


ORIGINAL ARTICLE

Public awareness of emergency medical services phone number

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ABSTRACT

Background: Activating the emergency medical services (EMS) system in case of medical emergencies must be quick and precise. This study was designed to measure public awareness of Riyadh's EMS phone number.

Methods: This is a cross-sectional study. It identifies major public hubs in Riyadh, Saudi Arabia, as the target locations. It was conducted from September 1st 2019 to December 31st 2019. A semi-structured survey was developed and distributed in person using convenience sampling to measure public awareness of EMS phone number. Ethical approval was obtained to include both adult and youth populations.

Results: A total of 4,806 participants agreed to complete the survey, 2,690 (56%) were male and 2,116 (44%) were female. The majority of participants (3,986, 82.9%) were adults above the age of 18, while 820 (17.1%) were minors under the age of 18. In terms of education, 3,320 (69%) participants had completed college-level or higher. Saudi citizens totaled 4,460 (92.8%). Participants who claimed that they knew the EMS phone number was 3,519 (73.2%). However, only 1,854 (38.5%) recalled the EMS phone number correctly.

Conclusion: The study results show a lack of public awareness of the local EMS phone number, as only 38.5% of the general public were able to recall the EMS phone number. Therefore, it is highly recommended that a major public campaign geared toward increasing public awareness of the EMS phone number is organized.

Keywords: Emergency medical service communication systems, patient transfers, ambulances, emergency medical technicians.

Introduction

Saudi Arabia is one of the biggest countries in the Middle East. Riyadh is the capital city of Saudi Arabia, its financial hub, and has an area of almost two thousand square kilometers. According to the 2018 census reports by the Saudi census organization, over 32.28 million people live in Saudi Arabia and Riyadh is home to more than 8 million people [1]. It is also one of the most populated areas in the Middle East. As with all developing cities in the world, the demand for emergency care has grown in the city [2].

The Saudi Red Crescent Authority (SRCA) is the sole provider of emergency medical services (EMS) for the vast majority of the country. It offers pre-hospital care through emergency calls and disaster response. The SRCA operates with qualified emergency medical technicians, paramedics, and doctors; it is mainly funded and supported by the government. The total number of

SRCA clinical providers in Riyadh is more than 1,700. Emergency calls are received via a central dispatch center with more than 15,000 calls per month.

The American Heart Association estimates that 350,000 cardiac arrests occur outside the hospital annually in America [3]. Survival rates decrease by 10% for every minute cardiopulmonary resuscitation is not performed. After 15 minutes, only 1 in 10,000 people survive [4]. This emphasizes the importance of early activation of

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EMS. Early activation requires the caller to recall the EMS phone number.

There is a gap in the literature in terms of examining the public awareness of EMS phone number in Saudi Arabia. The only study conducted in our country that examined awareness was conducted in the western region [5]. There is a lack of data on public awareness of EMS phone numbers in Riyadh city.

This study was designed to measure public awareness of the EMS phone number in Riyadh city to gain insight into actions that can be taken to increase chances of early activation of EMS services.

Methods

This study is an observational, cross-sectional study, where major public hubs were identified as the target locations in Riyadh, Saudi Arabia. It was conducted from September 1st 2019 to December 31st 2019. A semi-structured bilingual (Arabic and English) survey was developed, validated, and distributed in-person using convenience sampling to measure public awareness of the EMS phone number. In the validation stage, the survey was sent to three independent reviewers, and a question to rate the clarity of each question on a 5-point Likert scale (very clear, clear, slightly ambiguous, ambiguous, and incomprehensible).

Ethical approval to interview participants across all ages (adults and minors) was obtained from the King Abdullah International Medical Research Center.

The survey was designed to be filled by participants. Supplementary Material 1 shows the survey template used in this study. The survey asked for the demographic information of the participants, including gender, age group, nationality, education level, and location of residence. Then, two structured questions relating to the subject of research were asked, followed by a tailored question requesting that the participant write down the EMS phone number. The two questions were:

- Have you ever activated EMS?
- Do you know the number? If yes, then can you recall the number?

The inclusion criteria were members of the general public, above the age of 10, living within the city limits of Riyadh. Minors defined as participants under the age of 18 were required to submit a guardian's consent.

Data were collected in major city hubs such as shopping malls and entertainment sites. Eight trained data collectors distributed the survey in person using tablet computers to ensure the reliability and validity of the answers. Once all the data were collected, they were encrypted and saved on an Excel spreadsheet.

Our sample size estimate required a minimum of 4,269 subjects. We included 10% additional participant to a total of $\approx 4,700$. Our estimate was based on the following:

For estimating the infinite population proportion [6]

Proportion (p) = 0.50, Error (d) = 0.01, Alpha (α) = 0.05, $Z(0.975) = 1.959964$

Sample size (n) = 4,269

Univariate analysis was carried out based on the chi-square test to show how variables of our data including age, gender, literacy, and whether the participant had previously contacted EMS significantly affected the recall of the EMS phone number. Furthermore, our data were modeled using a multivariate multinomial logistic regression analysis, where the group chosen as the reference is the one that recalled the correct EMS phone number. There was no missing data in this study. All analyses were carried out using SAS 9.4 (SAS Institute Inc., Cary, NC), and the level of significance was set at $\alpha = 0.05$.

Results

A total of 4,806 participants agreed to complete the survey; 2,690 (55.9%) were male and 2,116 (44.1%) were female. The mean age was 36.8 years, 820 (17%) participants were 18 years or younger. Saudi citizens were 4,460 (92.8%) of the total participants. Table 1 shows the baseline characteristics of the participants.

Participants who claimed that they knew the EMS phone number were 3,519 (73.2%). However, only 1,854 (38.5%) participants who live in the city limits of Riyadh recalled the EMS phone number correctly. Table 2 shows the participants' knowledge of the EMS phone number.

This study examines a lack of ability to recall the correct EMS phone number among the participants depending on various demographic factors. Our results show that older participants are more likely to lack knowledge of the EMS phone number compared to the ≤ 18 years group with odds ratios and 95% CI of 1.739 (1.329, 2.275), 1.767 (1.336, 2.336), and 2.468 (1.755, 3.47) for the 19–25, 26–36, and >36 groups, respectively.

Table 1. Baseline characteristics of the participants.

Variable	N (%)
Age, years (mean \pm SD)	(36 \pm 8.72)
<18	820 (17.06 %)
19-25	2,153 (44.80%)
26-36	1,382 (28.76%)
> 36	451 (9.38%)
Gender	
Male	2,690 (55.97%)
Female	2,116 (44.03%)
Educational background	
College and higher	3,320 (69.08%)
High school or less	1,486 (30.92%)
Location	
Center of Riyadh	450 (9.36%)
West of Riyadh	443 (9.22%)
East of Riyadh	1,312 (27.30%)
South of Riyadh	484 (10.07%)
North of Riyadh	2,117 (44.05%)
Nationality	
Saudi	4,460 (92.80%)
Non-Saudi	346 (7.20%)

Female participants are more likely to lack knowledge of the EMS phone number compared to male participants with an odds ratio and 95% CI of 1.671 (1.424, 1.961). Participants with higher education levels are less likely to lack knowledge of the EMS phone number compared to the group with high school degrees or less with odds ratios and 95% CI of 0.443 (0.353, 0.555) and 0.613 (0.486, 0.772) for the bachelor or higher level and college students, respectively. Non-Saudis are more likely to lack knowledge of the number compared to Saudis with odds ratios and 95% CI of 3.323 (2.469, 4.47). Moreover, participants who had not previously contacted EMS are more likely to lack knowledge of the number with an odds ratio and 95% CI of 4.582 (3.657, 5.741). A full summary of the multivariate multinomial logistic regression analysis is provided in Table 3.

By comparing those who recalled the wrong EMS number to those who recalled the correct EMS phone number, our results show that only older participants (>36 years old)

are more likely to recall the wrong number compared to the ≤18 years group with odds ratio and 95% CI of 1.445 (1.057, 1.977). Female participants are more likely to recall the wrong number compared to male participants with an odds ratio and 95% CI of 1.376 (1.192, 1.588). Non-Saudis are more likely to recall the wrong number compared to Saudis with an odds ratio and 95% CI of 1.541 (1.126, 2.109). Moreover, participants who had no previous call to the number are more likely to recall the wrong number with an odds ratio and 95% CI of 1.738 (1.483, 2.037). A full summary of the multivariate multinomial logistic regression analysis is provided in Table 4.

Discussion

In this large-scale survey, there was a lack of public awareness of the EMS phone number. Our findings show that only 38.5% of the sample recalled the EMS phone number, which is alarming. In the case of a medical emergency, there is a 38.5% chance that the public

Table 2. Participants' recognition of EMS number.

Variable	Lack of knowledge	Recall EMS number		p value
	(n = 1,287) n (%)	No (n = 1,665) n (%)	Yes (n = 1,854) n (%)	
Age				
<18	573 (45)	282 (17)	319 (17)	0.0127
19-25	357 (28)	776 (47)	804 (43)	
26-36	219 (17)	443 (27)	582 (31)	
> 36	138 (10)	164 (9)	149 (9)	
Gender				
Male	653 (51)s	888 (53)	1,149 (62)	<0.0001
Female	634 (49)	777 (47)	705 (38)	
Educational background				
College and higher	904 (70)	1,171 (70)	1,330 (72)	<0.0001
High School or less	383 (30)	494 (30)	524 (28)	
Nationality				
Saudi	1,116 (87)	1,565 (94)	1,779 (96)	<0.0001
Non-Saudi	171 (13)	75 (6)	100 (4)	
Previous call to EMS				
Yes	108 (8)	332 (20)	576 (31)	<0.0001
No	1,179 (92)	1,333 (80)	1,278 (69)	

Table 3. Multivariate multinomial logistic regression analysis of lack of knowledge.

Parameter	Effect	OR	95% CI	p-value
Age reference (≤18)	19-25	1.739	(1.329, 2.275)	<0.0001
	26-36	1.767	(1.336, 2.336)	<0.0001
	>36	2.468	(1.755, 3.47)	<0.0001
Sex reference (Male)	Female	1.671	(1.424, 1.961)	<0.0001
Education reference (high school or less)	Bachelor or more	0.443	(0.353, 0.555)	<0.0001
	College student	0.613	(0.486, 0.772)	<0.0001
Location of residence reference (North Riyadh)	Central Riyadh	1.061	(0.807, 1.393)	0.6731
	East Riyadh	0.722	(0.6, 0.87)	0.0006
	South Riyadh	0.989	(0.758, 1.29)	0.9337
	West Riyadh	0.669	(0.506, 0.884)	0.0046
Nationality reference (Saudi)	Non Saudi	3.323	(2.469, 4.47)	<0.0001
Previous call reference (Yes)	No	4.582	(3.657, 5.741)	<0.0001

Table 4. Multivariate multinomial logistic regression analysis of recalling the correct number.

Parameter	Effect	OR	95% CI	p-value
Age reference (≤18)	19-25	1.175	(0.921, 1.498)	0.1944
	26-36	1.005	(0.777, 1.302)	0.9676
	>36	1.445	(1.057, 1.977)	0.0212
Sex reference (Male)	Female	1.376	(1.192, 1.588)	<0.0001
Education reference (high school or less)	Bachelor or more	0.817	(0.663, 1.005)	0.0562
	College student	0.848	(0.686, 1.05)	0.1302
Location of residence reference (North Riyadh)	Central Riyadh	0.923	(0.71, 1.199)	0.5489
	East Riyadh	1.005	(0.854, 1.183)	0.9515
	South Riyadh	1.184	(0.929, 1.508)	0.1716
	West Riyadh	0.956	(0.753, 1.214)	0.7119
Nationality reference (Saudi)	Non Saudi	1.541	(1.126, 2.109)	0.0070
Previous call reference (Yes)	No	1.738	(1.483, 2.037)	<.0001

will activate EMS correctly. In comparison with other studies, this finding is lower than other reported findings in our region [5] but similar to the findings in studies on the Indian continent [7]. The lower rate of recognition compared to a previous local study could be attributed to the different methodology we used in asking participants to recall the EMS number.

The possibility that a delay in calling EMS will occur is high in our society. The more worrying finding is that only 52.6% of participants who assumed to know the number were able to recall the EMS phone number correctly. Overconfidence in emergency situations is usually disastrous. Thus, it is crucial the public is educated in this regard.

Participants recalled 3-digit numbers designated to other public service agencies such as civil defense instead of the EMS number. The EMS phone number is 997, police is 999, and civil defense is 998. Many participants assumed that the emergency phone number is 911, even though this is, in fact, the emergency phone number in the US. The media in our region may contribute to the assumption that 911 is our emergency phone number.

The secondary analysis suggested that people with literacy are more likely to recall the correct number, and that previous experience in calling EMS was also a factor in recalling the number correctly. College students are more likely to recall the number correctly, and public campaigns focusing on public schools and colleges will improve the overall public recall of EMS phone numbers. We believe that improving public awareness will impact early activation of medical emergency services as our study shows that previous engagement with the number builds familiarity and allows a person to recall the number more easily.

The lack of a single standardized central emergency phone number (such as 911 in the US) is challenging. Public agencies' duplication of emergency call centers might be costly and directing funds toward a single central emergency call center might be more cost-effective. The results of our study suggest confusion regarding the multiple phone numbers of public service agencies. There is an urgent need to build a centralized single phone number for public service agencies to minimize this confusion.

Conclusion

In conclusion, the study results show a lack of public awareness as only 38.5% recalled the EMS phone number correctly. Many participants assumed that they know the EMS phone number but only 52.6% of them recalled it correctly. A major public education campaign to educate public on EMS phone number is recommended.

List of Abbreviations

EMS Emergency Medical Services
SRCA Saudi Red Crescent Authority

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate

Written informed consent was obtained from all the participants.

Ethical approval

Ethical approval was granted by King Abdullah International Medical Research Center Institutional Review Board via reference number SP19/375/R dated: 11/09/2019.

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***Supplementary Material 1. Copy of the questioner/
consent form.***

Questionnaire

Public awareness of EMS number in Riyadh

* General Information

» Gender

- Male
- Female

» Age

- 14-20
- 21-30
- 31-50
- +50

» Academic Level

- Elementary School
- Middle School
- High School
- University
- Post-Graduation
- None

» Nationality

- Saudi
- Non-Saudi

» Have you ever activated the EMS system?

- YES
- No

» Do you know the number of EMS system?

- YES
- No

» If yes, what is the number of EMS system?