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Associated factors with intensive care unit (ICU) admission and mortality among road traffic accident victims in southern Iran: results from a trauma registry

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Abstract: **Objective:** Road traffic crashes are a significant health problem worldwide, causing injury, disability, and death. This study aims to identify associated factors with intensive care unit (ICU) admission and mortality among road traffic accident victims using data from a trauma registry.

Methods: This descriptive study examined 368 road traffic accident patients in the national trauma registry system from March 2021 to March 2023. Following the objectives of the study, a checklist was created that included information on age, gender, marital status, level of education, injury severity score (ISS), Glasgow coma scale (GCS), and abbreviated injury scale (AIS). The factors associated with ICU admission and mortality among road traffic accident victims were found significant according to univariate and multivariable logistic regression analyses results.

Results: 87.8% of the 368 patients included in this study were men, with a mean age of 33.54±18.95 years. Ten patients (2.71%) of total died, and 46 (12.5%) needed to be admitted to the ICU. In-hospital mortality and gender were not significantly associated (P=0.081). However, univariate logistic regression revealed several factors significantly associated with in-hospital mortality, including GCS<8 (OR: 60.05, 95% CI: 11.67,309), ISS>16 (OR: 11.39, 95% CI: 2.67,48.55), ICU admission (OR: 5,01, 95% CI: 1.36,18.50), underwent surgery (OR: 0.055, 95% CI: 0.014,0.223), respiratory rate (OR: 0.726, 95% CI: 0.630,0.836), O2 saturation (OR: 0.906, 95% CI: 00.852,0.963), systolic blood pressure (OR: 0.910, 95% CI:0.865,0.957) and temperature (OR: 0.932, 95% CI: 00.891,0.975). Furthermore, the odds of ICU admission was found to be increased with an ISS>16 (OR: 2072.12, 95% CI: 17.29,50644.09), being a pedestrian (OR: 366.53, 95% CI: 31.44,389.85), GCS<8 on admission (OR: 87.64, 95% CI: 29.04,264.43), smoking (OR: 11.92, 95% CI: 1.45,97.64), drug usage before the accident (OR: 11.47, 95% CI: 7.09,18.56), being a motorcyclist (OR: 5.72, 95% CI: 1.06,29.22), age (OR: 1.19, 95% CI: 1.05,1.34) and the time duration between the event and admission (OR: 1.01, 95% CI: 1.003,1.02).

Conclusion: This study underscores the critical role of timely and effective medical interventions, including surgical procedures, in improving the outcomes of road accident victims. It also highlights the need for targeted preventive measures and interventions for high-risk groups pedestrians and motorcyclists.

Keywords: Hospital Mortality, Injuries, Iran, Risk Factors, Road Traffic Accidents

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1. Introduction

Road traffic accidents are a significant public health concern globally, causing a high number of injuries, disabilities and deaths each year (1).

Despite various measures to prevent road accidents and improve road safety, fatalities and injuries remain high (2). Hospitalization is often required to treat road traffic accident injuries, and mortality rates following hospitalization can be substantial (3).

Identifying associated factors for hospital mortality following a road accident is critical for improving patient outcomes and reducing the burden of road traffic injuries (4). The risk factors associated with hospital mortality following road traffic accidents are complex and multifactorial, including patient- and system-related factors (5).

Patient-related factors contributing to hospital mortality fol-

lowing the road traffic accidents include age, gender, comorbidities, the severity of injuries, and delayed hospital arrival. System-related factors include the quality of prehospital care, availability of specialized trauma care, and hospital infrastructure and resources (6,7).

Identifying these risk factors can inform healthcare professionals, policymakers, and the general public about the measures to prevent road accidents and improve patient outcomes (8). Preventive strategies may include improving the road infrastructure, enforcing traffic regulations, promoting safe driving behaviors, and providing timely and effective prehospital care (9).

Effective management strategies may include early identification and intervention of high-risk patients, timely referral to specialized trauma centers, and coordinated multidisciplinary care.

Several studies have investigated the risk factors for hospital mortality following road accidents, and their results have provided valuable insights into the nature of this problem (3,7,10).

One study found older age, male gender, head and neck injuries, severe injuries to the thorax and abdomen, hypotension, and the need for mechanical ventilation were significant predictors of hospital mortality following road traffic accidents (2). Another study identified alcohol consumption, not wearing a seatbelt, and being a pedestrian as substantial risk factors for hospital mortality (11).

Other studies showed the association of alcohol use (odds ratio (OR): 2.4), being a pedestrian (OR: 3.2), head and neck injuries (OR: 45.8) as well as thoracic (OR: 22.6), abdominal (OR: 6.2), vertebral (OR: 9.3), extremities injury (OR: 4.3), abnormal creatinine (OR: 4.1), GCS≤8 (OR: 1871.5), and ISS≥16 (OR: 20.32) with hospital mortality in road traffic accident patients (3).

Regarding the system-related factors, studies have highlighted the importance of prehospital care quality, access to specialized trauma centers, and the hospital infrastructure and resources (12). Effective hospital care has been shown to reduce hospital mortality rates by ensuring timely and appropriate management of injured patients (13).

Overall, the findings of these studies suggest that a comprehensive approach is needed to address the risk factors associated with hospital mortality following road traffic accidents. This approach should include measures to prevent road traffic accidents, promote safe driving behaviors, provide timely and effective hospital care, and ensure access to specialized trauma care.

Using a trauma registry is an efficient and accurate way to collect and analyze data on trauma patients (14), and this study is one of the few studies has used such a registry to investigate road traffic accidents related mortality.

Identifying associated factors of mortality in road traffic accident patients can inform trauma care providers factors to consider when treating patients at high risk of mortality.

This study aimed to identify associated factors between ICU admission and mortality rate among road traffic accident victims using data from a trauma registry.

2. Methods

2.1. Study design

A descriptive study was conducted, examining 368 road traffic accident patients who were included in the national trauma registry system over 24-month, from March 2021 to March 2023.

The study includes all trauma patients who arrived to the emergency department of Paymanieh hospital in Jahrom during the study period. Their data has been recorded in the national trauma registry system. The trauma registry program encompasses information on all trauma patients needed hospitalization, who were admitted for at least 24 hours, deceased in the emergency department with less than 24 hours of hospitalization, or transferred from the previous hospital's ICU to the current hospital's ICU with less than 24 hours of hospitalization. Patients with incomplete records, whom it is not possible to retrieve the missing information for any reason, were excluded from the study. All participants were given the opportunity to give their informed consent, and the study adhered to the ethical standards outlined in the Helsinki Declaration. The Jahrom University of Medical Sciences Research Ethics Committee gave the study their seal of approval under the Ethical ID IR.JUMS.REC.1400.061. All participants gave written consent to take part in the study after being informed of its goals, methods, potential risks, and benefits.

2.2. National trauma registry

The Sina trauma and surgery research center established the national trauma registry in Tehran, Iran (NTRI) in 2015 (15,16). The registry uses an eight-part questionnaire to gather information on demographics, injury specifics, prehospital care, emergency room (ER) treatment, hospital measures, diagnostic data, patients' outcomes, and severity of injuries. Patient interviews, physician input, and hospital information system (HIS) records are all used for gathering the data. The national trauma registry system is maintained by trained registrars, who are also responsible of entering patient data. Independent controllers check the data's accuracy and completeness. In 2021, Peymaniyeh Jahrom trauma hospital joined the national trauma registry program. Currently, the Sina trauma and surgery research center is directing the program's implementation of its protocol.

2.3. Severity of injury

The abbreviated injury scale (AIS), the injury severity score (ISS), and the Glasgow coma scale (GCS) which have previously been discussed , are used in this study to assess the severity of the injury (14).

AIS: the AIS ranges from 1 to 6. Score 1 indicates a minor injury and score 6 signifies severe injury or fatality. In our anal-

Table 1 Predictors of in-hospital mortality among traffic accident patients admitted to Jahrom trauma hospital in 2021-2022

Variable	Total	ICU admission		P-value	Discharge status		P-value
		Yes (n=46)	No (n=322)		Survived (n=358)	Died (n=10)	
Age(year), mean±SD	33.54±18.95	26.19±15.84	34.59±19.15	0.005[a]	33.80±18.78	24.2±23.54	0.114[a]
Hospitalization days, mean±SD	4.85±6.38	15.23±11.08	3.36±3.42	<0.001[a]	4.74±6.05	8.50±13.94	0.067[a]
Gender, n (%)							
Male	323 (87.8)	44 (95.7)	279 (86.6)	0.081[c]	316 (88.3)	7 (70)	0.082[c]
Female	45 (12.2)	2 (4.3)	43 (13.4)		42 (11.7)	3 (30)	
Nationality, n (%)							
Iranian	348 (94.6)	42 (91.3)	306 (95)	0.387[c]	339 (94.7)	9 (90)	0.064[c]
Non-Iranian	50 (5.4)	4 (8.7)	16 (5)		18 (5.0)	1 (10)	
Level of education, n (%)							
Illiterate	52 (14.1)	8 (17.4)	44 (13.7)	0.959[c]	50 (14)	2 (20)	0.125[c]
Primary	62 (16.8)	8 (17.4)	54 (16.8)		60 (16.8)	2 (20)	
Secondary	145 (39.4)	18 (39.1)	127 (39.4)		141 (39.4)	4 (40)	
Diploma	90 (24.5)	10 (21.7)	80 (24.8)		90 (25.1)	0 (0)	
Graduation	19 (5.2)	2 (4.3)	17 (5.3)		17 (4.7)	2 (20)	
BMI, n (%)							
<25	214 (58.8)	25 (54.3)	189 (58.7)	0.731[c]	210 (58.7)	4 (40)	0.290[c]
25-29.9	124 (33.7)	16 (34.8)	108 (33.9)		120 (33.5)	4 (40)	
≥30	20 (8.2)	5 (10.9)	25 (7.8)		28 (7.8)	2 (20)	
Marital status, n (%)							
Single	182 (49.5)	31 (67.4)	151 (46.9)	0.001[c]	175 (48.9)	7 (70)	0.418[c]
Married	185 (50.3)	14 (30.4)	171 (53.1)		182 (50.8)	3 (30)	
Divorced	1 (0.3)	1 (2.2)	0 (0)		1 (0.3)	0 (0)	
Occupation status, n (%)							
Employed	196 (53.3)	26 (56.5)	170 (52.8)	0.001[c]	192 (53.6)	4 (40)	0.007[c]
Unemployed	15 (4.1)	5 (10.9)	10 (3.1)		15 (4.2)	0 (0)	
Student	89 (24.2)	9 (19.6)	80 (24.8)		86 (24)	3 (30)	
Retired	9 (2.4)	1 (2.2)	8 (2.5)		9 (2.5)	0 (0)	
Disabled	7 (1.9)	1 (2.2)	6 (1.9)		7 (2.0)	0 (0)	
Housewife	30 (8.2)	0 (0)	30 (9.3)		30 (8.4)	0 (0)	
Children under six years	7 (1.9)	4 (8.7)	3 (0.9)		5 (1.4)	2 (20)	
Unknown	14 (3.8)	0 (0)	15 (4.6)		14 (3.9)	1 (10)	
Type of transfer to hospital, n (%)							
EMS	188 (51.1)	35 (76.1)	153 (47.5)	<0.001[c]	182 (50.8)	6 (60)	<0.001[c]
Personal	157 (42.7)	6 (13)	151 (46.9)		157 (43.9)	0 (0)	
Others	23 (6.3)	5 (10.9)	18 (5.6)		19 (5.3)	4 (40)	
Position the injured person, n (%)							
Pedestrian	43 (11.7)	3 (6.5)	40 (12.4)	0.016[c]	41 (11.5)	2 (20)	0.696[c]
Cyclist	3 (0.8)	0 (0)	3 (0.9)		3 (0.8)	0 (0)	
Motorcyclist	243 (66)	25 (54.3)	218 (67.7)		238 (66.5)	5 (50)	
Car passenger	79 (21.5)	18 (39.1)	61 (18.9)		76 (21.2) 3 (30)		
Alcohol consumption before the trauma, n (%)							
Yes	19 (5.2)	9 (19.6)	10 (3.1)	<0.001[c]	19 (5.3)	2 (20)	0.454[c]
No	349 (94.8)	37 (80.4)	312 (96.9)		339 (94.7)	8 (80)	
Drug use before the trauma, n (%)							
Yes	25 (9.6)	7 (15.2)	18 (5.6)	0.015[c]	23 (6.4)	2 (20)	0.092[c]
No	343 (93.2)	39 (84.8)	304 (94.4)		335 (93.6)	8 (80)	
Admitted to the ICU, n (%)							
Yes	46 (12.5)	-	-	-	42 (11.7)	4 (40)	0.008[c]
No	322 (87.5)	-	-		316 (88.3)	6 (60)	
GCS, n (%)							
<8	26 (7.1)	21 (45.7)	5 (1.6)	<0.001[c]	19 (5.3)	7 (70)	<0.001[c]
9-12	14 (3.8)	10 (21.7)	4 (1.2)		13 (3.6)	1 (10)	
13-15	328 (89.1)	15 (32.6)	313 (97.2)		326 (91.1)	2 (20)	
ISS, n (%)							
0-8	258 (80.1)	11 (23.9)	247 (76.7)	<0.001[c]	258 (72.1)	0 (0)	<0.001[c]
9-15	86 (23.4)	17 (37.0)	69 (21.4)		83 (23.2)	3 (30)	
>16	24 (6.5)	18 (39.1)	6 (1.9)		17 (4.7)	7 (70)	
AIS, n (%)							
<3	345 (93.8)	37 (80.4)	308 (95.7)	<0.001[c]	337 (94.1)	8 (80)	0.069[c]
≥3	23 (6.3)	9 (19.6)	14 (4.3)		21 (5.9)	2 (20)	

Table 1 Predictors of in-hospital mortality among traffic accident patients admitted to Jahrom trauma hospital in 2021-2022 (continued)

Variable	Total	ICU admission		P-value	Discharge status		P-value
		Yes (n=46)	No (n=322)		Survived (n=358)	Died (n=10)	
Ventilation, n (%)							
Yes	33 (9.0)	30 (65.2)	3 (0.9)	<0.001[c]	27 (7.5)	6 (60)	<0.001[c]
No	335 (91.0)	16 (34.8)	319 (99.1)		331 (92.5)	4 (40)	
The surgical operation, n (%)							
Yes	320 (87.0)	36 (78.3)	284 (88.2)	0.061[c]	317 (88.5)	3 (30.0)	<0.001[c]
No	48 (13.0)	10 (21.7)	18 (11.8)		41 (11.5)	7 (70.0)	
Smoking, n (%)							
Yes	44 (12.0)	12 (26.1)	32 (9.9)	0.002[c]	43 (12.0)	1 (10.0)	0.847[c]
No	324 (88.0)	34 (73.9)	290 (90.1)		315 (88.0)	9 (90.0)	
Body region, n (%)							
Head	24 (6.5)	3 (6.5)	21 (6.5)	0.757[c]	23 (6.4)	1 (10.0)	0.623[c]
Face	12 (3.3)	0 (0)	12 (3.7)		12 (3.4)	0 (0)	
Thorax	6 (1.6)	0 (0)	6 (1.9)		5 (1.4)	1 (10.0)	
Abdomen and pelvic contents	3 (0.8)	1 (2.2)	2 (0.6)		3 (0.8)	0 (0)	
Spine	2 (0.5)	0 (0)	2 (0.6)		2 (0.6)	0 (0)	
Upper extremity	57 (15.5)	5 (10.9)	52 (16.1)		56 (15.6)	1 (10.0)	
Lower extremity	70 (19.0)	9 (19.6)	61 (18.9)		68 (19.0)	2 (20.0)	
Others	194 (52.7)	28 (60.9)	166 (51.6)		189 (52.8)	5 (50.0)	
Vital signs							
Systolic blood pressure (mmHg), mean±SD	114.48±21.02	111.5±20.35	114.90±21.11	0.305[a]	115.91±17.85	63.0±48.54	<0.001[a]
Pulse rate (beats/minute), mean±SD	43.79±46.40	64.84±52.18	40.78±44.81	<0.001[a]	43.78±46.13	44.0±58.37	0.233[a]
Respiratory rate (breaths/minute), mean±SD	19.26±2.77	19.76±4.37	19.19±2.46	0.199[a]	19.47±2.01	12.0±9.66	<0.001[a]
O2 saturation (%), mean±SD	95.29±9.29	93.04±6.34	95.62±9.60	0.079[a]	96.18±4.09	63.50±41.26	<0.001[a]
Temperature (°C), mean±SD	35.35±5.94	36.47±0.58	35.19±6.33	0.173[a]	35.55±5.40	28.20±14.98	<0.001[a]
GCS score							
Admission eye GCS, mean±SD	3.74±0.78	2.45±1.25	3.92±0.46	<0.001[a]	3.80±0.66	1.5±1.43	<0.001[a]
Admission verbal GCS, mean±SD	4.63±1.09	2.73±1.76	4.90±0.59	<0.001[a]	4.70±0.95	1.80±1.87	<0.001[a]
Admission motor GCS, mean±SD	5.69±1.02	4.30±1.69	5.89±0.69	<0.001[a]	5.78±0.79	2.4±2.36	<0.001[a]
Time duration between event and admission (minute), median (interquartile range)	80.0 (48.37)	63.0 (36.0)	87.50 (49.5)	0.013[b]	80.0 (48.0)	60.5 (85)	0.424[b]

"-": Not applicable; a: Independent samples t test; b: Mann–Whitney test; c: Chi-squared test; ICU: Intensive care unit; SD: Standard deviation; GCS: Glascow coma scale; ISS: Injury severity score; AIS: Abbreviated injury score; EMS: Emergency medical service; BMI: Body mass index

ysis, a score greater than 3 indicated a severe injury.

ISS: the ISS assesses the overall injury severity by considering the highest AIS score among three body regions: head and neck (region A), chest (region B), and abdomen and pelvis (region C). The ISS score ranges from 0 to 75, the higher scores indicate more serious injuries. It is calculated by squaring the three highest AIS scores and summing them.

GCS: the GCS is a tool for assessing the level of consciousness in patients with neurological conditions. It consists of three components: eye-opening response, verbal response, and motor response, each score from 1 to 4 or 6 points. The total GCS score, ranging from 3 to 15, is obtained by summing the scores for each component.

2.4. Data Collection tools

In this study all data have been gathered using an electronic questionnaire. Age, gender, marital status, education level, occupation, body mass index (BMI), mechanism of injury, pulse rate, respiratory rate, method of hospital transfer, drug and alcohol use, status of patient while admitted to ICU, ISS, level of consciousness, AIS, and the body region of injury were among these factors.

2.5. Data analysis

The collected data was analyzed using STATA software, version 16.0 9, Stata Corp, based in College Station, Texas, USA. Standard deviation (SD) and mean were used to report continuous variables, while frequencies and percentages were used to present categorical data as needed.

The Pearson's chi-squared or Fisher's exact test was used to compare proportions. Univariate and multivariable logistic regression analyses were performed using a backward method to identify the factors linked to hospital mortality from road traffic accidents. The study's findings were presented as odds ratios (OR) and their corresponding 95 percent confidence intervals (CI).

Table 2 Univariate logistic analysis to determine associated factors for patient death in traffic accidents

Variable	B	S.E.	Adjusted OR (95% CI)	P-value
Type of transfer to hospital				
EMS	0.372	0.654	1.45 (0.40-5.22)	0.570
Personal	Ref	Ref	Ref	Ref
Admitted to the ICU				
Yes	1.61	0.666	5.01 (1.36-18.50)	0.015
No	Ref	Ref	Ref	Ref
GCS				
<8	4.09	0.836	60.05 (11.67-309.00)	<0.001
9-12	1.56	1.12	4.78 (0.52-43.69)	0.165
13-15	Ref	Ref	Ref	Ref
ISS				
0-8	Ref	Ref	Ref	Ref
9-15	20.31	2.25	66.51 (0.86-351.42)	0.994
>16	2.43	0.740	11.39 (2.67-48.55)	0.001
Ventilation				
Yes	2.91	0.676	18.38 (4.89-69.15)	<0.001
No	Ref	Ref	Ref	Ref
The surgical operation				
Yes	-2.89	0.710	0.055 (0.014-0.223)	<0.001
No	Ref	Ref	Ref	Ref
Vital signs				
Systolic blood pressure, mmHg	-0.095	0.026	0.910 (0.865-0.957)	<0.001
Respiratory rate, breaths/minute	-0.321	0.072	0.726 (0.630-0.836)	<0.001
O2 saturation, %	-0.099	0.031	0.906 (0.852-0.963)	0.002
Temperature, °C	-0.071	0.795	0.932 (0.891-0.975)	0.002

Significant level: P-value<0.05; ICU: Intensive care unit; GCS: Glascow coma scale; ISS: Injury severity score; AIS: Abbreviated injury score; EMS: Emergency medical service; CI: Confidence interval; S.E.: Standard error

Table 3 Multivariable analysis to determine associated factors for estimating ICU admission for road traffic injury

Variable	B	S.E.	Adjusted OR (95% CI)	P-value*
Age (year)	0.178	0.010	1.19 (1.05-1.34)	0.004
Hospitalization days	-0.420	0.334	0.657 (0.522-0.828)	<0.001
Position of the injured person				
Pedestrian	5.90	0.261	366.53 (31.44-389.85)	0.013
Cyclist	17.85	0.158	47.67 (0.821-50.69)	0.099
Motorcyclist	1.71	0.195	5.72 (1.06-29.22)	0.042
Car passenger	Ref	Ref	Ref	Ref
Drug use before the trauma				
Yes	2.44	0.578	11.47 (7.09-18.56)	0.041
No	Ref	Ref	Ref	Ref
Smoking				
Yes	2.47	0.447	11.92 (1.45-97.64)	0.021
No	Ref	Ref	Ref	Ref
GCS				
<8	4.47	2.18	87.64 (29.04-264.43)	<0.001
9-12	0.519	1.18	1.68 (0.369-7.64)	0.502
13-15	Ref	Ref	Ref	Ref
ISS				
0-8	Ref	Ref	Ref	Ref
9-15	6.41	0.869	935.66 (11.87-1273.82)	0.002
>16	7.36	1.54	2072.12 (17.29-50644.09)	0.002
Time duration between event and admission (minute)	0.011	0.039	1.01 (1.003-1.02)	0.008

*Multivariable logistic regression using backward technique, Significant level<0.05; OR: Odds ratio; GCS: Glascow coma scale; ISS: Injury severity score; S.E.: Standard error; CI: Confidence interval

Variable entered in the model: age, hospitalization days, gender, type of transfer to hospital, position of the injured patients, alcohol consumption, drug use, GCS, ISS, AIS, ventilation, surgical operation, smoking, systolic blood pressure, pulse rate, respiratory rate, O2Sat, temperature, eye GCS, verbal GCS, motor GCS.

3. Results

The data from a registry consisting of 368 road traffic accident patients were examined. Among them, 323 patients (87.8%) were male, 45 (12.2%) were female. The mean age of the patients included in this study was 33.54±18.95 years. Regarding education, most of the road traffic accident patients had either secondary education (145 (39.4%)) or a diploma (90 (24.5%)). Out of all the patients, 185 (50.3%) were married, 89 (24.2%) were either students, or were employed (196 (53.3%)). About 188 (51.1%) of the patients were transferred to the hospital by emergency medical services. 19 (5.2%) patients used alcohol, and 25 (9.6%) patients used drugs before the accident. There were 243 (66%) accidents caused by motorcycles, and 46 (12.5%) of them were admitted to ICU. The median time duration (IQR) between the event and admission was 80.0 (48.37) minutes. Twenty-six patients (7.1%) had GCS less than 8, 24 patients (6.5%) had ISS of more than 16, and 23 patients (6.3%) had AIS of more than 3 (Table 1).

The demographic and clinical traits of patients who survived and those who did not, show no discernible difference. Age, duration of hospitalization, sex, nationality, education, BMI, marital status, the injured person's position, alcohol and drug use, AIS, smoking, body region of injury, pulse rate, and the time duration between the event and admission were not significantly different between the two groups (P>0.05). The occupation status, type of hospital transfer, ICU admission, GCS, ISS, need of ventilation, surgical procedure, systolic blood pressure, respiratory rate, and O2 saturation, however, all showed significant differences (P<0.05) (Table 1).

A significant difference was observed between patients admitted to the ICU and other patients regarding demographic and clinical characteristics. Specifically, there was a significant difference between the two groups in terms of age, hospitalization days, marital and occupation status, type of transfer to the hospital, the position of the injured person, alcohol and drug consumption, GCS, ISS, AIS, smoking, ventilation, pulse rate, and the duration between the event and admission (P<0.05), as shown in table 1.

Univariate logistic regression revealed several factors significantly associated with in hospital mortality, including GCS<8 (OR: 60.05, 95% CI: 11.67,309), ISS>16 (OR: 11.39, 95% CI: 2.67,48.55), ICU admission (OR: 5.01, 95% CI: 1.36,18.50), underwent surgery (OR: 0.055, 95% CI: 0.014,0.223), respiratory rate (OR: 0.726, 95% CI: 0.630,0.836), O2 saturation (OR: 0.906, 95% CI: 00.852,0.963), systolic blood pressure (OR: 0.910, 95% CI: 0.865,0.957) and temperature (OR: 0.932, 95% CI: 00.891,0.975) (Table 2). The model's goodness of fit, measured at 124.53 (P<0.001), suggests the data was well-suited to the model.

The odds of ICU admission was found to increase with an ISS>16 (OR: 2072.12, 95% CI: 17.29,50644.09), being a pedestrian (OR: 366.53, 95% CI: 31.44,389.85), GCS<8 on admission (OR: 87.64, 95% CI: 29.04,264.43), smoking (OR: 11.92, 95% CI:1.45,97.64), drug use before the accident (OR: 11.47, 95% CI: 7.09,18.56), being a motorcyclist (OR: 5.72, 95% CI: 1.06,29.22), age (OR: 1.19, 95% CI: 1.05,1.34) and the time duration between the event and admission (OR: 1.01, 95% CI: 1.003,1.02) (Table 3). The model's goodness of fit, measured at 152.40 (P<0.001), suggests the data was well-suited to the model.

4. Discussion

This study has shown that, most patients involved in road traffic accidents were male, with an average age of 33.54 years and secondary school education was the most common level of education. Most of the patients were employed and married. Motorcycle accidents were the leading cause of injury, and a significant proportion of these patients had a history of alcohol or drug use. The univariate analysis revealed that factors associated with increased mortality were low GCS, high ISS, need for ventilation, and need for admission to ICU, undergoing surgery, low respiratory rate, low O2 saturation, low systolic blood pressure, and low body temperature. Additionally, age, the time duration between the event and admission, being pedestrian, motorcycle involvement, drug use before the accident, smoking, low GCS scores upon admission, and high ISS scores upon admission were all significant predictors of ICU admission. This is in agreement with previous findings indicate that such factors play an essential role in determining trauma patients' mortality rates (3,14,17).

As a result of this study, hospital admission with GCS<8, ISS>16, need of ventilation, or ICU admission dramatically increases mortality risk, with 60.05, 11.39, 18.38, and 5.01 times more likely, respectively. Previous studies have also demonstrated a correlation between mortality, GCS <8 (3,18), ISS>16 (3,17), need of ventilation (4,6,8), and ICU admission (7,19). As shown in a similar study by Yadollahi et al. (2018), the GCS index may be used in conjunction with other triage indices to estimate trauma patients mortality risks; in addition, the ISS is a significant risk factor for mortality of elderly patients in road traffic accidents (20).

Furthermore, undergoing surgery is associated with improved mortality outcomes among road traffic accident victims. According to a cohort study, patients who underwent trauma and acute care surgery had lower mortality rates than those who did not. Reducing the time between trauma and surgery improves the quality of trauma care (1,21). Healthcare professionals should consider these variables when assessing a patient's mortality risk and the potential benefits of surgery.

The study's results indicated that age is a risk factor for ICU admission. Risk of ICU admission associated with 1.19 times greater for each year of increase in age. One of the previous studies, has shown trauma patients experience increased morbidity and mortality with age (4), which may be attributed to a higher prevalence of comorbidities such as cardiovascular and pulmonary diseases. These underlying conditions may improve these patients' risk of complications and mortality.

Additionally, elderlies may also have a decreased ability to

tolerate stress due to aging-related physiological changes (22,23). Healthcare professionals should consider the patient's age when assessing the likelihood of ICU admission. Moreover, an increased risk of ICU admission is associated with a longer delay between a road traffic accident and a patient's hospitalization in the present study. Similarly, a study in Iran revealed an association between delayed hospital admission and higher mortality and morbidity (24). Likewise, a systematic review involving trauma patients concluded delayed hospital admission was associated with a higher mortality rate than patients admitted earlier (25).

Consequently, these associations may help clinicians in their decision-making and provide future research on the impact of delayed hospital admission on road traffic accident victims.

In this study, pedestrian victims of road traffic accidents were observed to have a higher risk of ICU admission. Previous studies have also found similar findings in the United States of America (26), South Korea (27) and Iran (5) found a significantly higher risk of ICU admission among pedestrian victims. These findings demonstrate the need of increased awareness of the elevated risk of ICU admission for pedestrian victims and the importance of interventions that can reduce the incidence of these accidents. In addition, motorcyclists are more likely to be admitted to an intensive care unit following road traffic accidents. Due to the lack of protective equipment, they have more severe injuries.

Previous studies have also identified motorcyclists as an at-risk group for ICU admission (5,28,29), and further research are needed to understand the factors contributing to this increased risk. Beyond this, interventions should be developed to reduce ICU admission risk and improve outcomes for motorcyclists.

Other study results showed that pre-accident drug use increases the risk of ICU admission following an accident. This has been corroborated by multiple studies, such as the study in India, which showed that trauma patients with a history of drug use had a greater risk of ICU admission than those without (30). A survey conducted by Swartz et al. (2018) revealed that most trauma victims were illiterate, had low socioeconomical status, and had used alcohol or drugs before the accident (31). These findings suggest pre-accident alcohol or drug use is a major risk factor for ICU admission among road traffic accident victims. Further research into the underlying mechanisms is warranted. Likewise, smoking is linked to an increased risk of ICU admission for road traffic accident victims. A literature review of studies involving trauma patients concluded that smokers were more likely to be admitted to the ICU than non-smokers (32).

Additionally, a study in Brazil investigating the effects of smoking on outcomes of road traffic accident victims also found a significantly higher rate of ICU admission among smokers compared to non-smokers (33). There is a possibility that smoking increases the likelihood of clot formation, damages the lungs, and increases the risk of developing a pulmonary embolism that may require hospitalization. Therefore, healthcare professionals must consider this risk factor when deciding on the course of treatment, and further research is needed to explore its effects.

Other study results indicate that patients with GCS<8 and ISS>16 have a significantly higher risk of being admitted to the ICU, with odds ratios of 87 and 2072, respectively. These findings are consistent with the literature, which has established the importance of GCS and ISS in determining the need for intensive care (34,35). Patients with lower GCS and higher ISS scores are more likely to have severe and life-threatening injuries thus require more intensive care (4,5). The results of this study underscore the need for advanced monitoring and treatments for trauma patients, as ICU ad-mission can help improve their outcomes. Furthermore, fu-ture research should focus on assessing the effects of ICU ad-mission on morbidity, mortality, and patient outcomes such as pain management, quality of life, and long-term recov-ery. In summary, the results of this study can help inform the clinical decision-making process for managing patients with traumatic injuries. They should be considered when consid-ering ICU admission.

5. Limitations

Our study does have some limitations. First, the study was only carried out in one hospital in Iran, which limits applying broadly the results to other populations or environments. Secondly, the study was retrospective, which might make it more challenging to establish a causal relationship or account for confounding factors. Third, the study did not examine the effects of certain variables that might be important for comprehending the frequency and results of road traffic accidents, such as using seatbelts or particular drugs taken before the accident.

Despite these drawbacks, this study has the following advantages: it offers crucial details on the traits and prognoses of patients who have suffered road traffic accidents in the study population. The study's results are more trustworthy and generally applicable due to the large sample size and use of a trauma registry for data collection.

6. Conclusion

In conclusion, this study underscores the critical role of timely and effective medical interventions, including surgical procedures, in improving the outcomes of road traffic accident victims. It also highlights the need for targeted preventive measures and interventions for high-risk groups, such as pedestrians and motorcyclists. These findings can inform physicians for clinical decision-making and guide efforts to enhance the care and outcomes of trauma patients. Further research is essential to expand our understanding of how these variables influence patient management and clinical outcomes in the context of road traffic accidents.

7. Declarations

7.1. Acknowledgement

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7.2. Authors' contribution

KR made several contributions to this project. The study's planning and execution, data collection and analysis, and first draft writing: VR, MJ; Search and screening of the literature: VRAJ, HK; Revision, edition, and contribution to the interpretation of the data: VR, MJ; Revision the manuscript and data collection: HK. The finished manuscript has been read by all authors and received their approval.

7.3. Conflict of interest

The authors state that they have no competing interests to declare.

7.4. Funding

A funding source for this study was the vice-chancellor for research of Jahrom University of Medical Sciences located in Iran.

7.5. Data availability

The corresponding author will provide the datasets created and used for the current study upon reasonable request.

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