among population. However, there are several important gaps remain in the detailed knowledge, confidence in symptom recognition, and behavioral responses. Prehospital delay appears to be driven more by attitudes and decision-making beliefs rather than by sociodemographic characteristics or knowledge alone. In particular, the tendency to wait for symptom improvement and misconceptions about transportation choices contribute to delayed care-seeking.

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Conflict of Interest

The authors declare no conflict of interest.

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