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Epidemiology of Road Traffic Accidents in Sudan

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Abstract:

Objective: *the aim of this study was to assess the epidemiological factors of Road Traffic Accident (RTA) in Sudan with special emphases on human factors of victims.* ***Methodology****: Data were collected using a questionnaire from victims and eyewitness and traffic- police reports.* ***Results****: The incidence of traffic accident was in progressive escalation with time. Younger individuals were twice susceptible compared to elder. The highest number of RTA reported is recorded in the rainy season.* ***Conclusion:*** *Morbidity and mortality from RTA is prevalent in Sudan, particularly in Khartoum State. Interventions include regulation, legislation and community projects are needed to decrease the burden.*

Key words: Sudan, Road Traffic Accident, Khartoum State

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INTRODUCTION

Death from road traffic injuries (RTI) and in particular Motor vehicle Traffic Accidents (MVTA) have been characterized worldwide as a hidden epidemic which affects all sectors of society [1]. An estimated 1.26 million people worldwide died in 2000 from RTI, 90% of them in low and middle income countries. According to the World Health Report 2002, of the global burden of injury, 30.3% morbidity and 28.7% mortality occurred in the South-East Asia Region [2]. In 2000, the RTI mortality rate for the world was 20.8 per 1,00,000 population (30.8 in males, 11.0 in females). The Asia-pacific region accounts for about 60% of global road deaths despite having only 16% of the world's vehicles. In the Americas, it was 26.7 for males and 8.4 for females [3]. In the Americas during 1997-2000 mortality from all land transport accidents was the tenth leading cause of death in the general population [4].

Road traffic accidents are a public health issue and cost a lot to individuals, families, communities and nations. The estimated cost is around 1-2% of a country's GNP in lower income countries [2]. In the majority of cases, road accidents are largely preventable and are usually caused by human errors including alcohol drinking, over taking and speeding, thus highlighting strict implementation of road safety measures.

The severity of road traffic accident injuries is influenced by a number of variables. Prominent among these are population and vehicle densities which could be used to assess fatality rate [5]. Since road users are not a uniform population, drivers, motorcyclists, pedestrians and passengers are exposed to different hazards and will therefore present different epidemiological factors [6].

Developing countries bear a large share of the burden, accounting for 85% of annual deaths and 90% of the disability-

adjusted life years (Daly's) lost because of road traffic injury [7,8]. And since road traffic injuries affect mainly males (73 percent of deaths) and those between 15 and 44 years old, this burden is creating enormous economic hardship due to the loss of family breadwinners.

According to a report of the General Directorate of Road Traffic, Government of Sudan, road traffic accidents increase every year, with the accident rate corresponding to 45 per 100 000 population. Khartoum State ranks first among other states of Sudan in respect of accidents and the number growing up from 4409 accidents in 1999 to 9347 accidents in 2008. Of the total 71130 accidental injuries and 6885 accidental deaths, 95.3% injuries (324 520) and 33.2% deaths (81 036) were due to road traffic. The sex ratio of road traffic injury in Khartoum was 3.4 males: 1 female. Road traffic injuries affect mainly the productive age group (74%) as reflected in the report [9].

Road traffic injuries are predictable and preventable, but good data are important to understand the ways in which road safety interventions and technology can be successfully transferred from developed countries where they have proven effective. Awareness of the consequences of road traffic injuries is lagging among policymakers and the general public. What's needed is incorporation of comprehensive road safety programs into national planning. This is a cause of concern-underlining the critical need for research and development on RTIs in Khartoum State.

MATERIALS AND METHODS

This descriptive study was conducted in Sudan in the state of Khartoum. The study group-consisted of all the RTA victims reporting to Khartoum city casualty during the period from 2001 to 2010 with specific focus to the latest two years. For the aim of the study, a RTA was distinct as accident, which

happened on the road between two or more matters, one of which must be any kind of a moving vehicle. Any injury on the road without involvement of a vehicle (e.g. a person slipping and falling on the road and sustaining injury) or injury involving a stationary vehicle (e.g. persons getting injured while washing or loading a vehicle) or deaths due to RTA were excluded from the study. The victims of the accidents and eyewitness were interviewed to obtain the information about the circumstances leading to accident. A questionnaire specifically designed for this purpose was used for interviewing the accident victims, either in the casualty or in the wards of Khartoum state different hospitals. More information were obtained from traffic-police reports. The data collected involved personal identification data, time, date, day and type of vehicles involved in RTA, etc. Although the study retrieved data for 10 years, but the available survivors for the latest two years were 194 persons.

Data analysis: Data management was done by using the Statistical Package for Social Sciences (SPSS version 16). SPSS was used for analysis and to perform Fisher exact test for statistical significance (p value). The 95% confidence level was used. A p=0.05 was considered statistically significant.

Ethical consent: Consent was taken from accidents survivors and eyewitness before interviewing them, in addition to constitutional consent from Khartoum sate directorate of traffic.

RESULTS

The present study investigated detailed variables on RTA for 194 persons, their ages ranging from 10-60 years, of whom 154 were males and 40 were females.

Table 1 Fig, 2and 3 summarize the incidence rates of RTA during the period from 2001 to 2010. Casualties as well as,

deaths rates were found to increase with time (each year is greater than the previous), but mortality incidence rates showed varying categories. The highest mortality incidence rates were found in 2004 followed by 3003, 2002 and 2001 representing 2.9%, 2.8%, 2.7% and 2.6% respectively. The number of traffic crashes registered has increased by three times in 2010(46757) compared to 2001(15827). The incidence rates were decreased from 2.6% (2001) to 1.9% (2010).

Table 1. Incidence rates of casualty in Khartoum State during the period from 2001 to 2010.

year	casualty	Mortality	percent
2001	15827	416	2.6%
2002	17280	462	2.7%
2003	18581	519	2.8%
2004	21958	651	2.9%
2005	27712	648	2.3%
2006	34019	748	2.2%
2007	37402	758	2.1%
2008	39176	810	2.1%
2009	44668	841	1.9%
2010	46757	891	1.9%

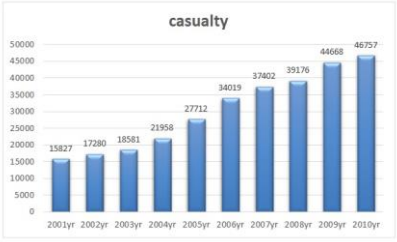

Figure 1. Incidence rates of RTA's casualty during the period from 2001 to 2010 in Khartoum State

Figure 2. Frequencies of RTA's mortality during the period from 2001 to 2010 in Khartoum State

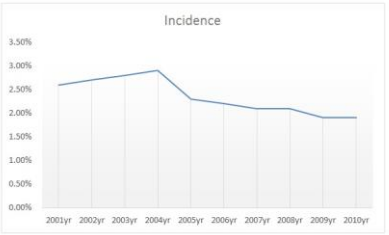

Figure 3. Incidence rates of RTA's mortality during the period from 2001 to 2010 in Khartoum State

In regard to the sex, males represent the greater number 154/194 (79.5%) compared to females 40/194 (20.5%). Moreover, most of the study population were at the middle age as indicated in Fig4. The age group 31-45 years represent the greater number of the total RTA victims followed by 16-30 years. Considering age group 16-45 years, constitute 68.4% of the total RTA victims.

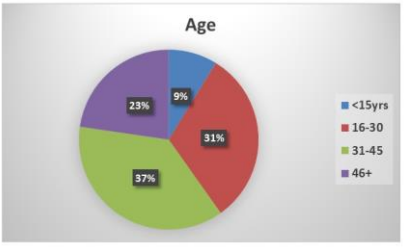

Figure 4. Description of the study population by age

Regarding the injuries types, the highest percentage was regarded as wounds followed by fractures and head injuries, representing 59%, 33% and 8% respectively as shown in Fig5.

Figure 5. Description of the study population by the type of the injury

Regarding the severity of the injury, 46% of the injuries were regarded as mild followed by medium and severe constituting 29% and 25% in this order, as shown in Fig 6.

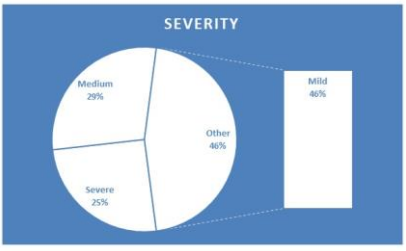

Figure 6. Description of the study population by the severity of the injury

As shown in Fig 7 most of the wheelers involved in the RTA were 4-wheelers, followed by above 4-wheelers.

Figure 7. Description of the study population by the types of wheelers

As shown in Fig 8 the majority of the victims were pedestrian representing 48.5% followed by passengers 34% and

drivers/riders 17.5%. Pedestrians are most vulnerable to injury and death.

Figure 8. Description of the study population by Road users

The study found that incidence of RTA were maximum within 6 AM to 12 Noon (38.1%) followed by 1-6 PM 33.5% and 6 PM to 12 Midnight20.1%**.**

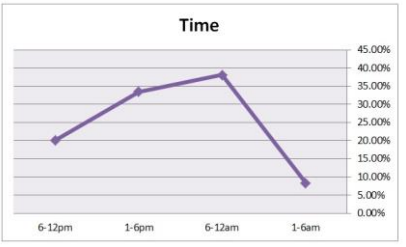

Figure 8. Description of the study population by time of an accident

It was observed that majority of accidents had been in the first day after the week-end (Sunday) 17.3% followed by the last day of work per week (Thursday) 15.3% and less frequency during the week-end days. The maximum incidence of road traffic accident was found to be during rainy season 39% especially in August and September, as shown in Fig 9 and 10.

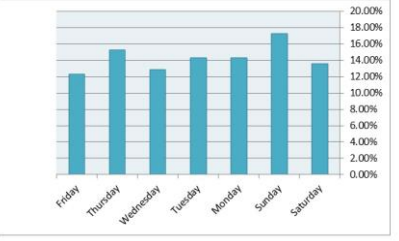

Figure 9. Description of the study population by the days

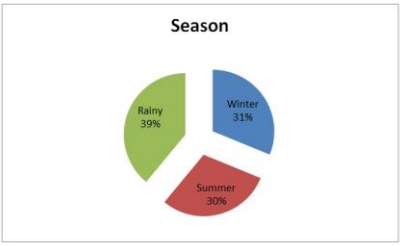

Figure 10. Description of the study population by the Season

Table 2. Shows the distribution of the study population by Place of Accident occurrence. The study showed that frequency of RTA was more (46.7%) in Khartoum locality and less in Shargelneel locality (6%).

Table 2. Distribution of the study population by Place of Accident occurrence

Place	Frequency	Percent
Khartoum	90	46.7%
Omdurman	21	10.8%
Bahri	27	14%
Jabal awleia	17	9%
Shargelneel	12	6%
Karary	14	7%
Ombaduh	13	6.5%

The study showed that, the maximum frequency of nature of occurrence is Pedestrian (46.8%) followed by collision (30.6%), as indicated in Table 3.

Table 3. Distribution of the study population by Nature, type and mode of occurrence of accidents

Nature	Frequency	Percent
Pedestrian	5028	46.8%
collision	3284	30.6%
overturning	864	8.1%
falling	749	6.9%
others	817	7.6%

This study found that, major contributing factor for crashes is the errors of driver and over speeding (14.9%). Regarding protective methods used, it is found that only (22.2%) among

the motorized two-wheeler drivers used protective helmets during RTAs ,(13.7%) seat belts were found to have been used by the car drivers and the occupants and (81.6%) of drivers had a valid driving license.

Table 4. Distribution of the study population by Driver errors

Type of error	frequency	percent
turn	37	19.3%
deviation	28	14.5%
Beyond wrong	28	14.5%
Wrong rotation	23	12%
Override signal	16	7.8%
Back to back	15	7.7%
Over speeding	29	14.9%
others	18	9.3%

DISCUSSION

Investigating causes of traffic crashes is complicated by the fact that a given crash seldom has a single unambiguous cause. Crash causes are usually complex and involve many factors. Based on studies conducted in different part of the world, it is possible to construct a list of categories that could influence the occurrence of road traffic crashes. If the factors that have contributed to the crash are identified it is then possible to modify and improve the transportation system.

This study found that, major contributing factor for crashes is the errors of driver and over speeding (14.9%). Although the relationship between speed and road traffic crashes is a complex one, in general, the higher the speed of a vehicle, the higher the probability of becoming involved in a crash and the greater the likelihood of more severe injuries sustained.

Over the last decade, the number of traffic crashes registered has increased by three times in 2010(46757) compared to 2001(15827). Age group 31-45 years shows almost maximum number of total RTA victims followed by 16-30 years

age group. Similar findings were observed in other studies [9, 10]. A higher number of cases in this age group can probably be explained on the basis that this is the most active period of life during which there is a tendency to take risk. It was observed that 68.4% of victims were in the age group of 16 to 45years. This shows that people from the most active and productive age groups are more involved in RTAs. This causes a serious economic loss to the community. Similar observations were also made in other studies [11,10]. It was noticed that below and above the age of 16 and 46 years respectively, there is a decrease in accident cases. The reason for this may be that children are taken care of by elders and are less likely to use vehicles. The lower proportion of RTAs in those aged 60 years and above could be due to the generally less mobility of these population groups.

The male/female ratio observed in this study was 4:1. The predominance of males was also observed by many authors [10]. This may be due to the fact that females lead a less active life and mostly remain indoors.

The highest number (39%) of RTA victims who reported was recorded in the rainy season. More accidents were observed in rainy months like August and September followed by winter season (31.2%). A similar observation was also reported by others [9,11].

Analyzing the time of R T A, it is found that, incidents were highest within 6 am -12 noon (38.1%) followed by 1-6 PM (33.5%) and 6 PM to 12 Midnight (20.1%). A similar result was observed by other studies [10,12] and differ in another one as found in South India as accidents occurred throughout the day but the peak time for RTAs showed that the highest number of RTAs occurred form 4 PM to 7 PM [10]. There is sufficient evidence in support of a high incidence of day-time accidents. This can be explained by greater traffic volume during the day resulting in greater risk of accident involvement as people

travel to work, children go to school, and commercial enterprises are open for business. The relative decline in traffic accidents at night may be explained by less night-time activity and travel.

In the present study, the highest number of reported accident occurred on Sundays (17.3%) and Thursdays (15.3%). A similar observation was also reported by others [9, 10].

In Khartoum, Sundays and Thursdays are the first and last working days of the week: this could be the possible reason for the large number of accidents on these days. People celebrate Friday as weekend and possibly are in a hurry to go to various places to join their working places on the following Sunday.

In this study the pedestrians constituted 48.5% of the main road users involved in RTA, followed by passengers (34%). Similar results were also observed by others [9,10, 12]. Pedestrians are most vulnerable to injury and death. This reflects the ignorance of traffic rules and speed of the vehicle. This may be due to a number of factors, including lack of pedestrian facilities in road design, poor knowledge and practice of road safety measures by the general population, uncourteous behavior of motorists, high speed driving, and low levels of vehicle ownership. The high proportions of passenger incidence appear to be due to extensive use of public transport, and the driving skill of their operators.

Considering the types of vehicle involved in RTA, 4-wheeler is more than a half of the total victims followed by above 4-wheeler vehicles and 3-wheeler vehicles. It reveals the more use of 4 -wheeler vehicle by untrained persons. Similar findings were reported by others [11,10]. Considering the place of accident, it is found that is highest in Khartoum locality (46.8%) which is more than one third of the total victims. It reveals the overcrowding and the inadequate provision of wide roads in this region.

The study showed that, the maximum frequency of nature of road traffic accident occurrence is Pedestrian (46.8%) followed by collision (30.6%). Different result was observed in Western Nepal, Falling down was the more common mode of accident claiming victims, followed by the knocked-down category [9]. Over 50% of the traffic accidents are due to excess speed and violation of signals at intersections in Saudi Arabia [13]. From the study it is also observed that, protective methods used among the motorized two-wheeler drivers only (22.2% protective helmets) during RTAs, (13.7%) seat belts were found to have been used by the car drivers and the occupants and (81.6%) of drivers had a valid driving license. Similar results were also observed by others [10,12], but in Western Nepal all drivers used the protective methods needed and had valid driving license [9].

CONCLUSION:

Road traffic accidents continue to be a growing menace, incurring heavy loss of valuable man-power and human resources, along with a corresponding drain of potential economic growth and hence.

Interventions in TRA are broad-based and include regulation, legislation and community projects. However, partnerships need to be formed with other sectors which interact with Road Traffic Accidents. Public health sector can play an important role in taking the lead in advocacy and support; it can add value to epidemiology and information systems, among others. The real pressure and motivation to improve driving stricter, more comprehensive and scientifically based test laying a stress on road rules, regulations and traffic control devices.

Acknowledgment

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