Original Research Article

Public Awareness of the Need to Call the Emergency Medical Services Following the Onset of Acute Myocardial Infarction and Associated Factors in Jazan region, Saudi Arabia

ABSTRACT

Background:
For many years, acute myocardial infarction has been one of the leading causes of death worldwide. One of the major complications of acute myocardial infarction is the event of "cardiac arrest". However, with an early approach to emergency medical services and early seeking of healthcare, the potential mortality chance can be reduced. Despite the significance of the situation and its vulnerability, delays in approaching emergency medical services exist due to variable influences. This study had investigated the reasons behind the delays and the awareness of the general public on acute myocardial infarction and its associated symptoms.

Methods:
This study is a cross-sectional type of research that was conducted in October 2021 through November 2021 period that invited 427 participants through social media platforms.

Results:
The online questionnaire was distributed and administered by 427 subjects. The mean age of the participants was (27.62 years, SD=11.692) with a minimum age of 18 years and a maximum age of 89 years. The majority of the study participants were females (n=237, 55.5%), of those who called during the daytime, 97.4% of them have mentioned that they would call the EMS directly but when investigated about the time to wait before calling EMS, 55.3% of the participants who chose to call during the daytime would call in less than an hour.

Conclusion:
For initiating public campaigns and providing the public with the consequences of an ignored myocardial infarction and the potential mortality that could be associated with delaying the emergency medicine services approach..

Keywords: Saudi Arabia, Public health, Jazan, Myocardial infarction, Cardiovascular diseases, Awareness

1. INTRODUCTION

Acute myocardial infarction (AMI) is a critical life-threatening condition that is associated with a worldwide high rate of mortality. Approaching the emergency medical services (EMS) can be delayed to various reasons that are influenced by multifactorial factors including individual and public health issues. However, the early recognition of AMI manifestations is

crucial, and persuading the general public on the need to decrease the delay time to approach the EMS for healthcare seek is needed [1,2]. The need for early management is critically necessary and is justified by the better outcome associated with the shorter gap between the presentation and EMS interventions [3].

In order to determine the level of awareness on the symptoms, acknowledge the reasons behind the EMS delay in approach; this study was conducted to reveal the perspectives and misconceptions and set stakeholders for future awareness on AMI and the need for early management.

2. METHODOLOGY

STUDY DESIGN AND SUBJECT SELECTION:

This study is a cross-sectional type of research that was conducted from October 2021 through November 2021 period. A sample that is typically representative of the general population was targeted to participate in this cross-sectional study. The aim established throughout the study falls under the umbrella of assessing the perceptions and confidence of the general population among their knowledge on acute myocardial infarction setting, along with the assessment of approaching the emergency medical services and the barriers that could prevent their calls. The questionnaire was designed through Google Documents surveys to be utilized as a self-administered survey; moreover, it was sent through the social networks for easy accessibility and approach. The data was collected based on a validated questionnaire that was modified by the study authors to be fit and valid to fulfill the aimed objectives of this study.

DATA COLLECTION AND SAMPLE SIZE:

The questionnaire involved a total of 40 questions. The conducted questions were categorized under three parts. The first part included sociodemographic information such as the gender, age of the participant, educational level, the profession, and current residence province for instance. The second part of the survey was designed to assess the knowledge on the risk factors and the symptoms of myocardial infarction. The third part has assessed whether the subjects have previously approached the emergency medical services and the possible barriers they have encountered. Moreover, the sample size was according to total population in Jazan (1,567,547) based on an OpenEpi software program, version 3, with a 95% confidence level, a margin of error =5, and 50% response distribution; thus, the sample size estimated was (400) for this study. The study had included 427 participants of both genders with the majority being female. The inclusion criteria were adults aged 18 years or more who lived in Jazan region, Saudi Arabia, at that time. The choosing of adults only is reasonable to fit our study objectives as they are the targeted populations to measure the level of awareness on the symptoms, acknowledge the reasons behind the EMS delay.

STATISTICAL ANALYSIS:

Regarding the frequencies and the percentages used for nominal variables, a chi-square non-parametric test was conducted to assess the significance among the responses. The SPSS IBM V28 analysis program was used for the data analysis.

ETHICAL CONSIDERATION

The study had been ethically approved by Jazan Health Ethics Committee (approval number 2161, dated August 23, 2021). Additionally, informed consent of approving the participation in the self-administered electronic survey was obtained from all the study subjects.

3. RESULTS

The online questionnaire was distributed and administered by 427 subjects. The mean age of the participants was (27.62 years, SD=11.692) with a minimum age of 18 years and a maximum age of 89 years. The majority of the study participants were females (n=237, 55.5%), and most of them were living in a city area (n=185, 43.3%), and the majority were in a college-level of education (n=324, 75.9%). **(Table.1)**

Variable	N (%) (n=427)
Gender	
Male	190 (44.5%)
Female	237 (55.5%)
Where is your place of residence?	
City	185 (43.3%)
Mountain area	23 (5.4%)
Village	219 (51.3%)
What is your educational level?	
College level	324 (75.9%)
Highschool level	82 (19.2%)
Uneducated	5 (1.2%)
Other	16 (3.7%)
What is your profession?	
Full-time job	83 (19.4%)
Part-time job	19 (4.4%)
Student	249 (58.3%)

Housewife	12 (2.8%)
Agriculture/ Business	2 (0.5%)
Unemployed	62 (14.5%)

Table.1: Baseline demographic information of the study participants.

354 (82.9%) of the subjects have self-reported that they are in a healthy status. Only 6 (1.4%) of the participants have stated that they have previously suffered from a myocardial infarction episode, and 2 (0.5%) have reported a previous incidence of stroke. Regarding the remarkability of the family history, the frequency of reported positive family history of myocardial infarction was 60 (14.1%), while 29 (6.8%) had a remarkable family history of stroke. The authors have investigated the subjects' responses to a situation of myocardial infarction; the study results have found that 393 (92.0%) of the participants would directly call the emergency medical services while 25 (5.9%) would prefer to wait and see. However, 9 (2.1%) stated that they would not call the emergency medical services. Excluding the option of "other response", most of the subjects have noted that they do not know how to call the services when they were asked about the reason behind not calling the emergency medicine in an incidence 76 (17.8%). On the other hand, 96 (22.5%) of the participants have mentioned that they believe it is a muscular pain that will resolve on its own in a short period. **(Table.2)**

Variable	(N%)	*P* value
When did you call the medical emergency services?		
I have not called	354 (82.9%)	
Off-time (Nights and holidays)	35 (8.2%)	
On-time (Day time)	38 (8.9%)	
Have you ever suffered of an incidence of myocardial infarction or stroke?		
No	419 (98.1%)	
Yes, myocardial infarction.	6 (1.4%)	
Yes, stroke.	2 (0.5%)	
Do you have a remarkable family history of myocardial infarction or stroke?		
No	338 (79.2%)	
Yes, of myocardial infarction.	60 (14.1%)	
Yes, of stroke.	29 (6.8%)	
Do you have the self confidence in understanding the acute myocardial infarction?		
I am confident that I can explain an overview of acute myocardial infarction to other people by myself.	169 (39.6%)	
I am not confident that I can explain an overview of acute myocardial infarction to other people by myself.	258 (60.4%)	
Would you take advice from a medial physician?		
Yes	355 (16.9%)	
No	72 (16.9%)	
In a situation of myocardial infarction, what would your response be?		
I would directly call the emergency medical services.	393 (92.0%)	

I would not call the emergency medical services.	9 (2.1%)
I would wait and see.	25 (5.9%)
What are the reasons behind not calling the emergency medicine services in this case?	
I do not know how to call them.	76 (17.8%)
I feel embarrassed calling.	9 (2.1%)
It is inconvenient for someone else.	5 (1.2%)
The symptoms do not require that.	51 (11.9%)
No response.	202 (47.3%)
Other.	84 (19.7%)
What is the reason behind waiting to call the emergency medicine services?	
Afraid of severe disease.	21 (4.9%)
Medical services are very far in distance.	32 (7.5%)
There are no other people to discuss the situation with.	11 (2.6%)
This is a muscular pain, and it will resolve soon.	96 (22.5%)
Other response.	267 (62.5%)
What is the duration of "waiting and seeing"?	
Less than one hour	176 (41.2%)
1-2 hours	54 (12.6%)
2-3 hours	19 (4.4%)
3-5 hours	4 (0.9%)
5 hours to the end of the day	8 (1.9%)
Tomorrow	10 (2.3%)
No response.	156 (36.5%)

Table.2: Overall responses of the participants to the assessing question.

We have assessed the current knowledge of patients among the risk factors that put an individual at risk for developing myocardial infarction. Different short-answer responses included "weight gain", "cardiovascular disease, diabetes mellitus, and hypertension", "smoking and obesity", "diet that is rich in fatty products", and "vascular occlusive diseases". Regarding the knowledge on myocardial infarction symptoms, most of the subjects have stated that "chest pain" and "syncope" are some of the myocardial infarction symptoms.

Moreover, we have questioned the participants about their self-confidence in understanding the topic of myocardial infarction and whether they have the capability to explain it to other individuals. Of the total, 169 (39.6%) of the subjects were confident that they can explain an overview about myocardial infarction to others. On the other hand, 258 (60.4%) were not confident. A chi-square goodness of fit test was used to test whether the pattern of the confidence differed from randomness. The expected frequencies in all of the cells were greater than five. $X^2 = 18.55$, $p<0.001$.

We have set a comparison between the responses of those who chose calling during the daytime (On-time) and those who mentioned that they have called during the nighttime or during the holidays (Off-time) and subjects who have not called the EMS. **(Table.3) (Figure.1)**
Of those who have called during the nighttime, 7 (20.0%) of them stated that they are not healthy and have listed the health issues they currently suffer from; while 28 (80.0%) of them were healthy (p=0.035). Of those who called during the daytime, 37 (97.4%) of them have mentioned that they would call the EMS directly in an event of myocardial infarction, while 32 (91.4%) of those who

called during the off-days have stated that they would call directly. On the other hand, of those who called during the daytime, none of them chose to "wait and see" (0.0%).

Assessing variable	On-time (Day time)	Off-time (Night or Holiday)	I have not called the EMS.	P Value
Gender				
Male	18 (47.4%)	22 (62.9%)	150 (42.4%)	0.062
Female	20 (52.6%)	13 (37.1%)	204 (57.6%)	
Place of residence				
City	21 (55.3%)	11 (31.4%)	153 (43.2%)	0.361
Mountain area	2 (5.3%)	2 (5.7%)	19 (5.4%)	
Village	15 (39.5%)	22 (62.9%)	182 (51.4%)	
What is your educational level?				
College level	31 (81.6%)	27 (77.1%)	266 (75.1%)	0.699
Highschool level	7 (18.4%)	5 (14.3%)	70 (19.8%)	
Uneducated	0 (0.0%)	1 (2.9%)	4 (1.1%)	
Other	0 (0.0%)	2 (5.7%)	14 (4.0%)	
What is your profession?				
Student	20 (52.6%)	18 (51.4%)	211 (59.6%)	0.077
Full-time job	11 (28.9%)	10 (28.6%)	62 (17.5%)	
Part-time job	1 (2.6%)	2 (5.7%)	16 (4.5%)	
Housekeeping	0 (0.0%)	1 (2.9%)	11 (3.1%)	
Agriculture/ Business	2 (0.5%)	1 (2.9%)	0 (0.0%)	
Unemployed	5 (13.2%)	3 (8.6%)	54 (15.3%)	
Are you healthy?				0.035
I am healthy.	30 (78.9%)	28 (80.0%)	296 (83.6%)	
Not healthy.	8 (21.1%)	7 (20.0%)	58 (16.4%)	
Have you ever suffered of myocardial infarction or stroke?				
No	37 (97.4%)	35 (100.0%)	347 (98.0%)	0.857
Yes, myocardial infarction.	1 (2.6%)	0 (0.0%)	5 (1.4%)	
Yes, stroke.	2 (0.5%)	0 (0.0%)	2 (0.6%)	
Do you have a remarkable family history of myocardial infarction or stroke?				
No	28 (73.7%)	24 (68.6%)	286 (80.8%)	0.415
Yes, of myocardial infarction.	7 (18.4%)	8 (22.9%)	45 (12.7%)	
Yes, of stroke.	3 (7.9%)	3 (8.6%)	23 (6.5%)	
Would you take advice from a medical physician?				
Yes	33 (86.8%)	28 (80.0%)	294 (83.1%)	0.734
No	5 (13.2%)	7 (20.0%)	60 (16.9%)	
In a situation of myocardial infarction, what would your response be?				
I would directly call the EMS.	37 (97.4%)	32 (91.4%)	324 (91.5%)	0.448
I would not call the EMS.	1 (2.6%)	0 (0.0%)	8 (2.3%)	

Wait and see.	0 (0.0%)	3 (8.6%)	22 (6.2%)	
What are the reasons behind not calling the emergency medical services?				
I do not know how to call.	2 (5.3%)	5 (14.3%)	69 (19.5%)	0.188
I feel embarrassed calling.	1 (2.6%)	1 (2.9%)	7 (2.0%)	
It is inconvenient for someone else.	0 (0.0%)	0 (0.0%)	5 (1.4%)	
The symptoms do not require that.	7 (18.4%)	2 (5.7%)	42 (11.9%)	
No response	22 (57.9%)	23 (65.7%)	157 (44.4%)	
Other	6 (15.8%)	4 (11.4%)	74 (20.9%)	
What is the reason behind waiting to call the emergency medical services?				
Afraid of severe disease.	3 (7.9%)	3 (8.6%)	15 (4.2%)	0.646
Medical services are very far in distance.	3 (7.9%)	2 (5.7%)	27 (7.6%)	
There are no other people to discuss the situation with.	0 (0.0%)	1 (2.9%)	10 (2.8%)	
This is a muscular pain, it will resolve soon.	10 (26.3%)	4 (11.4%)	82 (23.2%)	
Other response.	22 (57.9%)	25 (71.4%)	220 (62.1%)	
What is the duration of “wait and see” approach?				
Less than one hour.	21 (55.3%)	16 (45.7%)	139 (39.3%)	0.339
1-2 hours	1 (2.6%)	4 (11.4%)	49 (13.8%)	
2-3 hours	3 (7.9%)	3 (8.6%)	13 (3.7%)	
3-5 hours	1 (2.6%)	0 (0.0%)	3 (0.8%)	
5 hours to the end of the day	0 (0.0%)	0 (0.0%)	8 (2.3%)	
Tomorrow	1 (2.6%)	0 (0.0%)	9 (2.5%)	
No response.	21 (55.3%)	16 (45.7%)	133 (37.6%)	

Table.3: The associated participants factors with the different calling time pattern with an applied chi-square nonparametric test.

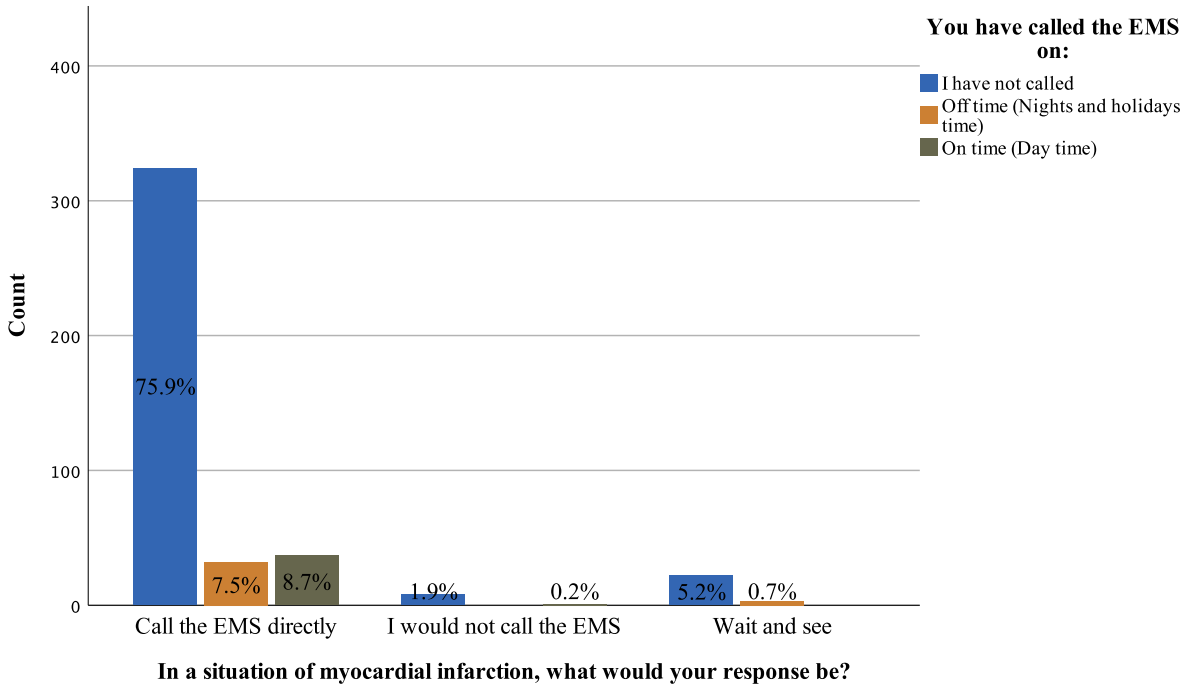

Figure 1: A bar chart representing the percentage of subjects who have called during off-time, day-time, or never called

When asked about the reason behind not calling the EMS, most of the subjects who chose to call during the daytime have mentioned that is a muscular pain that will resolve soon 10 (26.3%), and 32 (7.5%) believed the medical services are far in distance. The rest of the reasons are presented in **(Figure.2).**

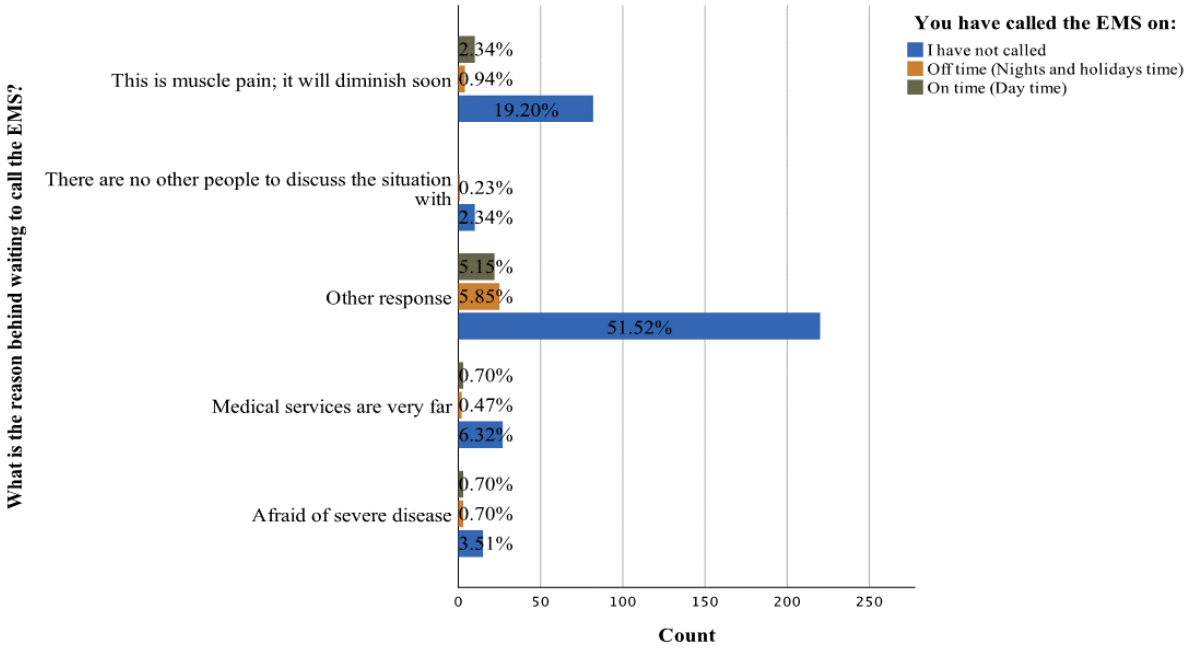

Figure 2: A bar chart visualizing the reasons behind the delays in calling.

Moreover, we have assessed the duration the participants would wait for before calling the EMS. Most of the subjects have stated that they would call in less than one hour (n=176, 41.2%), while 54 (12.6%) of them would wait for an hour to two hours. When compared between the three categories, 21 (55.3%) of the participants who chose to call during the daytime would call in less than an hour, while 16 (45.7%) of the nighttime category of subjects and 139 (39.3%) of those who have not ever called agreed on that on tops (*P*=3.39).

4. DISCUSSION

Acute Myocardial Infarction (AMI) is usually a complication of an ongoing atherosclerotic pathophysiological process inside the distribution of the coronary arterial supply. Under normal physiological circumstances, the blood supply to the myocardial tissue is established during the diastolic phase of contraction. The heart's demand for blood supply in the coronary arteries depends on several factors like contractility, heart rate, and overall activity. When the coronary arterial supply to cardiac cells is disrupted due to atherosclerosis, the demand for blood supply is not established, resulting in ischemic changes. Under certain circumstances, this ischemic change will progressively present as AMI. The presentation of AMI usually involves the presence of chest pain that radiates to the jaw, right shoulder, or arm. To obtain a better understanding of the current discussion, we decided to conduct this study to investigate the public awareness of the need to call the emergency medical services following the onset of acute myocardial infarction and associated factors in Jazan region, Saudi Arabia. There was low public awareness of the correct response to AMI symptom onset (placing an EMS call) in Jazan. The participants' self-confidence about understanding AMI was a significant factor affecting the AMI onset response which is low. The present study has some limitations that should be taken into consideration when interpreting and generalizing its findings. The study's cross-sectional design is inappropriate in explaining the causal link between the variables. Such studies are subject to nonresponse bias. Moreover, because the survey utilized in this study was self-reported, future research should utilize different methods, such as interviews. Additionally, female respondents represented 55.5 % of the study sample, despite the fact that the survey was dispersed equally across the target

population. An unequal gender ratio may limit our findings' generalizability. Nevertheless, the current study was valuable as it is the first study investigating the public awareness of the need to call the emergency medical services following the onset of acute myocardial infarction and associated factors in Jazan region in Saudi Arabia using a validated assessment tool. Moreover, this study revealed that there were small but significant differences in awareness of the appropriate response, as well as in the factors associated with this response, between the on-time and off-time which is similar to [2]. Our findings revealed that 92.0% of the participants would directly call the emergency medical services which are inconsistent with [2,11,12,13] while 5.9% would prefer to wait to see, 2.1% will not call, but 17.8% don't know how to call EMS. AMI is usually managed urgently by cardiac catheterization, and the prognosis usually depends on multiple factors throughout the management plan. The most important factor is the time between the onset of AMI-related symptoms and the initiation of the required intervention which is determined by the initiation of the patient-EMS response. AMI is considered a serious emergency medical condition that is associated with a significant rate of morbidity and mortality if not managed in the appropriate time frame. The time frame for the treatment of AMI is established from the identification of symptoms to the recommended therapeutic intervention. Cases of AMI that receive emergent medical attention and therapy are associated with less mortality rates in comparison to cases that do not. The timeline of disease identification to therapy is dependent on various factors like awareness of disease symptoms, fatality, and appropriate action like calling EMS. Overall, the time between the onset of symptoms and seeking medical intervention can be divided into two parts. The first part where it involves the patient and chaperons 'awareness and identification of the disease symptoms that will result in direct contact with EMS. The second part is the time gap that starts from the patient's arrival to the health care facility to therapeutic intervention, where this part of the timeline mainly depends on the medical personnel. Establishing appropriate action from the onset of symptoms to medical intervention is dependent thoroughly correlated with a positive outcome and a lesser mortality rate. An acute myocardial infarction may present with various symptoms that involve chest pain, shortness of breath, nausea and vomiting [4]. Throughout our study investigations, we believe that it is necessary to educate the general population about the different manifestations of AMI; this can be accomplished throughout the social networks, television, and throughout awareness campaigns. The susceptibility of patients suffering from AMI can be higher depending on the patient's age and risk factors [4]. EMS delay accounts for most of the delays that take place in cases of acute myocardial infarction. The delay can be caused by different factors depending on the region, system, and communication of the place the event took place. Identification of factors that cause EMS response to AMI cases can be challenging, yet it will contribute towards significant reductions in AMI-related case mortality rate. The authors believe that not approaching the EMS due to the different reasons stated by the study subjects including believing that the EMS is far in distance or that the symptoms do not require the seek of emergency help can contribute to this delay. Barriers towards reaching medical attention for AMI can be patient dependent or EMS dependent. Patient-related barriers involve a lack of awareness about the symptoms of the illness and the appropriate action that should be taken in response to the onset of myocardial infarction symptoms. EMS-related barriers involve the lack of appropriate communication between health care personnel and limited healthcare personnel in the given geographic area [5]. The fast-track concept of emergency care was mainly introduced due to the critical role of time in managing cases that involves myocardial infarction [6]. Prehospital identification of MI has a significant role in reducing the timeline between the door to balloon catheterization intervention, which is considered a vital aspect in determining the overall morbidity and mortality of a given case [7]. The sooner AMI symptoms are identified, and the patient is prepared for the appropriate intervention, the better the outcome will be predicted. The six-month mortality rate of post-MI patients that received immediate EMS, and had a short duration of door to catheterization was significantly lower. While the quality and efficiency of EMS implementation vary in different communities, patient or individual-related factors can affect the overall timeline between the

onset of symptoms and EMS response [8]. One of the complications associated with MI is sudden cardiac arrest (SCA). SCA can happen either pre-hospitalization or post-hospitalization. One of the main determents of SCA is the timeline between the onset of symptoms and cardiac catheterization. In a given study, it was concluded that more than one in 20 patients developed SCA at the time of hospital discharge [9]. Patients that reported self-transportation to health care facilities while suffering an AMI perceived EMS as a slower means of transportation meanwhile, patients that reportedly contacted EMS with the onset of their symptoms were significantly aware of its benefits. A significant portion of patients that had direct contact with EMS after suffering from an AMI was encouraged by their family member at the time of the incident [10].

5. CONCLUSION

The authors conclude that the public needs more awareness on the event of myocardial infarction. This can be accomplished by initiating public campaigns and providing the public with the consequences of an ignored myocardial infarction and the potential mortality that could be associated with delaying the emergency medicine services approach.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCES

1. Alrawashdeh, A., Nehme, Z., Williams, B., & Stub, D. (2020). Emergency medical service delays in ST-elevation myocardial infarction: a meta-analysis. Heart (British Cardiac Society), 106(5), 365–373. https://doi.org/10.1136/heartjnl-2019-315034

2. Yonemoto, N., Kada, A., Yokoyama, H., & Nonogi, H. (2018). Public awareness of the need to call emergency medical services following the onset of acute myocardial infarction and associated factors in Japan. The Journal of International Medical Research, 46(5), 1747–1755.

3. Saberian, P., Tavakoli, N., Hasani-Sharamin, P., Sezavar, S. H., Dadashi, F., & Vahidi, E. (2020). The effect of prehospital telecardiology on the mortality and morbidity of ST-segment elevated myocardial infarction patients undergoing primary percutaneous coronary intervention: A cross-sectional study. Turkish journal of emergency medicine, 20(1), 28–34. https://doi.org/10.4103/2452-2473.276380

4. Clawson, J. J., Gardett, I., Scott, G., Fivaz, C., Barron, T., Broadbent, M., & Olola, C. (2018). Hospital-Confirmed Acute Myocardial Infarction: Prehospital Identification Using the Medical Priority Dispatch System. Prehospital and disaster medicine, 33(1), 29–35. https://doi.org/10.1017/S1049023X1700704X

5. Yin, X., He, Y., Zhang, J., Song, F., Liu, J., Sun, G., Liang, Y., Ye, J., Hu, Y., Song, M., Chen, C., Xu, Q., Tan, N., Chen, J., Liu, Y., Liu, H., & Tian, M. (2020). Patient-level and system-level barriers associated with treatment delays for ST elevation myocardial infarction in China. Heart (British Cardiac Society), 106(19), 1477–1482. https://doi.org/10.1136/heartjnl-2020-316621

6. Herlitz, J., Wireklintsundström, B., Bång, A., Berglund, A., Svensson, L., & Blomstrand, C. (2010). Early identification and delay to treatment in myocardial infarction and stroke: differences and similarities. Scandinavian journal of trauma, resuscitation and emergency medicine, 18, 48. https://doi.org/10.1186/1757-7241-18-48

7. Alizadeh, R., Aghsaeifard, Z., Sadeghi, M., Hassani, P., & Saberian, P. (2020). Effects of Prehospital Traige and Diagnosis of ST Segment Elevation Myocardial Infarction on Mortality Rate. International journal of general medicine, 13, 569–575. https://doi.org/10.2147/IJGM.S260828

8. Choi, H., Cha, W. C., Jo, I. J., Choi, J. H., Sim, M. S., & Shin, T. (2020). The individual and neighborhood factors associated with the use of emergency medical services in patients with ST-elevation myocardial infarction. Clinical and experimental emergency medicine, 7(4), 302–309. https://doi.org/10.15441/ceem.19.083

9. Karam, N., Bataille, S., Marijon, E., Tafflet, M., Benamer, H., Caussin, C., Garot, P., Juliard, J. M., Pires, V., Boche, T., Dupas, F., Le Bail, G., Lamhaut, L., Simon, B., Allonneau, A., Mapouata, M., Loyeau, A., Empana, J. P., Lapostolle, F., Spaulding, C., … e-MUST Study Investigators (2019). Incidence, Mortality, and Outcome-Predictors of Sudden Cardiac Arrest Complicating Myocardial Infarction Prior to Hospital Admission. Circulation. Cardiovascular interventions, 12(1), e007081. https://doi.org/10.1161/CIRCINTERVENTIONS.118.007081

10. Mercuri, M., Connolly, K., Natarajan, M. K., Welsford, M., & Schwalm, J. D. (2018). Barriers to the use of emergency medical services for ST-elevation myocardial infarction: Determining why many patients opt for self-transport. Journal of evaluation in clinical practice, 24(2), 375–379. https://doi.org/10.1111/jep.12858

11. Cytryn KN, Yoskowitz NA, Cimino JJ, Patel VL. Lay public's knowledge and decisions in response to symptoms of acute myocardial infarction. Adv Health Sci Educ Theory Pract. 2009 Mar;14(1):43-59. doi: 10.1007/s10459-007-9085-z. Epub 2007 Oct 31. PMID: 17972154.

12. Whitaker S, Baldwin T, Tahir M, Choudhry O, Senior A, Greenfield S. Public knowledge of the symptoms of myocardial infarction: a street survey in Birmingham, England. Fam Pract. 2012 Apr;29(2):168-73. doi: 10.1093/fampra/cmr079. Epub 2011 Oct 5. PMID: 21976661.

13. Chow CM, Chu JY, Tu JV, Moe GW. Lack of awareness of heart disease and stroke among Chinese Canadians: results of a pilot study of the Chinese Canadian Cardiovascular Health Project. Can J Cardiol. 2008 Aug;24(8):623-8. doi: 10.1016/s0828-282x(08)70650-0. PMID: 18685742; PMCID: PMC2644359.