

# Clinical and cranial computed tomography scan findings in adults following road traffic accidents in Kampala, Uganda.

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## Abstract

**Background:** Globally, road traffic accidents are a major cause of death and disability. The developing countries bear a disproportionately large share of the RTAs which account for about 85% of the deaths. Most of these RTAs result in head injury, which globally, most scholars and medical practitioners consider a significant economic, social and medical problem. In Mulago National referral hospital, RTA is the leading cause of surgical admission.

**Objective:** To describe the cranial computed tomography (CT) scan findings in adults following RTA in Mulago hospital.

**Methods:** Using CT, detailed analysis of 178 adult patients with head injury following RTA was performed. Data was analyzed using SPSS version 16 and presented in tables and graphs. Data recorded included socio-demographic characteristics, clinical and CT variables.

**Results:** Seventy seven percent of the respondents were between 18- 39 years. 52.6% of patients had open head injury. Headache was the most common clinical variable followed by dizziness and aphasia. The most common CT characteristic was extra cerebral haemorrhage followed by brain oedema and raised Intra-cranial pressure (ICP). Intra-cerebral haemorrhage was commonest in the frontal lobe followed by parietal lobe.

**Conclusion:** Public health interventions like advocacy and education of the population on safe and responsible road usage should be emphasized to reduce on RTAs.

**Keywords:** Computed tomography scan, road traffic accidents, head injury, Uganda.

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## Introduction

Globally, road traffic accidents (RTAs) are a major cause of death and disability with a disproportionate number accruing in developing countries<sup>1</sup>. Road traffic accidents account for 2.1% of global mortality<sup>2</sup>. The developing countries bear a large share of the burden and account for about 85% of the deaths as a result of RTAs<sup>2</sup>. The problem is increasing at a fast rate in developing countries due to rapid motorization and other factors<sup>3</sup>. Public policy responses to this epidemic have been muted nationally and internationally<sup>4</sup>. Road traffic accidents are the leading cause of surgical admissions at Mulago hospital. This is

mainly because of reckless taxi operators on poorly designed roads<sup>5</sup>. Head injury is a significant economic, social and medical problem all over the world. Injury and deaths due to road traffic accidents are a major public health problem in the developing countries. Road traffic accidents are the most frequent cause of head injury with highest risk among the young age group.<sup>5</sup> The study by Galukande et al showed that 35.5% of patients present to Mulago hospital with head injury following RTA in Kampala<sup>5</sup>.

About 4000 CT scan examinations were done in a year at Mulago hospital in 2011, 44% of these were due to RTA with clinical evidence of head injury. The high burden of imaging in Uganda means that hospitals dedicate a significant amount of time and resources to trauma management<sup>6</sup>. There are no recent studies detailing the patterns of head injury following RTA in Uganda. Previous studies were done over ten years ago, could the pattern of head injury have changed over time? There is need to bridge this knowledge gap. Therefore, the purpose of

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this study was to describe the cranial CT scan findings following RTA.

## Material and methods

### Study setting

This was a descriptive, cross sectional study conducted in Mulago national referral hospital in Uganda with a bed capacity of 1500 and bed occupancy rate of 180 to 200%. Emergency brain CT scan service is available on a 24 hour basis.

### Sample size and sampling procedures

Adult patients recruited in this study were admitted through accident and emergency department to the emergency ward via Radiology department for brain CT scan examination. The sample size was calculated using open info computer software with the following assumptions: Population size of patients presenting to Mulago over 4 months with head injury 587 (N), a study by Kobusingye et al in 1999 showed that road traffic injuries account for 35.1% +/-5 of all trauma in Kampala (p) with confidence limits as % of 100(absolute +/- %)(d) = 5% and a design effect (DEFF) = 1. Using the equation Sample size  $n = [DEFF * N * p(1-p)] / [(d^2 / Z^2 * (1-\alpha) / 2 * (N-1) + p * (1-p))]$ , a sample size (n) of 178 patients was calculated and subsequently recruited in the study.

### Equipment

A Philips Tomoscan MX16, Host model, August 2010 CT machine in the department of Radiology was used to perform cranial CT scan examinations. Patients were stabilized in the emergency room before CT scan examination. No special patient preparation was required for emergency brain CT scans examinations. Non-enhanced helical axial brain CT scans were done from the skull base to the vertex. The images were annotated and a hard copy printed in bone and soft tissue windows. A discussed report of the examination and copies of the images were immediately availed to the Neurosurgeon on duty. Discussion points included the presence or absence of lesions, size of lesion, density of lesion, site of lesion, raised ICP which was evaluated by presence of effacement or obliteration of the basal cisterns especially the ambient and quadrigeminal cisterns. These were all captured in the data collection tool.

### Recruitment procedure for participants

Informed consent was sought from the patients who met

the inclusion criterion. All patients were scanned irrespective of their ability to pay for the examination or not. All the study patients had their history taken and examined by the admitting doctor in accident and emergency department. Brain CT scan examination was performed by the CT Technician on duty, and interpretations done by the principal investigator and discussed with the co-authors. The information was captured in the data forms. Data was collected using pre-tested questionnaires.

### Statistical methods

A statistician consultation was done during the planning of the study to ensure orderly collection, recording, editing, storage, retrieval and rigorous data analysis. Data sets were coded, cleaned and entered into a computer using EPIDATA software version 3.1 and exported to SPSS computer software version 16 for analysis. Frequency distributions were computed for different clinical variables such as dizziness, headache, aphasia, convulsions, open or closed head injury and hemiparesis as well as CT variables such as extra-cerebral haemorrhage, intra-cerebral haemorrhage, midline shift, brain oedema, raised ICP and skull fractures.

### Ethical considerations

Permission to carryout the study was sought from Ethics and Research Committee of Makerere University College of Health Sciences. Aware that almost all biomedical research are conducted for the purpose of systematically collecting and analyzing data from which generalisable conclusions may be drawn that may aid in improving the care of currently unknown beneficiaries in the future. We selected research participants in a fairly and equitable manner without personal bias. Lastly, we ensured that research participants' privacy was protected, we gave them opportunities to withdraw from the study should they decide otherwise.

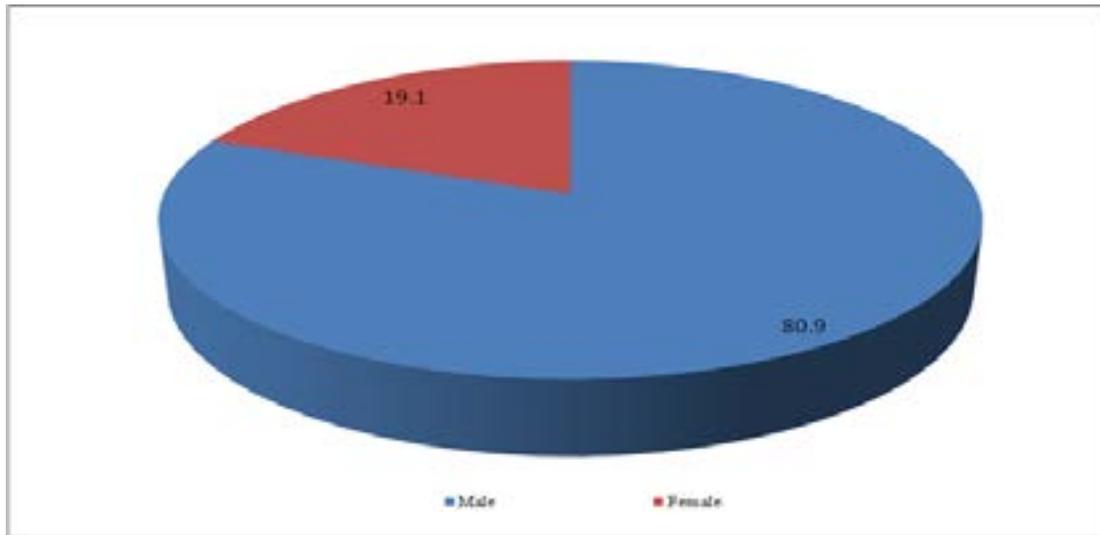
## Results

### Socio-demographic characteristics of the patients

A total of 178 patients with head injury following road traffic accidents were recruited in the study. Majority of the patients were below 40 years, mean age was 32.6 years (range 18 – 80 years) with a median of 49 years and mode of 20 – 29 years.

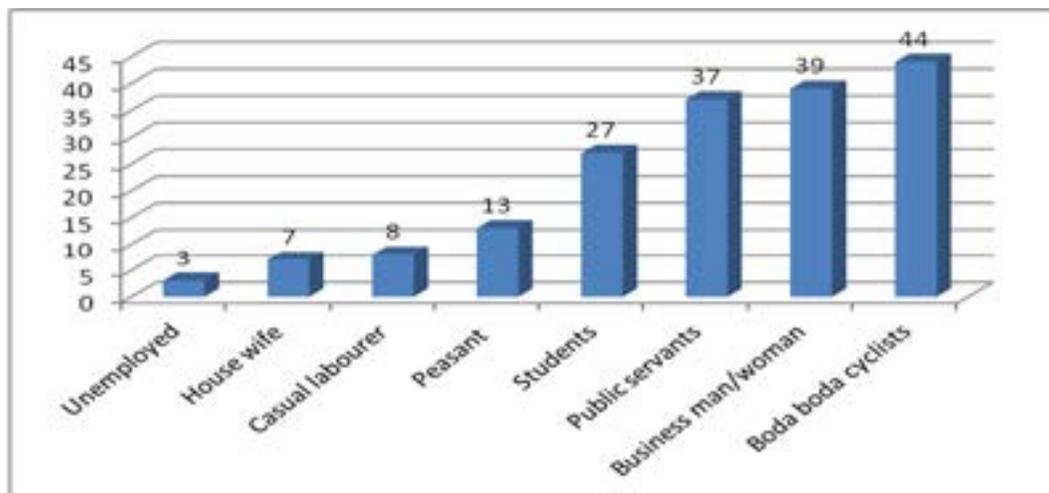
Of the 178 patients who had head injury following RTA, males accounted for 144 (80.9%) translating into a ratio of 4.2: 1 (Figure 1).

**Figure 1: Distribution of head injury by sex (N=178).**



Boda boda (44%) cyclists were the most involved in RTA, closely followed by business men/women (39%), public servants (37%) and the least involved being the unemployed (3%) (Figure 2).

**Figure 2: Distribution of head injury by occupation (N=178).**



**Clinical findings of the study participants.**

About 53% of patients had open head injury, the rest had closed head injury. Headache was the most common clinical variable (73%) followed by dizziness (58%) and aphasia (42%). About 14% of the patients had convul-

sions, while 76% of them had generalized convulsions. Of those who had altered mentation, 58% had a GCS of 13-15. This was followed by about 30% with a GCS of 9-12. Only 12% of the patients had a GCS of less than 8 (Table 1).

**Table 1: Socio-demographic characteristics of the patients studies (N = 178)**

<b>Characteristics</b>	<b>Number of patients (n)</b>	<b>Percentage (%)</b>
<b>Age</b>		
<20	21	12.1
20-29	73	41.3
30-39	42	23.6
40-49	21	11.5
≥50	21	11.5
<b>Marital status</b>		
Married	104	58.4
Single	63	35.4
Widower/widowed	8	4.5
Divorced	3	1.7
<b>Distance from Hospital</b>		
0-5 Km	12	6.7
6-10 Km	49	27.5
>10 Km	117	65.7
<b>Cause of accident</b>		
Bicycle	2	1.1
Boda boda	95	53.4
Motor vehicle	75	42.1
Unknown	6	3.4
<b>Passenger detail</b>		
Car passenger	19	10.7
Boda boda cyclist	68	38.2
Driver	12	6.7
Motor cycle passenger	29	16.3
Pedestrian	50	28.1
<b>Influence of alcohol</b>		
Yes	27	15.2
No	151	84.8

### Cranial computed tomography findings

The most common CT characteristic was extra-cerebral haemorrhage (44.1%). This was closely followed by brain oedema (38.8%), raised ICP (36.7%), normal brain (35.4%) and skull fractures (34.5%). Intra-cerebral haemorrhage was most common in the frontal lobe (28.7%) followed by the parietal lobe (25.6%). The occipital lobe (2.2%) and the cerebellum (0.6%) were the least involved parts of the brain. Thirty eight (21.6%) of patients had a midline shift of more than 3mm, seven (4%) of whom were more than 10mm (Table 2).

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**Table 2: Clinical findings of the study participants**

<b>Clinical variables</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
Dizziness	104	58.4
Headache	129	72.5
Aphasia	74	41.6
<b>Convulsions</b>	<b>25</b>	<b>14</b>
Focal	6	24
Generalized	19	76
<b>Clinical diagnosis</b>		
Open head injury	92	52.6
Closed head injury	83	47.4
<b>Hemiparesis</b>	<b>12</b>	<b>6.7</b>
Left	6	3.4
Right	4	2.2
Bilateral	2	1.1
<b>Pupils</b>		
Normal	127	92.0
<i>Dilated</i>	5	3.6
Unilateral	2	40
Bilateral	3	60
<i>Constricted</i>	6	4.3
Unilateral	1	16.7
Bilateral	5	83.3
<b>GCS</b>		
13-15	102	58
9-12	53	30.1
≤ 8	21	11.9

## Discussion

Analysis of data indicated that the most common age group involved in head injuries following RTAs was 20 – 29 years. A look at the Uganda's employment sector shows that the youth form the bulk of the employment sector engaging in both formal and informal economic activities.

The youth are also very mobile in the course of their work making them prone to RTAs. This is in keeping with previous studies conducted in 2009 by Galukande and Naddumba<sup>7,8</sup>.

Furthermore, the results indicate a male preponderance of 4.2:1, this is also similar to previous studies done in 1998 and 2004 in Uganda<sup>7,8,10</sup>. The typical cyclists who use bicycles and motorcycles in Kampala and surrounding areas were young adult males.

Most of the patients with head injury following RTAs cannot be managed in upcountry hospitals, so they are referred for specialised Neuro-surgical care at the National referral hospital. The Neuro-surgeons are also only based at the national hospital since they are very few.

The study showed that boda boda cyclists are the common group of people involved in RTAs, Motorcycles commonly referred to as boda bodas contributed to the highest burden of head injuries in this paper closely followed by motor vehicles. This is because of recklessness, indiscipline and lack of respect for other road users by most motorist all over the country<sup>7,8</sup>. There is also rapid motorization of Kampala, the roads are poorly planned, narrow with no designated passages for pedestrians. The pedestrians were the most commonly injured during road traffic accidents in this study<sup>4</sup>.

Our study also showed that most patients had mild head injury at presentation with only a few having severe head injury. The most common clinical variable at presentation included headache, dizziness, ENT bleeding and aphasia. Contrary to our findings where the most common clinical diagnosis was open head injury, earlier studies in Kampala reported closed head injury as the most common clinical diagnosis at presentation<sup>8</sup>.

Our findings further show that the most common CT characteristic was extra-cerebral haemorrhage, closely followed by brain oedema, raised ICP, normal brain and skull fractures respectively. These findings differ from previous studies where brain oedema and sub-dural haematoma were the most common CT findings<sup>10</sup>. This dif-

ference could probably be due to the change in motorisation pattern since the last study was done about 10 years ago in Uganda.

Intra-cerebral haemorrhage was commonest in the frontal lobe followed by the parietal lobe. The occipital lobe and the cerebellum were the least injured areas of the brain. This distribution of the intra-parenchymal haemorrhage is consistent with studies done locally and internationally<sup>8-10</sup>. This could partly be explained by the mechanism of impact in boda boda cyclists who were the most common group involved in RTAs, they usually fall forwards or sideways. Besides, most boda boda cyclists or their passengers rarely wear protective head helmets as seen in the study by Galukande<sup>6</sup>. This leaves the skull unprotected in the event of road traffic accidents.

## Conclusion and recommendations

Intra-cerebral haemorrhage, brain oedema, raised ICP, skull fractures and normal brain were diagnoses following CT scan examinations. The pattern of cranial CT characteristics has changed over time in Kampala, Uganda.

Public health interventions like advocacy and education of the population on safe and responsible road usage should be emphasized to reduce on RTAs.

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## Conflict of interest

There is no conflict of interest to declare.

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