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ORIGINAL ARTICLE

Incidence and reasons of interfacility transfer among trauma patients in Saudi Arabia, 2020

Nawfal Aljerian[1,2], Mohammed Arafat[1], Abdulrahman Aldhubaib[1], Ibrahim Almohaimeed[1], Ali Alsultan[1], Abdulaziz Alhosaini[1], Lyla Ashry[1*], Sawsan Alharthi[2], Ghadeer Al Elawi[3], Yasir Albarrak[4]

ABSTRACT

Background: The absence of experienced physicians in certain specialties and the lack of medical services necessitates the need for interfacility transfer of patients with traumatic injuries. This study aimed to identify the incidence of interfacility transfers in trauma patients within a 28-day period and to evaluate the types and reasons of traumatic injuries requiring lifesaving transfer.

Methods: This was a retrospective noninterventional chart review study. Data were acquired from the Saudi Medical Appointments and Referrals Center in Saudi Arabia. Only lifesaving-labeled trauma patients were included in this study.

Results: A total of 370 trauma patients were included in this study. Most of the patients were male (325; 87.8%) with a mean age of 31 years. Blunt injuries were the most reported type of injury (213; 57.6%) and motor vehicle accidents were most common mechanism of injury (164; 44.3%). Head and neck injuries accounted for majority of the cases (144; 38.9%). Lack of specialty was the most frequently reported main reason for transfer (244; 66%) with neurosurgery being the most lacking specialty (94; 25.4%). Riyadh and Mecca were the two provinces that reported most referral requests (29.5% and 15.7%, respectively).

Conclusion: The recruitment and retention of qualified trauma care personnel, improving healthcare facilities, and purchasing medical equipment would minimize the need for interfacility transfer among trauma patients. Larger analytical studies are required to quantify and localize the deficit and the weakness of the system to ensure timely access to an initial healthcare facility and definitive treatment of trauma patients.

Keywords: Incidence, trauma, interfacility, patients, Saudi Arabia.

Introduction

The leading cause of death is trauma-related injuries among individuals under the age of 45 years [1]. A higher survival rate was reported in severely injured trauma patients when treated at a trauma center [2,3]. On the other hand, a delayed transfer of trauma cases to hospitals prepared to handle trauma cases was associated with increased morbidity and mortality [4,5]. Emergency medical service (EMS) personnel are responsible for most of the trauma patients' transportation and disposition. The mode of EMS interfacility transport decision is built on the communication between the transferring EMS specialist and the receiving center by reviewing (1) physiological status, (2) stability of injured patients, (3) initial management, and (4) the optimal timing of transfer for the intended case [6].

Correspondence to: Lyla Ashry
*Ministry of Health Medical Referrals Center, Riyadh, Saudi Arabia.
Email: lashry@moh.gov.sa
Full list of author information is available at the end of the article.
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Adzemovic [7] used the data from the National Trauma Data Bank to evaluate the specific subsets of patients that derived maximal benefit from transfer to a tertiary trauma center. Those patients, who were transferred to a tertiary trauma center (94.8%; p-value < 0.001), showed a lower mortality rate than the other patients (5.2%; transferred to level III/IV trauma centers). Similarly in Oklahoma, a study evaluated the mortality differences for patients initially presenting to non-tertiary trauma centers in a rural region depending on the transfer status. Almost 43% of the patients (2,669 out of 6,229) were transferred to tertiary trauma centers. The transferred cases reported lower mortality as compared to those remaining at non-tertiary trauma facilities. Also, factors like the presence of severe head injury, age, and transfer to a tertiary trauma center were associated with a significantly lower 30-day mortality [8].

In another study, factors associated with the non-transfer among patients meeting the American College of Surgeons guideline criteria for transfer from non-tertiary centers were evaluated. Overall, patient-level factors accounted for 36% and center-level factors accounted for 58% of the variations in transfer practices. Patient-level factors associated with non-transfer included age older than 65 years and severe chest injury. Center-level factors associated with non-transfer included larger bed number, more trauma surgeons, and more neurosurgeons [9].

In Saudi Arabia, the referral system was applied by the Ministry of Health (MoH) for the first time in the year 1989 [10]. This system went through several stages of development until introducing the new electronic referral system "Ehalati" on November 27, 2012. "Ehalati," an Arabic word that means "my referral," is an electronic system that facilitates inter-hospital transfer by linking all governmental hospitals together. Furthermore, this system's services include inter-hospital medical consultation, evaluation of the patient's need for transfer, and the cases' disposition [11]. Ehalati classifies the referral requested cases into three categories: (1) lifesaving referral, which requires no delay in referral acceptance to the closest facility; (2) emergency referral that does not tolerate more than 12 hours delay; and (3) in-patient cases, which could be delayed but not more than 24 hours [12]. In 2019, the MoH published that 40,867 patients were referred by "Ehalati" in Jazan city, among these, 2,420 (5.9%) were lifesaving cases [13].

Given Saudi Arabia's population growth and geographical spread, the capacity of the country to meet its healthcare demand is strained. Trauma, in particular, is an area of high healthcare burden, with motor vehicle accidents (MVA) being the main cause of trauma in the country [14]. Limited number of studies identified the incidence and reasons of interfacility transfer of trauma patients in Saudi Arabia; thus, the aim of this study was to identify the incidence of interfacility transfer in trauma patients in Saudi Arabia within a 28-day period and to evaluate the types and reasons of traumatic injuries requiring urgent or emergent transfer.

Materials and Methods

This was a retrospective noninterventional chart review study. The study was conducted by reviewing charts and data of referral requested cases among the country. These data were obtained from Saudi Medical Appointments and Referrals Center which is a national center that aims to link all hospitals of the MoH with healthcare sectors in other government bodies, such as universities hospitals, National Guard hospitals, and the armed forces hospitals, with a view to accelerate the work process and to ensure the prevention of medical complications. Only lifesaving labeled trauma patients (370 out of 1,802), during the period from 1/11/2020 to 28/11/2020, were included in this study.

From the pre-collected data, the information of concern were extracted and organized into three main sections: (1) the demographic information of the patient as gender, age, and nationality; (2) the trauma detailed history including type, mechanism, and anatomical region; and (3) the transfer request details including the reasons for which a transfer was required such as lack of facility, lack of specialty, or lack of equipment.

The extracted data were organized using Excel Microsoft Office 2016 and was analyzed by using Statistical Package for the Social Sciences version 25.0. The frequencies, percentage, mean, and standard deviation were calculated. Chi-square (χ^2) was used to test the differences between nominal data. p-value < 0.05 was considered statistically significant.

Results

A total of 370 trauma cases were included. The majority were male (325; 87.8%) with a mean age of 31 years. Nearly two-thirds were Saudis (244; 65.9%). The highest number of trauma cases requiring lifesaving referral was from Riyadh Province (109; 29.5%). The least reported trauma injuries requiring transfer were from Northern Border regions and Jawf Province (1; 0.3% for each) (Table 1).

Around 342 out of the included cases (92.4%) were documented as accepted referred cases. The other referral-required cases were either consulted (12; 3.2%) or recommended for urgent referral (16; 4.3%) (Figure 1).

Blunt injuries were the most commonly reported type of injury in 57.6% of the cases. MVAs accounted for nearly half of the trauma-related mechanisms (164; 44.3%). Anatomically classified head and neck injuries accounted for majority of the cases (144; 38.9%). The least reported anatomical region of injury was chest (15; 4.1%) (Table 2).

Lack of specialty was the most frequently reported main reason for transfer among the cases (244; 66%). Out of all the specified reasons, neurosurgery was the number one reason for transfer (94; 25.4%). On the other hand, none of the cases required referral because of the lack of obstetrics and gynecology specialty (Table 3).

A comparison between the main reasons of referral among the provinces was also conducted (p-value 0.157). Among the cases reported for lack of facility, Riyadh Province (24; 27.6%) rated the highest, followed by Asir Province (12; 13.8%). Lack of specialty was most commonly seen in Riyadh Province (69; 28.3%), followed

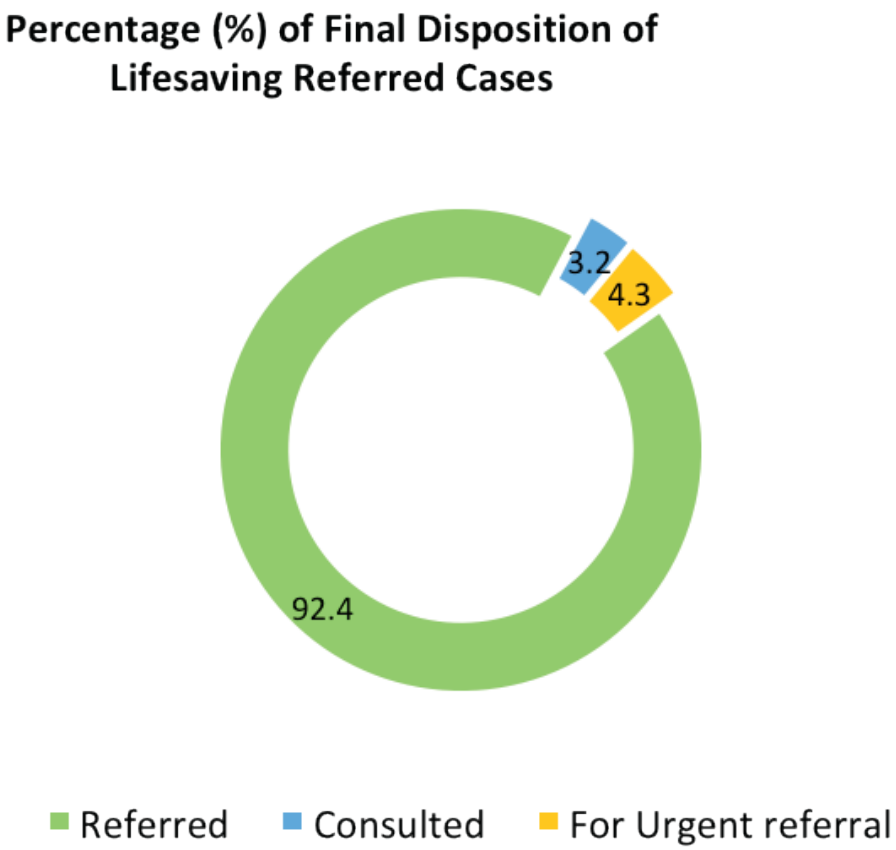

Figure 1. *Percentage (%) of final disposition of lifesaving referred cases from November 1 till November 28, 2020, Saudi Arabia (N = 370).*

Table 1. *Sociodemographic features and disposition of the lifesaving-labeled cases (N = 370).*

Category	Subject	Number/mean	Percentage %/SD
Gender	Female	45	12.2
	Male	325	87.8
Age		31.23	±19.49
Nationality	Saudi	244	65.9
	Non-Saudi (Yemenite, Egyptian, Syrian, Pakistani, etc.)	126	34.1
Region of referral	Northern Border Province (Arar)	1	0.3
	Jawf Province (Jawf, Sakaka, Alqurayyat)	1	0.3
	Tabuk Province	9	2.4
	Hail Province	3	0.8
	Qasim Province	23	6.2
	Riyadh Province (Riyadh, Almajma'ah, Alkharj)	109	29.5
	Medina Province (Medina, Yanbu, Alula)	30	8.1
	Mecca Province (Taif, Mecca, Jeddah, Alqunfudhah)	58	15.7
	AlBahah Province	9	2.4
	Asir Province (Asir, Bisha, Abha, Khamis Mushait)	32	8.6
	Jazan Province	28	7.6
	Najran Province	33	8.9
	Eastern Province (Hafar AlBatin, AlAhasa, Dammam)	34	9.2
Disposition of referred cases	Referred	342	92.4
	Consulted	12	3.2
	Recommended for urgent referral	16	4.3

Table 2. *Trauma/injury details of the lifesaving cases from November 1 till November 28, 2020, Saudi Arabia (N = 370).*

	Subject	Number	Percentage (%)
Type of injury	Blunt trauma	213	57.6
	Penetrating trauma	59	15.9
	Unspecified	66	17.8
	Other	32	8.6
Mechanism of injury	MVA	164	44.3
	Burn	15	4.1
	Drowning	2	0.5
	Traumatic amputation	8	2.2
	Falls	55	14.9
	Strangulation	2	0.5
	Gunshot	30	8.1
	Unknown	67	18.1
	Other (Stab, crush, cut, etc.)	27	7.3
Anatomical region of the injury	Head and neck	144	38.9
	Upper limb	26	7.0
	Chest	15	4.1
	Abdomen	22	5.9
	Spine	22	5.9
	Lower limb	34	9.2
	Multiple regions	34	9.2
	Unspecified	73	19.7

by Mecca province (45; 18.4%). Riyadh Province was the most common region reporting the lack of equipment (16; 41.0%), followed by Najran and Eastern Provinces equally (4; 10.3%) (Table 4).

Discussion

Trauma remains the leading cause of disability and preventable death worldwide [15]. In Saudi Arabia, trauma is classified as the number one killer with road traffic accidents (RTA) accounting for 85% of these cases [16,17]. This paper aimed to identify the rate, characteristics, and reasons of interfacility transfer among trauma patients as a preliminary step to implement new strategies in order to maximize the safety of trauma victims and ensure definitive treatment. According to the collected data, 92.4% were documented as accepted referred cases, whereas the remaining percentage (7.6%) was advised or consulted only despite that they were labeled as lifesaving transfer. This might be due to several factors including the capacity at the receiving hospital, errors of the entry, feasibility of interfacility transfer, geographic limitations, and patient-preference considerations.

Most of the transferred trauma victims were men (87.8%), with a mean age of 31 years, injured in RTAs (44.3%) in this study. Similarly, the road traffic statistics of 2020 have shown that the number of RTAs was 25,561 with 4,618 deaths; 42.2% of the victims were 30 years old or younger and 89% of the total deaths were male [18].

The number of male victims was higher and younger in age in the current study compared to what has been reported in Brazil and Mexico [19,20]. Udry [21] stated that males are more likely to get injured and die because of their risky primitive behavior, biological difference, role models (parents, for instance), and limited supervision. It was elaborated that it is not limited to humans, but it expands to involve all mammal species [21].

Despite the updated policies and regulation for road safety, RTAs still have a significant burden on the healthcare system. The MoH records showed that one-fifth (20%) of the occupied beds and nearly most of the deaths (81%) were RTA victims [16,22]. This adds further burden on the economy of the kingdom due to the loss of men during their productive years [22]. Globally, RTA victims are more likely to be young men, despite the variation of the percentage from one country to another [23]. Thus, trauma in general and RTAs in particular encounter a significant impact on both the health and the economic sectors locally and worldwide. Yet, in Saudi Arabia, there is a noticeable reduction in RTAs from 2018, with a total of 30,579 till 2020 with a total of 25,561 cases [18]. This might be due to the coronavirus 2019 pandemic and the lockdown in addition to the highest orders to license women driving. Also, the kingdom is continually updating and tightening the traffic regulations year after year like expanding the coverage of Saher (traffic enforcement law) speed cameras.

The Saudi yearbook showed a number of 391,988 referrals, including trauma and non-trauma cases, among the provinces in 2020. It was highest in Jeddah and Mecca (both are included in Mecca province) by 37,135 cases (9.47%) and 35,509 cases (9.06%), respectively [18]. However, this study showed that the highest number of trauma cases that required lifesaving interfacility transfer were observed in Riyadh province, followed by Mecca province among the 13 provinces in

Table 3. *Main and specified reason of interfacility referral of trauma cases in Saudi Arabia during the 28-day interval, 2020 (N = 370).*

Main reason	Sub-reason	Number	Percentage (%)	Sections total
Lack of facility	Operating room	23	6.2	87 (23.5%)
	Intensive care unit	34	9.2	
	Burn unit	12	3.2	
	Endoscopy	5	1.4	
	Interventional radiology	3	0.8	
	Other	6	1.6	
Lack of specialty	Trauma surgery	17	4.6	244 (65.9%)
	Neurosurgery	94	25.4	
	Orthopedic surgery	27	7.3	
	Vascular surgery	23	6.2	
	Thoracic surgery	12	3.2	
	Cardiac surgery	5	1.4	
	General surgery	4	1.1	
	Plastic and reconstructive surgery	11	3.0	
	Ear, nose, and throat	2	0.5	
	Pediatric surgery	6	1.6	
	Urology	1	0.3	
	Obstetrics and gynecology	0	0.0	
	Anesthesia	3	0.8	
	Interventional radiology	2	0.5	
	Ophthalmology	5	1.4	
	Neurology	10	2.7	
	Internal medicine	2	0.5	
	Cardiology	1	0.3	
	Gastroenterology	2	0.5	
	Adult ICU	0	0.0	
	Pediatric ICU	16	4.3	
	Other	5	1.4	
Lack of equipment/device	US	1	0.3	39 (10.5%)
	CT	31	8.4	
	Mechanical ventilator	1	0.3	
	Other	6	1.6	
Grand total		370	100	

Table 4. *Disposition of the trauma cases after the referral request compared according to the region (N = 370).*

	Lack of facility		Lack of specialty		Lack of equipment		Total		Pearson χ2
	n	%	n	%	n	%	n	%	
Northern border Province	0	0.0	1	0.4	0	0.0	1	0.3	0.157*
Jawf Province	1	1.1	0	0.0	0	0.0	1	0.3	
Tabuk Province	1	1.1	8	3.3	0	0.0	9	2.4	
Hail Province	1	1.1	1	0.4	1	2.6	3	0.8	
Qasim Province	5	5.7	12	4.9	6	15.4	23	6.2	
Riyadh Province	24	27.6	69	28.3	16	41.0	109	29.5	
Medina Province	4	4.6	24	9.8	2	5.1	30	8.1	
Mecca Province	10	11.5	45	18.4	3	7.7	58	15.7	
AlBahah Province	4	4.6	5	2.0	0	0.0	9	2.4	
Asir Province	12	13.8	18	7.4	2	5.1	32	8.6	
Jazan Province	8	9.2	19	7.8	1	2.6	28	7.6	
Najran Province	8	9.2	21	8.6	4	10.3	33	8.9	
Eastern Province	9	10.3	21	8.6	4	10.3	34	9.2	
Total	87	100	244	100	39	100	370	100	

* Pearson's χ2 value is insignificant in this correlation.

Saudi Arabia included in this study. This is attributed to the urban development and modern civilization in Saudi Arabia, resulting from the oil boom and the associated sharp rise in lifestyle standards. Both have contributed to the increased number of residents in these areas, hence more trauma injuries compared to less crowded areas [17]. This study and other analytic studies might help the government to quantify and localize the deficit and the weakness of the system, thus improving the healthcare outcomes.

In addition to the demographic factors, the clinical details of the cases played a major role in the need and acceptance of the referred cases. The retrieved data reported limited information regarding the clinical condition of the intended cases including the vital signs, random blood sugar level, and the Glasgow Coma Scale. In addition, detailed information about the chief complaint - trauma in this study - included site, mechanism, and type. The most reported site of injury was the head and neck region in this study and previous papers for almost three decades [22]. A similar result was found in Nigeria in 2014, according to Adoga and Ozoilo [24]. There was no significant correlation demonstrating the impact of the clinical condition of the patient upon his final disposition. On the contrary, Zhou [25] stated that injury mechanism (like penetrating injuries) and site (like chest injuries) might cause the patient not to be transferred to another facility despite meeting the criteria. This might be due to the limited number of cases in the study or the inaccurate entry of the data by the primary healthcare provider. The requesting hospital resources and human power also contribute to the final referral decision.

The current reporting referral system contains elements that justify the transfer request in addition to the previous illustrated information. Lack of specialty was considered as the main reason for referral of trauma cases (n = 244; 66%), and among specialties, neurosurgery was the main specified reason for transfer (n = 94; 25.4%). In the same context, this is probably explained by the high number of head and neck injuries that were not treated in the primary hospital and later were transferred. Similar results were identified by Sorensen et al. [26] in a retrospective study that involved 4,796 trauma patients who were transferred from other facilities. It was noticed that the main reason for interfacility transfer was head and neck injuries, and the most common specialty they were referred to was neurosurgery [26]. This could be supported by the fact that, despite head and neck injuries constituting only 12% of the body surface area, it is one of the most common regions that are commonly involved in trauma patients-related injuries [27,28]. Tang et al. [29] found that extremity fractures were the most common reason for referral and radiology specialty was the most common lacking specialty. According to the paper, the trauma team were qualified enough to treat minor traumatic brain injuries without an intervention of a neurosurgeons [11,29]. The second main reason in this paper was lack of facility in general (n = 87; 23.5%) and lack of intensive care units as the commonest specified reason of transfer (n = 34; 9.2%). This percentage could explain the general status of those patients as they are severely injured patients and lifesaving transfer is a must for them. Similarly, a study, which analyzed data of 8,524 trauma patients, found that 1,165 patients (13.7%) underwent interfacility transfer because of lack of facility and specifically lack of intensive care units and operating rooms. Those patients were also similar to the current study's participants as they tend to be severely injured and have high mortality rates [12,30].

Discovering the system's weak and strong points helps in improving healthcare quality, patient satisfaction, and outcome. Several factors were noticed to limit the outcome of this paper. First, the extracted data were insufficient to analyze the situation of the patients from several aspects as Injury Severity Score (a morbidity and mortality predictor) and physical examination findings. Hence, risk and benefit analysis of the intended cases transfer was not possible. Second, the available data were limited to a specific duration (28 days) and therefore the number of cases was not sufficient to assess the correlations with the included factors. Lastly, there was no information about the requesting and the receiver hospital/ healthcare provider. Thus, localization, human power, and resources were not available to analyze their contribution and to demonstrate a better picture of the problem source (facility, specialty, equipment, or other factor).

This study provides several recommended steps that might help overcoming those limitations, starting with improving the reporting system of the referral requests by user reviews and feedback about convenience, elements, method of entry, etc. This might encourage the users to give more attention and effort to the entered data and thus improve the quality and minimize the deficiency. Expanding the retrieved data duration to include more cases would provide more variety and accuracy of the analytical tests to navigate the system deficit. Thus, it aids to plan for targeted healthcare resources' investments allocated toward the point of weakness. This includes the recruitment and retention of qualified trauma care personnel, improving healthcare facilities, and purchasing medical equipment to minimize the need for interfacility transfer of trauma patients. Also, including more information, like the mode of transfer, the time required for the whole process, and the type of vehicle/ instrument used in the injury, might provide unexpected contributing factors. Public education about the burden and the risk of RTAs and their important role in prevention might raise the awareness and the sense of responsibility. Road safety evaluation and screening are also as important as the strict rules and laws to buffer the impact. Implementing plans to explore and solve the infrastructure deficiency helps the government to improve the healthcare efficacy, system outcome, and budget management.

Conclusion

The recruitment and retention of qualified trauma care personnel, improving healthcare facilities, and purchasing medical equipment would minimize the need for interfacility transfer among trauma patients. Larger analytical studies are needed to quantify and localize the deficit and the weakness of the system to ensure timely

access to an initial healthcare facility and definitive treatment of trauma patients.

List of Abbreviations

Chi-square	χ^2
EMS	Emergency medical service
MoH	Ministry of Health
MVA	Motor vehicle accidents
RTA	Road traffic accidents

Conflict of interest

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

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Consent to participate

Informed consent was obtained from all the participants.

Ethical approval

The study was approved by the relevant ethics review board at King Fahad Medical City, Riyadh, Saudi Arabia. Approval number: FWA00018774, March 7, 2021.

Author details

Nawfal Aljerian[1,2], Mohammed Arafat[1], Abdulrahman Aldhubaib[1], Ibrahim Almohaimeed[1], Ali Alsultan[1], Abdulaziz Alhosaini[1], Lyla Ashry[1], Sawsan Alharthi[2], Ghadeer Al Elawi[3], Yasir Albarrak[4]

1. Ministry of Health, Medical Referrals Center, Riyadh, Saudi Arabia
2. King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia
3. Princess Nourah Bint Abdulrahman University, Riyadh, Saudi Arabia
4. Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia

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