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## The prevalence of road traffic accidents in Juba City, 2018, South Sudan

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### Abstract

**Background:** Road traffic accidents remains as one of the leading causes of death and life-long disability worldwide.

**Objectives:** This study aimed to determine the prevalence and associated risk factors for road traffic accidents in Juba, South Sudan.

**Methods and materials:** This are a retrospective study using data from registers at Juba Teaching Hospital and Directorate of Traffic police between 1<sup>st</sup> January to 31<sup>st</sup> December 2018. Data were collected, cleaned and entered into a computer database. Statistical analysis was performed using SPSS Version 21 Software. A variable with a *p* value of <0.05 was considered statistically significant.

**Results:** Out of 7862 patients were recorded in the OPD at Juba Teaching Hospital (JTH), 7.3 % (575/7862) were road traffic accident (RTA) cases. This is at rate of 7313 per 100,000 of the population. Of all the 575 cases of RTA in JTH, 82% (472/575) were males and 18% (103/575) females with age ranging from 9 months to 97yrs and a mean age of 26.9yrs, SD+/-12.53. Most of the patients 37 % (214/575) were of age group 31-40years, with majority 36% (207/575) coming from an unidentified location. Munuki block had the highest 25.2% (145/575) within Juba city council , while areas outside Juba city council had the least 7.5% (43/575).

Interestingly most of the patients 44 % (253/575) presented to the OPD at night, while 19 % (111/575) presented in the morning. Most 20 % (113/575) presented to the OPD in May 4 % (23/575). There were no cases in June. Out of 1081 drivers involved in RTA, age group 31-40yrs (37%), 21-30yrs (37%), 21-30yrs (36%), 31-40yrs (42%) and 31-40yrs (31%) had an outcome of car accidents causing death, severe injuries, slight injuries, damage and influenced by alcohol respectively with *p*=0.015. It was noted that 81% (926/1141) drivers had driving licenses, while 19% (215/1141) driving without licenses. Private cars were associated with the highest outcome; 56% causing death, 50% causing slight injuries and 42% causing severe injuries with *p*=0.01. Unfortunately, 82% of drivers driving under alcohol influence were drivers driving private cars as the highest with *p*=0.000. Out of the 1472 cars registered, majority were private cars 38% (27/71), 36% (134/373), 47% (222/475) and 100% (11/11) were involved in accidents causing death, severe injuries, damage to property and driven under influence of alcohol respectively with *p*=0.003. Motorcycles reminded leading cause of slight injuries, 39 % (214/542) but also the second leading in causing severe injury 35 % (190/542) as well as damage to property 20 % (96/475). Most of the cars 22% (13/58) caused accidents resulting to death as well as slight injuries 16.8% (67/404) in March; severe injuries 13.3% (39/291) seen in November, where as damage to the property 13.6% (40/296) in February. Accidents due alcohol intoxication 50% (16/32) were seen in January but *p*=0.58.

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**Conclusion:** Road traffic accidents still remain a public health problem in Juba with younger age drivers involved in accidents.

**Keywords:** Road traffic accidents; Juba teaching hospital; Directorate of traffic police; South Sudan

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## 1. Introduction

Road Traffic Accident (RTA) is an event that occurs on a way or street open to public traffic resulting in one or more persons being injured or killed, where at least one moving vehicle is involved [1]. This is caused either by collision between vehicles or vehicles and pedestrians or vehicles and animals or vehicles and geographical or architectural obstacles. World Health Organization (WHO) data have showed that mortality due to road injuries remains very high, estimated at 1.35 million in 2016[2]. This is approximated to 3,700 persons injured each day by RTA in 2011[5]. Globally, road traffic injuries are the eighth leading cause of death, leading high injury-related deaths among aged group 5–29 years [2]. It is the top three causes of mortality in the economically active population group of 15–44 years of age [3]. Majority of casualties were from low and middle income countries (LMIC) [4]. It is projected that car accidents will be the fifth leading cause of death in the world by 2030[5] if there is no strategy put in place to mitigate it. More than half of all road traffic deaths are among vulnerable road users such as pedestrians, cyclists and motorcyclists. Pedestrians and cyclists make up 26%, while motorized two- and three-wheelers contribute to 28% of the deaths [2]. Car occupants represent 29 % of all deaths and the remaining 17% are unidentified road users. Of all the global road traffic deaths, Africa has the highest 44% proportion of pedestrian and cyclist mortalities.<sup>2</sup>

In Africa, Nigeria account for the highest proportion of injuries and deaths resulting from RTA. Road accidents in Nigeria is the third leading cause of overall deaths as well as the leading cause of trauma related deaths [5]. Interestingly, it is the most common cause of disability, physical and socioeconomically burden in the communities. Furthermore, there is increase in the rise of RTA which is most often due to the reckless and speedy driving of the vehicles, violating traffic rules, overburdened of public transport vehicles, poor maintenance of the vehicles, drunk driving, and driver fatigue [6].

There are very few studies done in South Sudan on RTA. We found one paper by Cham et al which focused on age group, type of vehicles involved, alcohol influence and seasonality of RTA in Juba[7]. However, there no studies on prevalence and risk factors associated with RTA. Hence, this study is intended to determine the prevalence of road traffic accidents and its associated factors. We believe the outcome of this study will bridge the knowledge gap and influence policy makers in designing strategies that will improve traffic regulations and road safety measures.

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## 2. Material and methods

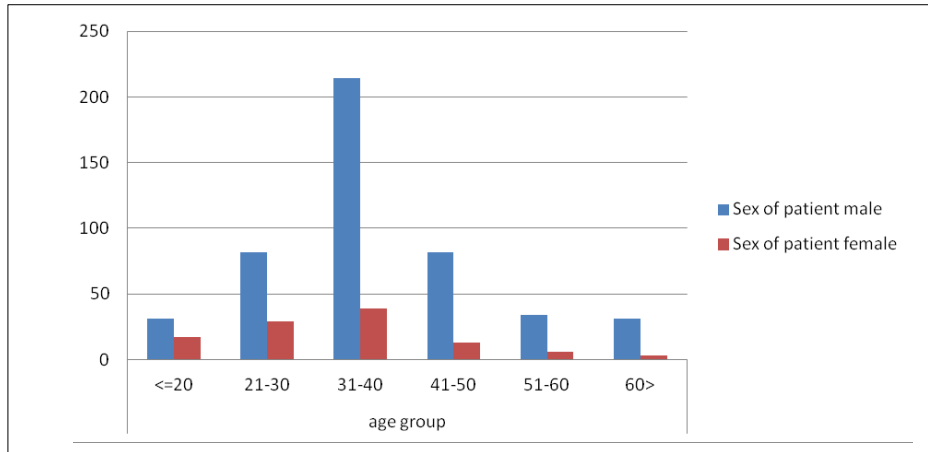
We conducted a retrospective study using secondary data from the registries of Juba Teaching Hospital (JTH) and Directorate for traffic police in Juba, Central Equatoria State, and South Sudan. From the records in JTH, we obtained demographic data of the patients such as sex, age and address. In addition, we recorded the month and time of presentation at JTH. On the other hand, data collected from the traffic police registry consisted of demographic data of the drivers like sex, age, address. In addition, recorded month of the accident, outcome of the accident, type of license, and type of the vehicle, and category were included. The sample sized of the study participant included all the patients that presented as RTA to outpatient department (OPD) of JTH and drivers reported to the traffic police from 1<sup>st</sup> January to 31<sup>st</sup> December 2018.

Ethical approval was obtained from the College of Medicine, University of Juba and the national ministry of health (NMOH).

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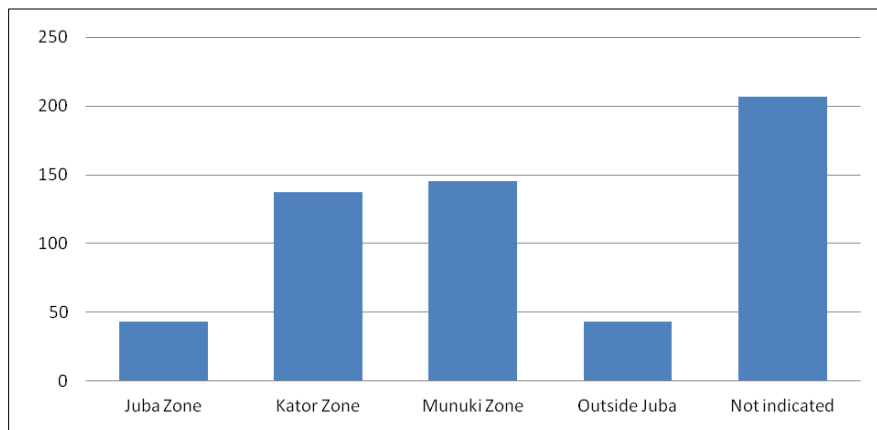
## 3. Results

A total of 7862 patients were recorded in the OPD at JTH during the period of the study. Of these, 7.3 % (575/7862) were cases of RTA. This is at rate of 7313 per 100,000 of the population. Of all the 575 cases of RTA in JTH, 82% (472/575) were males and 18% (103/575) females with age ranging from 9 months to 97yrs and a mean of 26.9, SD+/- 12.53. Most of the RTA patients 37 % (214/575) were of age group 31-40years, Fig 1.

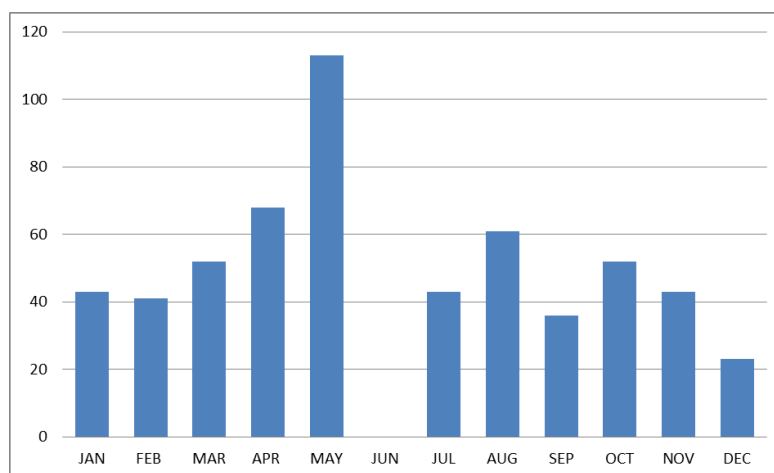


**Figure 1** Distribution of patients according to sex and age group attending OPD at JTH

Majority of the patients 36% (207/575) in RTA were coming from an unidentified location. Munuki block had highest cases of RTA 25.2 % (145/575) within Juba city council, while areas outside Juba city council had the least cases of RTA 7.5 % (43/575), Figure 2.



**Figure 2** Distribution of patients according to their residential areas



**Figure 3** Distribution of patients attending OPD according to the month of attendance at JTH

Interestingly most of the patients 44 % (253/575) presented to the OPD at night, while 19 % (111/575) presented in the morning. Most of these patients 20 % (113/575) presented to the OPD in month of May 4 % (23/575) and less cases presented in December. Remarkably, there were no cases of RTA in June as shown in Fig 3.

**Table 1** The distribution of ages of drivers and type of cars with outcome of the car accidents among drivers in Juba City

Variable	Outcome of the car accidents					
	Causing death N (%)	Causing severe injury N (%)	Causing slight injury N (%)	Causing damage N (%)	Due to influence of alcohol N (%)	P-value
Less than or 20	12 (20)	49 (17)	65 (16)	11 (4)	1 (3)	0.015
21-30	17 (30)	109 (37)	142 (36)	109 (37)	9 (28)	
31-40	22 (37)	89 (30)	126 (32)	124 (42)	10 (31)	
41-50	5 (9)	26 (9)	56 (14)	37 (13)	8 (25)	
51-60	0 (0)	14 (5)	15 (4)	12 (4)	4 (13)	
61 and above	2 (3%)	4 (2)	0 (0)	2 (0.7)	0 (0)	
Total=1080	58	291	404	295	32	
<b>Driving licenses</b>						
Private car	34 (56)	130 (42)	148 (33)	149 (50)	13 (82)	P=0.01
General car	13 (21)	74 (24)	99 (22)	72 (24)	1 (6)	
Heavy car	5 (8)	50 (16)	83 (18)	54 (18)	1 (6)	
Without license	9 (15)	63 (20)	117 (26)	25 (8)	1 (6)	
Total=1141	61	317	447	300	16	

**Table 2** Distribution of types of cars and the outcome of accidents in Juba city

Variable	Outcome of the car accidents					
	Causing death N (%)	Causing severe injury N (%)	Causing slight injury N (%)	Causing damage N (%)	Due to influence of alcohol N (%)	P value
Private	27 (38)	134 (36)	190 (35)	222 (47)	11 (100)	P=0.003
Pick-Up commercial	6 (8.4)	13 (3.4)	10 (2)	12 (3)	0 (0)	
Taxi	0 (0)	0 (0)	3 (1)	0 (0)	0 (0)	
Toyota hiace (mini bus)	8 (11.2)	7 (1.9)	72 (13)	90 (19)	0 (0)	
Lorries	9 (12.6)	49 (13)	27 (5)	19 (4)	0 (0)	
Heavy truck	6 (8.4)	27 (7.3)	0 (0)	10 (2)	0 (0)	
Motor cycle	3 (4.2)	108 (29)	214 (39)	96 (20)	0 (0)	
Governmental	10 (14)	27 (7.3)	19 (3.4)	19 (4)	0 (0)	
Diplomatic	0 (0)	8 (2)	5 (1)	3 (0.6)	0 (0)	
Truck	2 (2.8)	0 (0)	2 (0.4)	4 (0.8)	0 (0)	
Total=1472	71	373	542	475	11	

A total of 1081 drivers were involved in RTA according to the data obtained from the Directorate of traffic police registry. The age groups of the drivers involved in RTA were of age group 31-40yrs (37%), 21-30yrs (37%), 21-30yrs

(36%), 31-40yrs (42%) and 31-40yrs (31%) with outcome of car accidents causing death, severe injuries, slight injuries, damage and influenced by alcohol respectively with  $p=0.015$ , Table 1. It was noted that 81% (926/1141) drivers had driving licenses, while 19% (215/1141) driving without licenses. Of all the cars involved in RTA, private cars were associated with the highest 56% causing death, 50% causing slight injuries and 42% causing severe injuries with  $p=0.01$ , Table 1. Unfortunately, 82% of drivers driving under alcohol influence were drivers driving private cars as the highest with  $p=0.000$ , Table 1.

Out of the 1472 cars registered by the traffic police during RTA, majority were private cars 38% (27/71), 36% (134/373), 47% (222/475) and 100% (11/11) were involved in accidents causing death, severe injuries, damage to property and driven under influence of alcohol respectively with  $p=0.003$ , Table 2. Motorcycles were the main leading cause of slight injuries, 39% (214/542) in this study but also remains the second leading causing in severe injury 35% (190/542) as well as causing damage to property 20% (96/475).

Most of the cars 22% (13/58) caused accidents resulting to death as well as slight injuries 16.8% (67/404) were in March; severe injuries 13.3% (39/291) were seen in November, whereas damage to the property 13.6% (40/296) were in February as shown in table 3. It is worth mentioning that accidents due alcohol intoxication 50% (16/32) were seen in January but  $p=0.58$ , Table 3.

**Table 3** Distribution of outcome of car accidents according to months in Juba City

Variable	Outcome of the car accidents					P Value
	Causing death N (%)	Causing severe injury N (%)	Causing slight injury N (%)	Causing damage N (%)	Due to influence of alcohol N (%)	
January	2 (3.4)	17 (5.8)	0 (0)	23 (7.8)	16 (50)	P=0.58
February	7 (12)	34 (12)	38 (9)	40 (13.6)	0 (0)	
March	13 (22)	29 (9.9)	67 (16.8)	26 (8.8)	1 (3.1)	
April	10 (17)	22 (7.5)	51 (12.8)	21 (7)	1 (3.1)	
May	6 (10)	14 (4.8)	36 (9)	22 (7.5)	0 (0)	
June	0 (0)	30 (10)	63 (15.8)	39 (13)	3 (9.4)	
July	1 (1.7)	14 (4.8)	25 (6.3)	16 (5)	0 (0)	
August	2 (3.4)	21 (7)	31 (7.8)	22 (7.5)	3 (9.4)	
September	4 (6.9)	25 (9)	15 (3.8)	16 (5)	2 (6.2)	
October	5 (8.6)	27 (9)	29 (7.3)	30 (10)	5 (15.6)	
November	7 (12)	39 (13.3)	25 (6.3)	24 (8.2)	0 (0)	
December	1 (1.7)	19 (6)	24 (6)	17 (5.8)	1 (3.1)	
Total=1081	58	291	404	296	32	

#### 4. Discussions

Globally, Road traffic injuries are major causes of mortality and morbidity with approximately 1.35 million death and 20 - 50 million injuries each year [2]. This is a public health threat especially in low and middle-income countries where 85% of the world's road traffic-related fatalities occur. In addition, RTA causes 90% of the disability adjusted life years (DALY) caused by RTAs worldwide [6, 8].

In this study, we have shown that RTA contributes to 7.3% of the patients attending OPD emergency department of surgery in JTH. This is very low compared to a study conducted by Haile et al where the prevalent is 62.5% [9]. This might be because of a small sample size in our study despite the fact that both were hospital-based studies. However, if prevalence is converted to rate, our study showed a rate of 7,313 per 100,000 populations. This is higher than studies conducted in Ethiopia which reported rate of 63 per 100,000 population [3] and Guinea which found a rate of 28.7 per

100,000 population [10]. This is because in Ethiopia it was a survey involving a larger sample size while ours was a hospital base study. In Guinea, it involved 20 hospitals while ours was one hospital-based study. Males were more affected than females with a high statistical significance. This is similar to that of studies conducted in Iran [11] and Sri Lanka [12]. This might be due to fact that females are more involved with most of the domestic work resulting to less risk of exposure to RTA. On the other hand, males are engaged in outdoor activities for the whole of the day searching for money in order to bring food home. In so doing, they become more exposed to RTA than females. Moreover, in South Sudan there is less respect to pedestrians by car or motor cycle drivers when they are crossing or moving along the roads. Most of the patients in this study ranged from 9 months to 97 years with mean age of 27 years. It seems the infants and children got involved in RTA either as the parents cross the roads or in a car collision. Most of the patients were age group 31-40 years in this study. This is similar to studies conducted in India [1], Ghana [13] but higher than studies done in Iraq [14].

In our study most of the patients were brought from Munuki block and mostly presenting to OPD during night hours. It is worth mentioning that Juba city is divided into 3 blocks namely Juba, Kator and Munuki. Munuki block is the most highly populated block. Most of specialized hospitals are located in the Juba block. With difficulties in transport, citizens get it harder to get a means of transport to transport them to more specialized health facilities. Most of the patients depend entirely on public transport which normally stops services earlier or use private cars availed by relatives, friends or neighbors. Most of the times such kind assistance is available after working hours. Furthermore, hiring a private transport is very expensive.

Most of the patients present to the hospital as cases of RTA more in May than any other months. This is because rain started early in 2018 resulting to destruction and distortion of most of the main roads in the city.

In this study, data analyzed from the directorate of Traffic Police showed a mortality rate of 5%. This is lower than that of studies done in Libya [15] and in Central African Republic [16]. This might be due to our poor infrastructure and less number of cars in comparison to these countries. Furthermore, there might be missed and unrecorded accidents in the traffic police offices. Most of the drivers in our study range between 31-40 years. This is the most hyperactive age group and very difficult to discipline in the country. Moreover, some are associated with high ranking civil servants who give them immunity to any crime they commit. Hence the chance for them to drive carelessly and recklessly is more obvious. Worst of it, most of them drive under alcohol influence as well as involved in fatal car accidents. Similarly, Cham et al [7] in 2014 showed age group 21-30 years were involved in fatal car accidents. Our study which was done after 4yrs from Cham et al, has demonstrated that the traffic administration have improved a little bit in their regulatory system.

In this study, 56 % private cars (with drivers with licenses) caused death to the passenger (s) with a high statistical significance. Cham et al too did showed that private vehicles had high prevalence. This might be due to increase in the number of privately own cars in comparison to other types in the country. Interestingly private cars are involved too in severe injuries as well as damaging property in the city. On the other hand, motor cycles contributed 39% of the slight injuries. This might be due to the fact motor cycle riders try to make short cuts by riding in between and crossing in front of the cars. Consequently, they get knocked down.

Most drivers, 50% were seen to drive under influence of alcohol more in January. This might be due to the fact that most of them were back to the city after Christmas and New Year holiday handovers. Interestingly, February is associated with more damage to property. This might be explained by increase of the vehicles in the city after the holidays and consequently more accidents. Interestingly 1472 vehicles, including motor cycles, were recorded by the directorate of Traffic police but only 27 % (391/1472) had their outcome not registered and 22% (331/1472) their drivers not recorded. This may be due to fact that some vehicles after accident, being minor, and their owners negotiate and make or reach to an acceptable agreement with victims and off they go. In other circumstances drivers have to run for their life after car accident otherwise they will get killed by the expectators in the site of the accident.

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## 5. Conclusion

This study has shown that majority of drivers are younger and associated with RTAs. Most of the RTAs were reported at night with more males affected than females. Most of the affected populations were from Munuki block. More accidents, under the influence of alcohol, were seen in January.

### *Limitations*

- This is a retrospective study whose estimates were collected partly from JTH and Traffic police.
- Limited access to data in Juba Teaching Hospital as well as Traffic police administration.

- Missing information in all the data from JTH as well as in Traffic police administration.
- Failure to report sites of injuries to the patients as well as clear line of interventions done in the hospital and duration of stay in the hospital.

### *Recommendations*

Most of the RTAs are committed by young drivers and under influence of alcohol resulting to high mortality. The followings are our recommendations:

- Improvement of road safety measures, tightening up driving regulations and putting very hard penalties for anyone who violates them.
- Coordination between the Ministry of the Transport, Roads and Bridges and the Juba City Council to embark on improvement of the infra-structure of most of the roads within Juba city as well as expanding internally connecting roads. This will relieve congestion in the main roads as well as reducing RTA.
- Construction of bumps or Zebra cross or traffic lights on roads opposite very busy institutions like schools, markets, worship places etc for pedestrians to cross peacefully and safely.
- Regular monitoring and maintenance of bad roads by both ministries for transport and Juba city council.
- Strict regulations and conditions for driving licenses by directorate of traffic police administration. Usage of certificated and standardized driving schools to facility in driving licenses will be helpful.
- Helmet should be made compulsory for motor cycle riders with their passenger by law in all parts of the country and existing traffic rules should be strictly enforced.
- Public awareness on road safety should be conducted frequently using Newspapers, Television and other media outlets in order to enlighten the communities of South Sudan about how prevent once self from RTA.
- National Ministry of Health to establish a specialized hospital at Munuki as well as expanding JTH to have a specialized department for RTA in a better standardized manner.
- Develop standardized data collection tools for both health facilities and national traffic police administration capturing very important global variables for RTA.
- Improvement of the department of statistics (in both hospitals and traffic police administration) and capacity building of the cadres to keep in line with recent and more recent knowledge in data collection, designing of data collection tools, storage and sharing of data in both ministries of transport, health and interior.
- Invest more in research by providing research grants to respective institutions (e.g. universities). This will help institutions develop local and scientifically sound solutions to arising problems facing our nation

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### **Compliance with ethical standards**

#### *Acknowledgments*

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#### *Disclosure of conflict of interest*

The authors declare no conflict of interest. This research received no funding from any funding agency.

#### *Contributions*

Conceptualization by K. S, A. C, J.T, J.C, L.A, R.A, S.L, T.A, R.C, A.L, R.L,, and J. L; statistical analysis by K. S; writing—original draft preparation by K. S; reviewing and editing, J.L, R.Land J.T. All authors have read and agreed to the published version of the manuscript.

#### *Statement of informed consent*

The authors of this research declare that there was no informed consent obtained since this was a retrospective study in which data was obtained from medical and traffic police records in Juba Teaching Hospital and State traffic Police administration respectively. However an ethical approval was obtained from the ethical review board in the national ministry of Health and approved by both administrations of Juba Teaching Hospital and Traffic Police.



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