



Improving the Pre Hospital Care Of Road Traffic Injuries in Saudi Arabia

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Abstract: Road traffic injuries cause enormous morbidity and mortality worldwide and place heavy burdens on global and national economies. Although all regions are affected, low- and middle-income countries share a disproportionate burden. The significance of this public health threat is growing in Saudi Arabia, where current estimates show that 10.0 percent of all deaths in the country are due to RTIs and it is the second cause of death [World Health Organization, 2010]. Improvements in emergency medical services and prehospital trauma care can help minimize mortality and morbidity from road traffic injuries (RTIs) worldwide, particularly in a high rate country of RTIs such as Saudi Arabia. The current study aimed to explore pre-hospital trauma care process for RTI victims in Saudi Arabia and to identify potential areas for improvements based on the experience and perception of pre-hospital trauma care professionals. A qualitative study design using a grounded theory approach was selected. The data, collected via in depth interviews with 20 pre-hospital trauma care professionals, and by accessing public record irrespective of form (e.g. Photograph, painting, biography, television broadcast, news report, survey, government or organizational document, etc.) Were analyzed using the constant comparative method. Public education and six categories emerged to describe the factors that improve pre-hospital trauma care process: (1) staff qualifications and competences, (2) availability and distribution of resources, (3) communication and transportation, (4) involved organizations, (5) laypeople and (6) infrastructure.

[Shammah Ahmed Ali; Baha'a Alddin Hani Yousef Nasser; Abdulrahman A Hassanein; Abdulaziz F Al Sowat; Abdullah A Al Ghamdi; Ibraheem H Al Shahrani and Faisal SAI Malki. **Improving the Pre Hospital Care Of Road Traffic Injuries in Saudi Arabia.** *Nat Sci* 2020;18(6):79-87]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). <http://www.sciencepub.net/nature>. 11. doi: [10.7537/marsnsj180620.11](https://doi.org/10.7537/marsnsj180620.11).

Keywords: RTI, Pre hospital care, Road traffic injuries, Trauma.

1. Introduction:

Improving the Pre Hospital care of Road Traffic Injuries in Saudi Arabia The last thing we need is another war. Nevertheless, we have a big one - the war on the Saudi Arabia's roads, why we have high mortality rate of road accidents and what is relationship between pre hospital care and the number of road traffic accident's mortality. How the community understand their responsibility in reducing the number of morbidity and mortality in traffic accidents. How can pre-hospital care of road traffic injuries be improved in Saudi Arabia? Road traffic injuries cause enormous morbidity and mortality worldwide and place heavy burdens on global and national economies. Worldwide in 2011, road traffic injuries caused an estimated 1.3 million deaths nearly 3,400 people die on the world's roads every day [World Health Organization, 2010] [World Health Organization, 2013]. By the year 2020, traffic injuries are projected to 1.9 million deaths every year [World

Health Organization, 2013]. Road traffic injuries cause considerable economic losses to victims, their families, and to nations as a whole. These losses arise from the cost of treatment (including rehabilitation and incident investigation) as well as reduced/lost productivity (e.g. in wages) for those killed or disabled by their injuries, and for family members who need to take time off work (or school) to care for the injured [World Health Organization, 2013]. There are few global estimates of the costs of injury, but an estimate carried out in 2000 suggest that the economic cost of road traffic crashes was approximately US\$ 518 billion. National estimates have illustrated that road traffic crashes cost countries between 1–3% of their gross national product, while the financial impact on individual families has been shown to result in increased financial borrowing and debt, and even a decline in food consumption [World Health Organization, 2013].

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Road traffic injuries have been neglected from the global health agenda for many years, despite being

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predictable and largely preventable. Evidence from many countries shows that dramatic successes in preventing road traffic crashes can be achieved through concerted efforts that involve, but are not limited to, the health sector. [World Health Organization, 2013] In Saudi Arabia the number of traffic accidents during the year 2011 are 544,179, about 1.537 accidents per day. The number of people injured in the same year amounted to more than 39,000 thousand patients and 7.153 thousand deaths at a rate of 20 deaths per day, including 13 deaths of young people, which represent 75% of the deaths, the statistics show that Saturday is the highest days of the week in the percentage of traffic accidents and the least on Friday, noting that the highest percentage of deaths are out of the cities by 60% and 40% within cities [“Maj. Gen. Suleiman”, 2012]. The reports confirm that there is a large percentage of permanent disability occur to persons because of road traffic injuries up to 20-50 million people per year worldwide, it also represents the injuries caused by traffic accidents are the main causes of death among young people in the world in age group between 15-29 years [“Maj. Gen. Suleiman”, 2012]. The rate of traffic accidents per individual in the Kingdom is much higher than in developed countries. Experts predict that if the current rate of traffic accidents continue, the Kingdom may have four million traffic accidents a year by 2030. That means a person will die on Saudi roads every hour in 2014 if the country’s accident rate continues at its current pace. There are approximately 7,100 road fatalities every year and 38,000 seriously injured individuals, of whom 7 percent are permanently disabled. [“19 die daily”, 2013] Rapidly increasing motorization is outpacing the development of transportation infrastructure. This fact is the primary reason for the increasing numbers and rates of motor vehicle injuries in Saudi Arabia. The lagging transportation infrastructure includes roadway improvement, occupant protection laws, traffic law enforcement, and emergency medical services. Improvements in emergency medical services and pre-hospital trauma care can help minimize mortality and morbidity from road traffic injuries (RTIs) worldwide, particularly in a high rate country of RTIs such as Saudi Arabia. Low and middle-income countries (LMICs) account for 90% of Disability Adjusted Life Years (DALYs) lost and for 90% of the deaths from road traffic crashes [“World Health Organization”, 2009]. As the majority of trauma deaths in LMICs occur in the pre-hospital setting [World Health Organization, 2010], it is suggested that improvements in pre-hospital trauma care can contribute to a decrease in crash-related mortality and morbidity [World Health Organization, 2010]. Prehospital care involves prompt

communication and activation of the system, proper actions at the scene of the crash by bystanders, and the prompt response of the system. This includes all the appropriate personnel, assessment, and treatment of the injured people at the scene, and transport to trauma care facilities while delivering the necessary medical care before arrival at the hospital. Training is the most important aspect of successful prehospital care. In many communities, prehospital care is provided by “basic first-aid providers” or “Emergency Medical Technicians-Basic” (EMT-Basic). Some centers have intermediate prehospital trauma care providers (EMT-Intermediate) who are able to administer intravenous therapy and apply pneumatic antishock garments in addition to basic maneuvers. A few centers have advanced prehospital training known as EMT-Advanced. Advanced EMTs are able to do endotracheal intubation, needle thoracostomy, and cricothyroidostomy. [WHO, 2005].

Therefore, a well-trained and fully equipped crew able to stabilize the victim before transport will improve the victim’s chances of recovery and reduce the number of dies as well as relieving the pressure on hospital based emergency staff, especially in the case of a multiple victim event and road traffic injuries. The aim of this study is to assess the characteristics of prehospital care in patients who were injured in RTAs, evaluating pre-hospital trauma care provided in city streets and roads out of the city also determine the average response time for first responders both in cities and in rural areas and to explore pre-hospital trauma care process for RTI victims in Saudi Arabia and to identify potential areas for improvements.

2. Method:

A grounded theory approach was used for the collection and analyses of data. Also a survey questionnaire were used.

Study setting:

This study was conducted among pre-hospital trauma care workers, mainly from Makkah region, the holy city in Saudi Arabia with a population of around 7 million [Central Department of Statistics, 2010]. The total number of road traffic injuries deaths in Makkah in 2013 was 772. [“Traffic director”, 2014]. The EMS in Saudi Arabia, which is mainly based on a Basic Life Support (BLS) system, is centralized under Saudi Red Crescent Authority that provides emergency medical services [personal communication, May 1, 2014]. In Makkah city, pre-hospital trauma care is provided by the Saudi Red Crescent. In 2010 the Red Crescent center Makkah region had 50 ambulance dispatch sites (urban and roadside), about 170 ambulances (which were mainly equipped with BLS instruments) and about 350 staff (including physicians, paramedics, and emergency medical technicians) [Saudi Red Crescent,

2014]. The Saudi Red Crescent Operations in Makkah received during the first quarter of this year 2014, 34534 calls culminated in March by 12728 calls while it was in the month of January 11032 and in February 10774 calls [“Official spokesperson”, 2014]. The largest number of total cases was in Jeddah about 16554, then Makkah by 10664 calls and Taif 7316 calls [“Official spokesperson”, 2014]. The Red Crescent center in Makkah region receives more than 383 calls each day about 15 calls in each hour [“Official spokesperson”, 2014]. The operators, who answer the calls in the Red Crescent central dispatch, are usually trained emergency medical technicians (EMT) [personal communication, May 1, 2014]. For each incoming call, the operator determines whether the situation needs the dispatch of an ambulance or not. Once the decision to dispatch an ambulance is made, the operator informs the ambulance dispatch site closest to the crash scene to help the victim. Moreover, there are a number of general physicians in the central dispatch who provide medical consultation for people who call EMS and also give medical advice to the technicians who treat victims at the crash scene or on the way to the hospital [personal communication, May 1, 2014]. According to the referral system, Makkah (like other big cities) is divided into several regions by the EMS. Each region has one trauma hospital and if a crash occurs in that region, the ambulance should transfer the patient to that specific hospital [personal communication, May 1, 2014].

Study participants and data collection:

The participants of the study consisted of twenty male health professionals (workers), all have at least three years' experience in pre-hospital trauma care (including five physicians, twelve emergency medical technicians and three paramedics working as ambulance staff, manager or adviser in Makkah city Saudi Red Crescent center (ten participants), Jeddah Red Crescent center (five participants) and Taif Red Crescent center (five participants). The reason for the only male participants was that ambulance staff and administrative staff are usually men in Saudi Arabia. Purposeful sampling was used for the initial interviews and according to the emerging codes and categories data were collected by means of theoretical sampling. Participant selection, data collection and data analysis continued until theoretical saturation was reached and a rich description of experience had been obtained. In-depth interviews in Arabic language were used for data collection. Each interview began with general questions about the participants' own experiences of the prehospital trauma care process for RTI victims and their perceptions about “factors affecting an effective prehospital trauma care process”. Probing questions were also used to clarify information and gain additional data. The interviews lasted from 20 to

40 minutes (no association between interview time and profession of interviewee was observed). All interviews were done between April and May 2014 by the Paramedic students at the last years of college. The research team is a Paramedic student's one including only male students with same backgrounds from Saudi Arabia (Makkah, Jeddah and Taif); three students from Makkah, one from Jeddah and one from Taif. All students have been worked with Saudi Red Crescent as a volunteer.

Questionnaires survey:

In 2014, a web form questionnaires were sent to people in different social media from Makkah region and a little from other regions of Saudi Arabia. The first part of the questionnaire looked at the personal information. The second part requested information regarding the evaluating of prehospital care provided by EMTs in road accidents. The final part asked equations to identify the awareness of first aid in the community. The questionnaire is a self-administered questionnaire containing 29 questions, which takes about five minutes to complete. It measures and evaluate the prehospital care in road traffic injuries and the awareness of first aid. Nine quantitative questions were included that used a yes and no options. Nine of the questions assessed personal interactions between EMS providers and patients, two assessed communication and transportation, and the seventh was a global satisfaction measure. In addition, eight quantitative questions were included to collect information about the public awareness about first aid, number of ambulance and to measure the suffering from car accidents. One open-ended questions asked to allow people to write any suggestions for improvement the prehospital care provided in car accidents.

Data analysis:

All interviews were recorded, transcribed verbatim and analyzed using constant comparative method [Sharon M. Kolb, 2012]. Data collection and data analysis took place simultaneously and an initial analysis of each interview was made before the next interview and if some important issues emerged they were then brought up in the next interview. Accordingly, each interview provided the direction for the next one. Open, axial and selective coding was applied to the data [Sharon M. Kolb, 2012]. Open coding involved a line-by-line analysis, labeling, and grouping of the data into categories and sub-categories. Axial coding involved further conceptualization of the categories by specifying the relationships between them and by integrating them into a new form. Finally the number of categories was reduced and major new categories were generated. Selective coding resulted in one core category which related to all other categories. All the analyses were

done by the first student in collaboration with the research team.

Rigor:

Regarding trustworthiness, credibility was ensured through constant comparison, member check, and peer review. Constant comparison was done by returning to the data several times during the analysis to verify and develop categories. Five of the participants were contacted after the analysis and were given a summary of the primary results to determine whether these results were in accordance with their experiences (member check).

Ethical considerations:

Verbal consent was obtained and all participants were informed that they could refuse to participate or withdraw from the interviews at any time.

3. Results:

In the process of data analysis, we have established a numbers of factors to develop prehospital care, including Public education campaign and six categories emerged: (1) staff qualifications and competences, (2) availability and distribution of resources, (3) communication and transportation, (4) involved organizations, (5) laypeople and (6) infrastructures. We divided these categories into factors inside the EMS and factors outside the EMS. The core category that was related to all the other categories was defined as "interaction and common understanding". Each category by itself or in interaction with others can facilitate or inhibit an optimal pre-hospital trauma care process by influencing each of the main stages of the process. In the following, we present the public education campaign and categories, which emerged from the data, considering their effects on the pre-hospital trauma care process.

Public education:

Campaign According to an SRC survey (Magazine of SRC Society, 1998), only 3% of those interviewed had recognized that the emergency phone number for SRC is 997, 70% had answered that it was 911, which they knew from the famous 911 US television program [AlGhamdi AS, 2002]. All participants stated that public education plays an important role in effective RTI and considered it should be widely spread. It was mentioned that, in recent years, many activities and public education campaigns have been implemented by the police, focusing on the primary and secondary prevention of road traffic injuries, but the need for more public education regarding RTI was clearly stressed. It was considered that this should incorporate aspects related to better cooperation of people with the emergency services, basic first aid techniques, the role of the different emergency services in road traffic crashes, as

well as safe victim transportation when ambulances are not available. All participants pointed out that the mass media, especially television, were relevant channels of public health information in the Saudis context. On the other hand, it was strongly felt that, since many people still do not have enough knowledge of first aid, their cooperation should be limited to protection of the crash scene and alerting the emergency services, especially at urban crash sites. Their cooperation should also be under the supervision of members of the emergency services. Most participants stated that training of those who arrive initially at the crash scene was another way of improving crash scene management. The fact that, in Saudi culture, those who help others are held in high esteem can be beneficial when it comes to RTI. It was proposed that training should include basic principles of safe rescue, Cardio Pulmonary Resuscitation (CPR), victim triage and safe transportation to medical centers. This group could be made up professional drivers. The same suggestion was made with regard to other people who volunteer their help. Providing a kit of simple equipment and supplies and a special uniform for this group could improve their cooperation. Some participants also recommended an ongoing pilot programme, in which police officers receive special training on how to manage crash sites.

Factors inside the EMS Staff qualifications and competences:

Most participants were concerned with the shortages of professional medical staff and the inadequate skills and knowledge of the current staff in EMS. Inappropriate training plans about pre-hospital trauma care and out of date, unpractical and inadequate training courses were mentioned as the main reasons for inadequate skills and knowledge among the staff, although they noted that (SRC educational plans have improved considerably during recent years, especially with the assistance of Emergency Medicine specialists. Malpractice, conflicts among staff members and interference from untrained laypeople were perceived to be the consequences of the inadequate skills and knowledge of staff. "The development of emergency medical services one of the things that we observed in recent years, the Red Crescent in the past five years had been suffering from. Lack of workers like administrators, paramedics and ambulance drivers, also lack of the number of centers in all regions of Saudi Arabia and lack of incentives for workers in this field" (Participant 1) Moreover, the participants reported that the ambulance staffs often misjudge emergency cases due to the high number of non-emergency dispatches. Since the staff have a lot of non-emergency dispatches during the day, they think that every case is non-emergency like most of the cases and if a real

emergency happens they are not mentally and practically prepared. According to the participants, non-emergency dispatches resulted from non-emergency calls from the public, calls from the police about crashes without injury and also inappropriate screening of calls in the central dispatch. Fatigue and dissatisfaction of the staff and also a risk of missing the actual emergency cases that need trauma care are described as the main consequences of a high rate of non-emergency dispatches. Availability and distribution of resources Deficiency and maldistribution of resources were viewed as an important barrier for providing effective pre-hospital trauma care. The factors that contributed to resource deficiency and inadequacy were described as short supply of professional staff, ambulances and dispatch sites, lack of necessary equipment in the ambulances (e.g. defibrillator and monitoring equipments), lack of rescue equipment in the ambulances, and lack of some drugs (e.g. Crash Event Trauma hospital Early notification Early response Efficient onscene care Safe and prompt transportati on Interaction and common understanding Interaction and common understanding Communication and transportation Availability and distribution of resources Staff qualifications and competences Factors inside EMS Factors outside EMS Involved Laypeople organizations Infrastructures painkillers). Some other concerns were the long distances between ambulance dispatch sites (which affects response time), and substandard road-side dispatch sites. "At some crashes, when we reach the scene we see that the victim is trapped in the car and we have to call the Fire Department because we don't have rescue equipment to help the victim. This is a time loss which is critical for the victim's life". (Participant 5)

Communication and transportation:

Different opinions were gathered concerning crash management and delayed victim transport. At many crashes, the police must be present to take statements, which is important for insurance and legal purposes. This task wastes precious time and delays the transportation of victims to hospital. Members of other organizations stated that an insufficient number of ambulance dispatch sites could also result in delayed transportation. Moreover, the fact that rescue activities are designed in different ways in different organizations could contribute to delays. Substandard telecommunication equipment; and undeveloped satellite navigation (GPS), which might hamper coordination and cooperation among the organizations. "The referral system has a lot of problems. The streets have changed, and since we do not have GPS, we cannot track our ambulances. The maps we are using are old and not updated. This

system is ineffective, not only for traumas but also for other specialties". (Participant 10)

Factors outside the EMS:

Involved organizations In addition to the Red Crescent, there are two other organizations involved in the management of a crash and the rescue of crash victims in Saudi: the Police, and the Fire Department. The participants believed that poor coordination and cooperation between these organizations and the Red Crescent and the insufficient knowledge and skills regarding the rescue of victims and managing the crash are important obstacles to providing prompt and effective pre-hospital trauma care at the crash scene and when transporting the victims to hospital. They explained that each organization arrives at the crash scene at different times and there is no communication or a common telephone line between these organizations that can be used for coordination and information exchange. The participants pointed out that the Police and the Fire Department have rescue teams who are responsible for rescuing victims in some specific situations such as when a victim is trapped in a car. However, these teams sometimes arrive late on the scene and often try to rescue the victims in an unsafe way. The teams were not considered qualified to provide medical care for victims. Sometimes, the delayed arrival of the police, combined with a lack of cooperation in ensuring a safe and secure environment for EMS staff constitutes another important barrier to timely and effective trauma care. "Sharing experiences with Arab and foreign ambulatory organizations is important to develop the emergency medical services. Some countries have considerable experience in earthquakes, floods or other natural disasters. The EMS in Kingdom of Saudi had lack in these experiences. We have seen in Jeddah city when it sank because of rain how there was a lot imperfections in ambulatory device. Therefore, exchange of experiences is important". (Participant 14)

Laypeople:

The involvement of laypeople at the crash scene was perceived as negative due to reasons such as providing incomplete or wrong information, and emotional reactions and conflicts with the EMS personnel. The participants expressed that interference from laypeople and their forming a crowd at the crash scene may result in wasting critical time in providing effective care and also, in some circumstances, may contribute to secondary injuries for the victims and even lead to a new crash. They pointed out that factors such as cultural values and beliefs (including: humanitarian assistance, willingness to help, curiosity and excitement), lack of knowledge together with the late arrival and lack of competence of EMS staff and laypeople's mistrust in them are factors leading to

laypeople's interaction or interference at the crash scene. Invariably, laypeople are the first to arrive at a crash site. According to most stakeholders, laypeople are often stressed and can easily interfere with the activities of ambulance personnel. They usually remove victims too quickly and take them to hospital in their vehicles. Their involvement is regarded as necessary to alert the emergency services and seen as useful in rural and remote areas. However, members of the EMS and police officers consider that laypeople, when too involved in crashes occurring in urban areas, may easily contribute to wasted time, hamper the emergency services, cause secondary injuries to victims and even provoke new crashes. Furthermore, lack of public educational plans about providing first aid at the crash scene, unclear roles of the involved organizations and also laypeople at the crash scene were emphasized as important issues. The participants indicated that there is inadequate collaboration and interaction between Red Crescent and the media concerning public education. They also noted that the role of other involved organizations about public education (including laypeople) is not clear either.

Infrastructure:

A number of factors were mentioned as potential obstacles to an efficient infrastructure for pre-hospital trauma care such as lack of GPS system, sub-standard road infrastructures (including lack of an emergency lane in cities and free-ways outside cities), lack of infrastructures for helicopter ambulances in the big cities, and an inadequate telecommunication system. "Red Crescent needs mechanical cares maintenance department, which checks the tires, engine oil, brake, and all other mechanical things. Sterilization department for ambulance vehicle is important thing because ambulance cabin always exposed to pollution and patients' blood. Therefore, it need fast, full sterilization from inside and outside". (Participant 9).

Core category:

Interaction and common understanding Combination of rescue activities and the introduction of one emergency telephone number were suggested by most participants. Further, better coordination among organizations was regarded as necessary for effective victim management. It was proposed that all health ministry ambulance and Red Crescent ambulances should be equipped with rescue equipment, as well as other vital equipment. Moreover, in order to improve victim rescue, staff training was seen as more important than physical equipment, including the number of ambulances and ambulance dispatch sites. One suggestion for interurban roads was the establishment of a collaborative group consisting of ambulance team members, police officers and road & transportation

officers, which would be more useful in crash black spots. Access to a helicopter ambulance in crowded cities was also regarded as necessary. Both these last two suggestions are currently being implemented in many cities and need to be expanded. The negative involvement of laypeople perceived by the participants was mainly explained by cultural values and beliefs and laypeople's lack of knowledge about their role and how they should interact at the crash scene. Suggestions that came up for improving interaction and building a common understanding among different actors, mainly focused on ways to improve communication and information exchange, improve coordination, and increase the knowledge and skills of the actors. The participants suggested a reform of the current EMS structure and its rules and regulations in order to facilitate better communication and coordination between different SRC centers across the country. To improve the knowledge and skills of staff, along with communication and interaction through multidisciplinary meetings, were other suggestions by the participants. Moreover, almost all participants emphasized public education campaigns using the mass media, especially TV, and also educational plans for special target groups as the most efficient way of improving public knowledge.

Summary result of the questionnaires:

We received completed questionnaires from 417 people. This is the result. Male, 208, 51% Female, 199, 49% Gender Male Female Urban, 359, 88% Rural, 48, 12% How would you describe the area in which you are residing? Urban Rural Saudi 94% Other 6% Nationality Saudi Other 207, 51% 114, 28% 48, 12% 31, 7% 8, 2% 1, 0% Age 18-24 25-34 35-44 45-54 55-64 More than 65 278, 68% 131, 32% Have you ever did car accident? Yes No 135, 47% 79, 27% 36, 13% 37, 13% How many times do you have car accidents? 1 2 3 More than 3 Yes, 114, 39% No, 181, 61% Did you injured by the incident? Yes No in the village, 7, 3% in the City, 191, 66% in highway, 90, 31% Where does the accident happened? in the City in the village in highway Driver 51% Passenger 49% when the accident happened you were? Driver Passenger Sever Moderate Mild Severety of injuries 15 65 68 15 65 68 0 10 20 30 40 50 60 70 80 how worse your injuries was? Severety of injuries A lot of damages Just a little No Did the car damage? 117 157 16 0 20 40 60 80 100 120 140 160 180 Did the car damage? Yes, 96, 33% No, 194, 67% Did you call the ambulance? Yes N o 1 minute, 46, 42% 2 minutes, 24, 22% 3 minutes, 11, 10% more than 5 minutes, 21, 19% didn't answer, 7, 7% how many minutes did it take until the ambulance answer your call? 1 minute 2 minutes 3 minutes more than 5 minutes didn't answer Fast (1-10minutes), 31, 26% Slow (more than 10 minutes), 76, 62% didn't arrive,

15, 12% How many minutes did the EMTs takes to arrive? Fast (1-10minutes) Slow (more than 10 minutes) didn't arrive Yes, 151, 56% No, 120, 44% Did you suffer from crowding around you at the time of the incident? Yes No 0 10 20 30 40 50 60 70 Excellent Average Poor The paramedic crew clearly explained the procedures performed: 49 57 19 The paramedic crew acted in a concern and caring manner: 66 46 13 The paramedic crew and there equipment presented in professional manner: 42 63 18 The ride to the hospital in the ambulance was: 50 44 24 49 57 19 66 46 13 42 63 18 50 44 24 Excellent 46% Average 46% Poor 8% How would you rate the overall quality of the care provided? Excellent Average Poor Yes 29% No 71% Was there negligence from paramedics? Yes No 69 86 90 43 49 0 10 20 30 40 50 60 70 80 90 100 1 to 5 6 to 10 11 to 30 31 to 100 More than 100 1 to 5 6 to 10 11 to 30 31 to 100 More than 100 How many car accident do you see in your life? 69 86 90 43 49 How many car accident do you see in your life? Yes, 164, 46% No, 189, 54% Do have any one in your family dead from car accident? Yes No 16 4 1 7 122 0 20 40 60 80 100 120 140 Brother Sister Mother Father Other Brother Sister Mother Father Other who did dead from accidents in your family? 16 4 1 7 122 who did dead from accidents in your family? Lot of information, 43, 11% Just a little, 258, 68% Nothing, 81, 21% Do you have enough information about First Aid? Lot of information Just a little Nothing Yes, 299, 77% No, 88, 23% Do you know the number ambulance in Saudi Arabia? Yes No Yes, 87, 22% No, 301, 78% Have you got a medical emergency course before? Yes No Yes, 51, 13% No, 336, 87% Is there a first aid awareness in the media? Yes No.

4. Discussion:

The findings from the current study are to some extent, consistent with a study by Mock et al [Mock C & Arreola-Risa C, 2003], which indicates that human resources, physical resources, organization, and administration are critical weak points in trauma systems, especially for hospital trauma care in LMICs. Shortages of professional staff, ambulances and dispatch sites were important barriers to providing effective pre-hospital trauma care. Moreover, the inappropriate distribution of the resources is another issue that was brought up in the current study that could be explained by the general shortage of resources. But in general, the issue of shortage of resources was not seen as a major problem compared to other issues. Inappropriate administration and organization was identified as one of the critical barriers to an effective pre-hospital trauma care in the current study because it influences all the other essential components of the SRC. In contrast to Mock et al [Mock C, Arreola-Risa C, 2003], who mainly

focused on supply and utilization procedures, the findings from the current study are mainly concerned with issues such as the inappropriate structure of the SRC, misconceptions among health policy makers and SRC managers and a low level of motivation among staff. The current study showed that inappropriate communication network, ineffective medical consultation and inefficient referral system are other important factors that hinder the provision of effective trauma care on the scene or when transporting the victims to hospital. These factors, which are related to each other, could be facilitated by a combination of short and long-term interventions. Some examples of these facilitating factors could be the use of new technologies for improving communication network in addition to increasing the number of radio channels, to employ experienced physicians for medical consultation and to provide appropriate trauma care courses for them and also updating maps related to the referral system and establishing GPS. The poor coordination and cooperation between involved organizations is a major barrier to an effective trauma care system. Integrated emergency dispatch or central call reception is one of the strategies recommended by World Health Organization (WHO) [Sasser S, Varghese M, 2005] for enhancing coordination between these organizations. The WHO [Sasser S, Varghese M, 2005] has also suggested that since the police and firefighters often arrive at the crash scene before EMS personnel, they need to be trained in BLS skills. One of the most common issues raised in relation to RTI was the interaction of untrained laypeople and their lack of knowledge and skills in handling the situation in general; and the victims in particular. According to the World Health Organization (WHO) [Mohan D, Tiwari G, 2006], the role of laypeople who are present at a crash scene should be: to contact the emergency services; help to put out fires; and take action to secure the crash scene (e.g. preventing further crashes, preventing harm to rescuers and bystanders, controlling the crowd of onlookers, and applying first aid). It seems that some – but not all – of these WHO recommendations are not fully followed in the study area. More specifically, laypeople extricate – or try to extricate – victims instead of taking action to secure the scene. This might be related in part to the sense of haste and urgency that they also have reported, but also to the late arrival of the emergency services at the scene, which has an adverse effect on the management of the crash scene. This, in turn, calls for better public information concerning what should preferably be done by laypeople at the crash scene (including calling the emergency service, and not moving any victims unless trained in doing so). Such information should also point out the important role that trained laypeople can

play when, among other things, applying first aid e.g., checking the victims' airways, bleeding and circulation [Hussain LM, Redmond AD, 1994], and being involved in the scene management. Public education should also emphasize the issue of the emotional behaviour of laypeople and how this can impede the work of ambulance team members, which would be important to address in a public education campaign. Conclusions The study illustrates the major factors to providing effective pre-hospital trauma care for RTI victims in a middle income setting with rapidly increasing motorization. Based on the study findings, improving the interaction within the current pre-hospital trauma care system and building a common understanding of the role of the SRC emerged as key issues in the development of an effective pre-hospital trauma care system. List of Abbreviations RTIs: Road traffic injuries; LMICs: Low- and middle-income countries; EMS: Emergency medical services; DALYs: Disability adjusted life years; BLS: Basic life support; GPS: Satellite navigation system; EMT: Emergency medical technician; PHTLS: Pre-hospital Trauma Life Support; WHO: World Health Organization.

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