Raghad A. Alamer. Saudi J Er Med. XXXX;XX(XX):001-006
DOI: XXX

Original Article

Awareness of first aid measures among the public in response to road traffic accidents in Makkah population

Raghad A. Alamer[1], Tala A. Zamil[2], Shahad N. Alsharif[2], Reem K. Alnemari[2], Amal A. Alamary[2], Wujud A. Alshehri[2], Mokhtar M. Shatla[3]

ABSTRACT

Background: Although road traffic accident (RTA) rates have decreased in Saudi Arabia, regional variations remain. First aid (FA), combined with early emergency calls, may reduce mortality and morbidity. However, public awareness and confidence levels regarding the provision of FA after RTAs are still low. This study assessed the knowledge, attitudes, and barriers among the public in the Makkah region.

Methods: This cross-sectional study assessed public awareness and knowledge toward FA management of RTAs in Makkah City, Saudi Arabia. Data were collected from March 16 to September 26, 2025, and an anonymous online survey was distributed electronically to the public.

Results: A total of 390 participants were enrolled. Almost half (49.2%) of the participants reported having received previous FA training. Most respondents were aged 18–44 years (85.9%), and trained individuals were more likely to be younger than 44 years (91.1% *vs.* 80.8%; $p = 0.009$). Females comprised 71.5% of participants. Training was significantly more prevalent among individuals with a high school education or lower ($p = 0.019$). Awareness of emergency numbers was reported in 80.2% of participants, which was significantly higher among those who were trained (88% versus 72.7%; $p < 0.001$).

Conclusion: The level of FA preparedness in the Makkah region is not uniform. Formal FA training was associated with higher knowledge levels, although barriers to providing FA remained common. Community-based FA programs for bystanders should be more widely implemented and could potentially enhance bystanders' levels of response and outcomes in RTAs.

Keywords: awareness, first aid, public, road traffic accidents, Makkah

Introduction

Road traffic accidents (RTAs) are a major global health problem, causing approximately 1.3 million deaths annually and up to 50 million nonfatal injuries, the majority of which (93%) occur in low- and middle-income countries [1]. RTAs are the 8th leading cause of death worldwide and are projected by the World Health Organization to become the 5th leading cause by 2030 [1,2]. In Saudi Arabia, RTAs remain among the leading causes of mortality, particularly in younger age groups [3]. First aid (FA), defined as immediate assistance provided by a bystander or victim with minimal or no medical equipment, plays a critical role in preserving life, preventing further complications, and improving outcomes until professional medical care is available [4,5].

FA refers to immediate care provided to an injured or ill person until professional medical services are available. It saves lives, reduces pain, prevents complications, and supports recovery [6]. Studies have shown that even untrained bystanders can improve the survival rates of accident victims with severe injuries or cardiac arrest. Delays in identifying and managing RTA victims increase the severity of outcomes, making early prehospital intervention and access to high-quality hospital care essential. For example, a Canadian study

Correspondence to: Wujud Ali Alshehri
*College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia.
Email: Wujudshehri@gmail.cm
Full list of author information is available at the end of the article.
Received: 19 February 2026 | **Accepted**: 30 Aug 2026

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reported that survival rates increased from 8% to 32% if bystanders administered FA [6]. Similarly, a cross-sectional study in Jordan involving 1,500 university students found insufficient FA knowledge and suggested the implementation of practical training at the secondary school level. However, publications addressing FA expertise in the Middle East remain limited [1].

Therefore, this study aimed to evaluate the level of public knowledge and awareness of FA measures in response to RTAs in Makkah, Saudi Arabia, where this topic has not been widely investigated. These findings are expected to contribute to the improvement of road safety and outcomes for accident victims.

Materials and Methods

Study design, setting, and time

This cross-sectional study was conducted in Makkah, Saudi Arabia, between March and September 2025.

Study participants and sampling technique

This study included adults aged ≥18 years residing in Makkah, Saudi Arabia, of both sexes who agreed to participate. Participants were recruited using convenience sampling through an online self-administered questionnaire distributed electronically via social media platforms. Although this method allowed easy access to a large number of participants, it may have introduced a selection bias toward younger individuals, females, and those with higher education levels or greater interest in health-related topics.

Sample size

The sample size was calculated using OpenEpi software version 3.0, based on the estimated population size using the 2022 Saudi census data (32,175,224 individuals). With a 95% confidence interval (CI) and anticipated response rate of 50%, the minimum required sample size was 385 participants.

Data collection

Data were collected using a structured online questionnaire adapted from and modified from previously published studies that assessed FA awareness and attitudes toward RTAs. Before distribution, a community medicine specialist reviewed the questionnaire to assess its clarity, relevance, and comprehensibility.

The questionnaire consisted of the following three main sections:

(1) Sociodemographic information, including age, sex, educational level, occupation, marital status, place of residence, driving license status, and previous FA training.

(2) Knowledge section assessed participants' understanding of basic FA principles, including airway obstruction management, victim positioning, fracture management, and bleeding control.

(3) Attitude section, which evaluated participants' willingness to provide FA or attend FA training, perceived the importance of FA knowledge for drivers, and concerns regarding legal consequences.

Formal psychometric validation and internal consistency testing, including Cronbach's alpha, were not performed, and should be considered when interpreting the findings.

Ethical approval

Ethical approval was obtained from the Biomedical Research Ethics Committee of Umm Al-Qura University (Approval No. HAPO-02-K-012-2025-06-2821).

Data analysis

Data were analyzed using SPSS software version 26. Categorical variables are presented as frequencies and percentages, while continuous variables are expressed as means ± standard deviations (SDs). Pearson's chi-squared test was used to examine the associations between categorical variables. Welch's two-sample t-test was used to compare the mean knowledge scores between the two groups, while one-way analysis of variance (ANOVA) was used for comparisons across more than two groups.

Multiple linear regression analysis was performed to identify the factors independently associated with knowledge scores. The variables included in the regression model were selected based on their statistical significance in the univariate analysis and clinical relevance.

The knowledge score was calculated based on the participants' responses to the knowledge-assessing items and converted into a percentage scale ranging from 0% to 100%, with higher percentages indicating better FA knowledge.

A p-value <0.05 was considered statistically significant.

Results

In total, 390 respondents fulfilled the inclusion criteria. Participants were stratified according to their previous FA training status, with 49.2% reporting prior FA training and 50.8% reporting no previous training. Most participants were aged 18–44 years (85.9%), and females represented 71.5% of the sample. Previous FA training was significantly associated with younger age ($p = 0.009$), educational level ($p = 0.019$), marital status ($p < 0.001$), absence of children ($p < 0.001$), and awareness of emergency contact numbers for RTAs ($p < 0.001$). No significant association was observed between sex and previous FA training ($p = 0.067$) (Table 1).

Among the participants, 47.2% reported having a current driving license, and the majority used vehicles for personal purposes (92.4%). Only 34.8% reported having a FA kit in their car, with no significant association between possession of a FA kit and previous FA training. Additional driving-related characteristics are provided in the Supplementary Material available online.

Nearly half the participants (46.7%) reported previous involvement in an RTA, whereas only 6.4% reported providing FA at the accident scene. Approximately 15.4% of the participants reported exposure to more than five RTAs during the previous year. Poor knowledge

was the most frequently reported barrier to providing FA (56.4%) and was significantly more common among participants without previous FA training (68.2% *vs.* 44.3%; $p < 0.001$). Fear of causing complications was another commonly reported barrier (51.0%), while legal and personal safety concerns were reported by 22.3% and 10.3% of participants, respectively (Table 2).

The mean knowledge score among the participants was 47.9% (range: 0%–90.91%), reflecting a relatively low level of FA knowledge. Detailed responses to the knowledge-assessment items are provided in the supplementary material available online. Higher knowledge scores were significantly associated with younger age ($p = 0.0003$), female sex ($p = 0.0001$), educational level ($p = 0.002$), single marital status ($p < 0.001$), absence of children ($p < 0.001$), awareness of emergency hotlines ($p = 0.001$), and absence of a driving license ($p = 0.017$). No significant associations were observed between the knowledge scores and barriers to FA provision (Table 3).

The participants generally demonstrated positive attitudes toward FA and RTAs. Most participants agreed that drivers should have FA knowledge and expressed a willingness to attend FA training courses. Higher knowledge scores were significantly associated with more positive attitudes toward FA training and provision (Tables 4 and 5).

Multiple linear regression analysis demonstrated significant independent associations between knowledge scores and several variables, after adjusting for potential confounders. Having children was independently associated with lower knowledge scores ($\beta = -12.1$, $p = 0.009$), whereas previous FA training ($\beta = 8.42$, $p < 0.001$) and awareness of the RTA emergency hotline ($\beta = 5.65$, $p = 0.012$) were independently associated with higher knowledge scores (Table 6).

Table 1. *Distribution of sociodemographic characteristics (n: 390)*

Overall sample (n: 390)		Ever received FA training?		
Term	**Overall N (%)**	**Yes N (%) (*n* = 192)**	**No N (%) (*n* = 198)**	**p-value**
Age group				**0.009****
18–44	335 (85.9)	175 (91.1)	160 (80.8)	
45–60	44 (11.28)	15 (7.8)	29 (14.6)	
More than 60	11 (2.82)	2 (1)	9 (4.5)	
Gender				0.067
Male	111 (28.46)	46 (24)	65 (32.8)	
Female	279 (71.54)	146 (76)	133 (67.2)	
Education				**0.019***
High-school or less	154 (39.49)	90 (46.9)	64 (32.3)	
Diploma	26 (6.67)	11 (5.7)	15 (7.6)	
Bachelor's	191 (48.97)	80 (41.7)	111 (56.1)	
Post-graduate	18 (4.62)	11 (5.7)	7 (3.5)	
None	1 (0.26)	0 (0)	1 (0.5)	
Marital status				**<0.001*****
Single	271 (69.49)	157 (81.8)	114 (57.6)	
Married	112 (28.72)	33 (17.2)	79 (39.9)	
Divorced	6 (1.54)	1 (0.5)	5 (2.5)	
Widowed	1 (0.26)	1 (0.5)	0 (0)	
Children?				
Yes	107 (27.44)	33 (17.2)	74 (37.4)	
No	283 (72.56)	159 (82.8)	124 (62.6)	
Emergency number to report RTA				
Yes	313 (80.26)	169 (88)	144 (72.7)	
No	77 (19.74)	23 (12)	54 (27.3)	
$\alpha = 0.05$. $p < 0.05$*, $p < 0.01$**, $p < 0.001$***				
P-values obtained from Pearson's chi-square test of independence				

Discussion

This study assessed the FA knowledge related to RTAs among adults in Makkah, Saudi Arabia. The overall mean knowledge score was 47.9%, indicating a moderate gap in

Table 2. *RTA experience and FA deployment barriers (n: 390)*

Overall sample (n: 390)		Ever received FA training?		
Term	**Overall N (%)**	**Yes N (%) (n = 192)**	**No N (%) (n = 198)**	**p-value**
RTAs exposure last year				0.787
1 to 5	330 (84.62)	161 (83.9)	169 (85.4)	-
More than 5	60 (15.38)	31 (16.1)	29 (14.6)	-
Ever been in a RTA	182 (46.67)	86 (44.8)	96 (48.5)	0.529
If yes, ever provided FA on scene	25 (6.41)	13 (6.8)	12 (6.1)	0.783
Barriers				
Poor knowledge	220 (56.41)	85 (44.3)	135 (68.2)	<0.001***
Fear of inflicting complications	199 (51.03)	95 (49.5)	104 (52.5)	0.617
Legal concerns	87 (22.31)	43 (22.4)	44 (22.2)	0.99
Personal safety concerns	40 (10.26)	21 (10.9)	19 (9.6)	0.787
$\alpha = 0.05$. $p < 0.05$*, $p < 0.01$**, $p < 0.001$***				
P-values obtained from Pearson's chi-square test of independence				

Table 3. *Associations between knowledge score and background parameters (n: 390)*

Knowledge (%) VS:	p-value	Estimate (95% CI)
Age group	0.0003***	-
Gender	0.0001	8.6 (4.5 to 12.7)
Education	0.0024**	-
Marital status	<0.0001***	-
Children?	<0.0001***	14.3 (10.3 to 18.2)
Emergency number to report RTA	0.0015**	7.9 (3.1 to 12.7)
Driving license	0.0174*	4.5 (0.8 to 8.3)
RTAs exposure last year	0.6806	–1 (–6.1 to 4)
Ever been in a RTA	0.0505	3.7 (0 to 7.5)
If yes, ever provided FA on scene	0.5963	-

Table 4. *Attitude of participants towards FA (n: 390).*

Variable	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Each driver should know FA	187 (47.95%)	190 (48.72%)	9 (2.31%)	3 (0.77%)	1 (0.26%)
Can provide FA	116 (29.74%)	191 (48.97%)	63 (16.15%)	16 (4.1%)	4 (1.03%)
Will attend FA training	172 (44.1%)	183 (46.92%)	30 (7.69%)	3 (0.77%)	2 (0.51%)
FA is important but not always enough	71 (18.21%)	202 (51.79%)	76 (19.49%)	33 (8.46%)	8 (2.05%)
FA training is available	81 (20.77%)	177 (45.38%)	100 (25.64%)	30 (7.69%)	2 (0.51%)
Helping RTA victims isn't only for HCPs	147 (37.69%)	186 (47.69%)	37 (9.49%)	14 (3.59%)	6 (1.54%)
Legal concerns about FA	69 (17.69%)	146 (37.44%)	118 (30.26%)	48 (12.31%)	9 (2.31%)

Table 5. *Associations between attitude and knowledge score (n: 390)*

Knowledge (%) VS:	p-value	Estimate (95% CI)
Each driver should know FA	**0.0070****	**-**
Can provide FA	**<0.0001*****	**-**
Will attend FA training	**0.0024****	**-**
FA is important but not always enough	0.0701	-
FA training is available	0.4177	-
Helping RTA victims isn't only for HCPs	**0.0227***	**-**
Legal concerns about FA	0.2832	-

public awareness of essential FA measures. Deficiencies were noted in airway management, recognition of apnea, recovery positioning, and fracture management, even

Table 6. *Multiple linear regression analysis for factors associated with knowledge score (n: 390 complete responses)*

Term	Coef (95% CI)	p-value
(Intercept)	40.732 (35.64 to 45.82)	<0.0001***
Age group	-	-
18–44	Ref	Ref
45–60	2.067 (–4.77 to 8.9)	0.5523
More than 60	1.581 (–9.67 to 12.83)	0.7825
Marital status	-	-
Single	Ref	Ref
Married	–0.004 (–9.11 to 9.1)	0.9992
Divorced	–3.209 (–18.08 to 11.66)	0.6715
Widowed	–0.264 (–34.24 to 33.72)	0.9878
Children?	-	-
No	Ref	Ref
Yes	–12.135 (–21.28 to –2.99)	0.0094**
Emergency number to report RTA	-	-
No	Ref	Ref
Yes	5.653 (1.24 to 10.06)	0.0122*
Driving license	-	-
Yes	Ref	Ref
No	3.008 (–0.62 to 6.64)	0.1044
Ever received FA training?	-	-
No	Ref	Ref
Yes	8.424 (4.78 to 12.07)	<0.0001***

among participants who reported previous FA training. These findings suggest that current training exposure may not be sufficient to ensure adequate retention of practical FA knowledge, and highlight the need for more structured and practical educational approaches.

Several sociodemographic factors were significantly associated with FA knowledge. Higher knowledge scores were observed among younger participants, females, single individuals, participants without children, and those aware of emergency hotline numbers. Previous FA training was also independently associated with higher knowledge scores, which is consistent with findings from previous studies that demonstrated a positive association between formal FA training and improved theoretical and practical knowledge related to RTAs [4,11,12]. Similarly, awareness of emergency medical service hotline numbers was associated with better knowledge, which may reflect greater awareness of emergency response systems and preparedness to respond to RTAs [13].

Our findings partially align with those of previous regional and international studies reporting higher FA knowledge among younger individuals and previously trained participants [7,8]. However, the observed association between lower educational levels and higher FA training exposure differs from that reported in other published studies [1]. These differences may reflect variations in the study population, recruitment methods, and the accessibility of FA training programs across different settings. In this study, training opportunities

were accessible through vocational institutes, driving schools, or community-based initiatives.

This study also identified several barriers to the provision of FA after RTAs. Poor knowledge was the most frequently reported barrier, particularly among participants without prior FA training. Fears of causing complications, legal concerns, and concerns about personal safety have also been commonly reported. Similar barriers have been described in previous studies examining bystander response during emergencies [14–16]. These findings highlight the importance of improving public confidence through practical scenario-based FA training programs. In addition, increasing awareness of legal protection policies, including the Good Samaritan principles, may help reduce hesitation toward providing emergency assistance.

Attitudes toward FA were generally positive, as most participants agreed that drivers should possess FA knowledge and expressed a willingness to attend training programs. Participants with more positive attitudes toward FA demonstrated significantly higher knowledge scores, which is consistent with previous literature and the Health Belief Model [17].

Although previous exposure to RTAs was common among participants, it was not significantly associated with higher knowledge scores, suggesting that personal experience alone may not improve preparedness in the absence of formal education or training. Overall, the findings of the present study support existing evidence emphasizing the importance of formal FA education and public awareness initiatives to improve bystander responses after RTAs [18].

This study contributes to the existing literature by identifying specific knowledge gaps and factors associated with FA knowledge among adults in Saudi Arabia. These findings may help guide future educational initiatives and targeted FA training programs to improve public preparedness and emergency responses.

Limitations

This study had several limitations. Its cross-sectional design allowed for the identification of associations only and did not establish causality. The use of an online convenience sampling method may have introduced a selection bias toward younger, female, and more educated participants, which may limit generalizability. In addition, the data were self-reported, and practical FA skills were not objectively assessed. The questionnaire was adapted from previous studies but did not undergo formal psychometric or internal consistency testing.

Conclusion

The present study demonstrated relatively low levels of FA knowledge related to RTAs among adults in Makkah. Previous FA training and awareness of the number of emergency hotlines were associated with higher knowledge scores, whereas poor knowledge, fear of complications, and legal concerns were common barriers to providing FA. These findings support the need for accessible and practical FA training programs, increased public awareness of emergency response, and legal protection policies for bystander assistance.

Acknowledgments

The authors gratefully acknowledge the cooperation of all participants.

List of Abbreviations

FA	First aid
RTA	Road traffic accident
RTAs	Road traffic accidents
HCPs	Healthcare professionals
CI	Confidence interval
UQU	Umm Al-Qura University
SPSS	Statistical Package for the Social Sciences
$\chi 2$	Chi-squared test
SD	Standard deviation

Conflict of interest

The authors declare that there are no competing interests related to that work.

Funding

None.

Consent to participate

All participants provided informed consent.

Ethical approval

This study obtained an approval from the Biomedical Research Ethics Committee of Umm Al-Qura University, by the approval number (HAPO-02-K-012-2025-06-2821).

Author details

Raghad A. Alamer[1], Tala A. Zamil[2], Shahad N. Alsharif[2], Reem K. Alnemari[2], Amal A. Alamary[2], Wujud A. Alshehri[2], Mokhtar M. Shatla3

1. Department of Emergency Medicine, King Abdullah Medical City, Makkah, Saudi Arabiaia
2. College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia
3. Department of Community Medicine and Pilgrims' Health Care, College of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia

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