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ORIGINAL ARTICLE

COMPUTERIZED TOMOGRAPHIC FINDINGS AND INJURY PATTERN IN PATIENTS WITH TRAUMATIC BRAIN INJURY AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA

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ABSTRACT

Introduction: Head trauma constitutes a major part of public health problem worldwide particularly among the young population. Computerized tomography is the recommended first line imaging modality to identify injuries associated with head trauma. The aim of this first phase thematic study was to document computerized tomographic findings and injury pattern of head trauma in patients scanned at Tikur Anbessa Specialized Teaching Hospital in Addis Ababa.

Materials and Methods: This cross-sectional descriptive study with prospective data collection involved 348 patients with head injury imaged with computerized tomography at Tikur Anbessa Specialized Hospital from March to August 2016. Computerized tomography findings and clinical information were recorded and analyzed.

Results: Males were involved in 79% of the cases, making male to female ratio of 3.8:1. The age range 20-39 years was the most frequently affected group, (44.7%). Road traffic accident was the etiologic factor in 117 (55%), assault in 63 (29.7%), and fall accident in 31 (14.6 %) of injuries. Accidental fall was the second most frequent cause of injury in the pediatric age < 10 years, while RTA was the leading cause. Skull fracture was seen in 172 (49.4%), brain contusion in 105 (30.2%) and epidural hematoma in 56 (16.1%). Mixed type of injuries were recorded in 158 (45.4%) of cases.

Conclusion: This study has demonstrated that the most commonly affected groups in head injury are young males, the most frequent cause being road traffic accident, also in the very young. High proportion of patients had computerized tomography confirmed injury including those who would need urgent intervention. The study emphasizes the necessity of computerized tomography service for evaluation of TBI patients and recommends the need for concerted effort to reduce RTA.

Key Words: Traumatic Head Injury, Mechanism of Injury, fracture, hemorrhage, computerized tomography

INTRODUCTION

Traumatic brain injury (TBI) constitutes one of the main health problems worldwide, representing a major cause of morbidity and mortality in trauma patients, particularly among the young productive age group. Different studies showed that road traffic accident (RTA), accidental fall and assault are the top identified leading causes of traumatic injury (1-5). There is a high occurrence of RTA worldwide, especially in low and middle-income countries, and this is robbing them of the young and productive labor force, incurring great health and economic costs and facilitating social crisis in these countries (6-9). RTA and fall related deaths are predicted to rise in rank, RTA becoming the 7th (from the current 9th) and fall the 17th (from the current 21st) leading causes of death by 2030 (10).

According to the 2010 WHO global status report on road safety; road fatalities per 100,000 inhabitants per year in Ethiopia were 17.6 and road fatalities per 100,000 motor vehicles were 11,666 recorded as the second highest in the world (11). This adds to the urgency for bringing these challenges under control.

Previous hospital-based studies at TASH have reported trauma as the second common cause of emergency hospital admission, the primary cause of neurosurgical admission, and the major cause of death among patients admitted with trauma (12, 13). In another hospital-based study in North West Ethiopia, head injury was the second common cause of surgical admission accounting for 35% of all neurosurgical admissions (14).

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Recovery from TBI is highly influenced by prompt diagnosis and appropriate and timely treatment. Initial assessment of a patient with TBI includes evaluation of the clinical status of the patient including severity of the injury. Computed Tomography (CT) is the front line imaging of choice in the acute phase of TBI patients. CT allows identification of surgically treatable focal lesions: hemorrhages as well as focal or diffuse lesions: contusion; and diffuse axonal injury (DAI) which does not require surgical intervention, thus avoiding unnecessary intervention, which might worsen patient's condition and health treatment cost. Knowledge of pattern and severity of imaging findings is crucial for providing relevant and appropriate interpretation as part of an integrated treatment approach. (15-21).

CT scan was introduced in Ethiopia merely 15 years ago, availability was scarce to the mainstream health service providers, and very few published reports of cranial CT imaging of head injury are documented in Ethiopia. Data showing the neuroimaging magnitude of the problem is limited, diagnostic criteria are not standardized and there is no well-structured national guideline for diagnostic triage of head injury victims in Ethiopia.

The aim of this thematic study is to document CT features of injuries on head trauma victims and compare these findings with the mechanism of injury (MoI) to show the impact of the various risk factors and shed light for eventual preparation of evidence-based multifaceted standardized guideline for diagnosis and management of TBI. This article is the first of a series of articles which focuses on general CT and MoI patterns and demographic characteristics of TBI patients.

PATIENTS AND METHOD

A hospital-based cross-sectional study with prospective data collection was conducted in all patients with the clinical diagnosis of TBI and had CT scan done at the Department of Radiology of TASH in Addis Ababa, Ethiopia, from March 1, 2016 to August 30, 2016. All patients underwent standard non-contrast CT scan using a Philips 128-slice MDCT. Sequential axial slices were obtained from skull base to vertex. Images were evaluated using brain window, and bone windows with multi-planar and 3D reconstructions. A detailed radiological evaluation was done by a senior resident and/or consultant radiologist(s). Documented cranial CT findings included calvarial fracture, and primary and secondary intracranial injuries. The demographic data, injury mechanism and clinical information were drawn from the CT request paper and chart. All the findings were recorded, in a questionnaire format prepared for the study.

The raw data were checked for completeness, coded and entered, and analyzed using SPSS version 20.0 statistical window package. Frequency distributions, graphs, and tables were used to present the data as appropriate.

Ethical clearance was obtained from IRB of CHS, AAU and permission secured from the research committee of the department of radiology CHS, AAU. Data collection was done by the investigators and patients' information was kept confidential.

RESULTS

A total of 348 CT images of patients who sustained head injury were analyzed; 275(79%) of the patients were males with a male to female ratio of 3.8:1. Their age ranged from one to 78 years with a mean (SD) age of 27.4(±15.6). Patients in the age range 20-39 constituted 44.7% of the cases, while those greater than 60 years constituted 6% (Figure 1).

Data regarding MOI was available for the 212 patients, of which 117(55%) were victims of Road Traffic Accident (RTA), 63(29.7%) were assaulted, and 31(14.6%) had fall injuries. This showed at least 34% of the total injuries was due to RTA, 18.1% associated with assault and 8.9% resulted from accidental fall. RTA was the cause of injury in 12/21 (54.5%), and accidental fall for 9/21 (40.9%) among children less than 10 year of age for whom MOI was available. This implied that when data were extrapolated from the total number of children less than 10 years in the study (all with and without available MoI), which numbered 41, the injury, in at least, 29.3% and 21.9% of them were due to RTA and falling, respectively. Males constituted 73.7% of RTA injury, 90.5% of assault, and 90.3% of fall injury patients (Figure 2).

CT-scan-positive injuries were seen in 244 (71.6%) of the cases, 74.2% of males and 62% of females (P=0.042). Among those in the age group <20 years, 72.4% had positive CT findings, 64.7% in the 20-39 age range while 87.8% of patients in the age groups 40-59, and 81% in those > 60 years of age had positive CT scans, indicating statistically significant correlation (P=0.014) (Table 1).

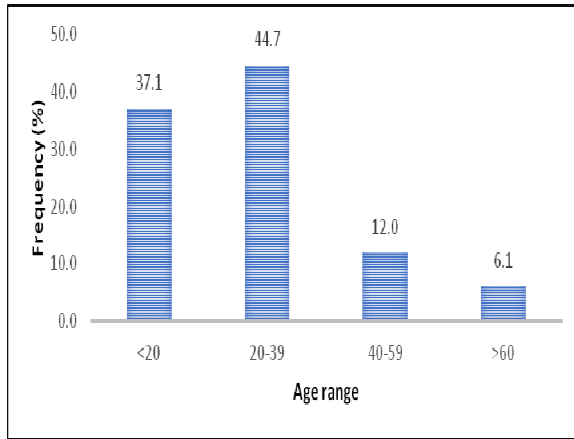


Figure 1: Age distribution of head injury patients (n= 342) assessed by computerized tomography, Tikur Anbessa Specialized Hospital, Addis Ababa. 2016

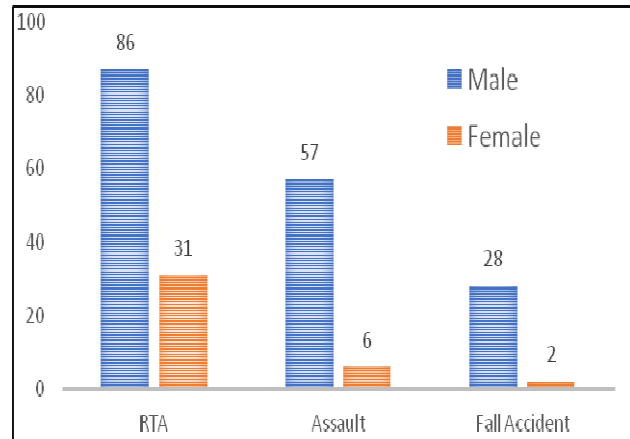


Figure 2: Distribution according to sex and injury mechanism of head Trauma patients (275 males and 73 females), assessed byCT scan In Tikur Anbessa Specialized Hospital, Addis Ababa. 2016.

Table 1: Cranial CT findings among head trauma patients by age group, Tikur Anbessa Specialized Hospital, Addis Ababa. 2016

Age group in Years	CT Scan Findings No. (%)		
	No	Yes	Total
<20	35 (27.6%)	92 (72.4%)	127 (37.1%)
20-39	54 (35.3%)	99 (64.7%)	153 (44.7%)
40-59	5 (12.2%)	36 (87.8%)	41 (12.0%)
>60	4 (19%)	17 (81.0%)	21 (6.2)
Total	98 (28.4%)	244 (71.6%)	342 (100%)

Chi-square = 9.755; df= 3; P=0.0208

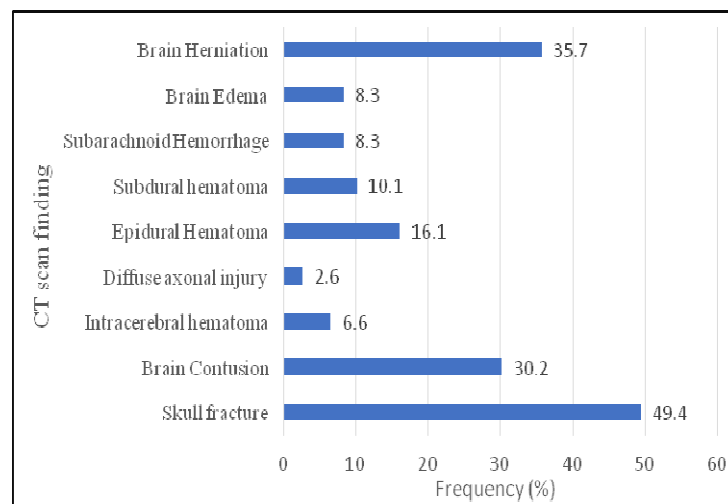


Figure 3: Type of head injuries among patients assessed by CT imaging (n=348), Tikur Anbessa Specialized Hospital, Addis Ababa. 2016.

More than one CT findings were documented in 158 (45.4%) of patients, constituting 74.6% among assault related injuries, 54.8% accidental fall and 30.5% among RTA injury cases. The most common abnormality was skull fracture, detected in 172 (49.4%) of patients, followed by brain contusion in 105 (30.2%), epidural hematoma in 56 (16.1%), subdural hematoma in 35 (10.1%), subarachnoid hemorrhage in 29 (8.3%), intra-cerebral hematoma 23 (6.6%) and DAI in 9 (2.6%). Cervical spine injury was seen in 20 (5.7 %) of the cases, most frequent being in accidental fall injuries (12.9%), and facial bone fracture in 10.9%. Secondary injuries including diffuse brain edema and brain herniation were detected in 21 (8.3%) and 89 (35.7%) of the 253 CT positive cases (Figure 3).

DISCUSSION

This study has shown that TBI is more frequent in males. Moreover, this is most common in the 20-39 age groups and least frequent in those above 60 years. TBI cases who most commonly come with RTA and assault related injuries are young male subjects. Similar observation was made by several authors (13,16,17,20,22). One possible explanation can be that young males are more into outdoor activities and tend to be more physically engaging and aggressive with more involvement in assault situations, whereas the elderly tend to be more home-bound and reserved, thus the occurrence of injuries from RTA and assault is a lot less frequent.

The high frequency, 117 (55 %), of RTA related injuries seen in this study reaffirms what has been documented by other investigators (14,16,17,20). The high incidence of RTA related injuries, particularly, in developing countries can mainly be ascribed to poor car maintenance, poor state of the roads, reckless driving, inadequate education and implementation of safety measures as well as use of alcohol (8,16,17). Assault related injury was the 2nd most commonly observed cause in this study (18.1%). However, this ranking of cause of injury in some reports does not concur with this pattern. In two studies done outside Addis Ababa, one by Woldemichael K. conducted in Jima University Specialized Hospital (22), showed assault as the first cause constituting 30.9% followed by RTA, 30.3% of the causes. The other study was by Bashah et al. which was conducted in the Amhara National Regional State referral hospital and showed a frequency of assault 37.4% and RTA of 33.9% (20).

Earlier findings at TASH, where the present study was done, showed that RTA constituted the highest frequency (38.3%) followed by assault (31.5%) (12), which are in agreement with our finding. This might be due to the high crowding of vehicles and people in the capital city, Addis Ababa, and the fact that TASH received patients from all over the country. In this study, RTA turned out to be the leading cause with fall injury being second in children less than 10 years of age. This is similar to some studies, which showed high occurrence of RTA (21), but differs from others (16), which reported higher occurrence of fall injury.

The majority (71.6%) of CT scans were positive for traumatic injury. These figures are in agreement with other reports, 78% and 74% (17,18). Mixed patterns of injuries also showed higher frequency than solitary ones. The most common abnormal finding in this study was skull fracture 49.4% followed by brain contusion 30.2 %, which agrees with the study by Adeyekun et al, where skull fracture was seen in 62%, followed by hemorrhagic contusion in 46.3% (18). Another study from North West Ethiopia showed similar findings with the most common abnormal finding being skull fracture in 52% followed by intra-cerebral hemorrhage and contusions in 51% (13,15).

RTA was the commonest cause in those who sustained facial bone fractures, (16.1%), while upper cervical bone fracture was more frequent in fall injuries, (12.9%). These can be related to various factors, including force, direction and circumstances of the injury that involve speed of the vehicle in RTA, targeting in assault and the height and site in fall injury, which in turn determine the type of the injury (23). During the course of this study, there were many setbacks and limitations such as incomplete patient chart recording and imaging request forms with inadequate patient information regarding the MOI, and relevant clinical findings like severity scale (Glasgow Comma Scale). Missing medical record numbers of patients on request papers was a distinct setback frequently encountered making it difficult to retrieve patient information. Incomplete radiological reporting and the lack of Picture Archiving and Communication System (PACS), affected the efficiency in image evaluation, archiving and image retrieval during this study.

Conclusion

This study has demonstrated that young males are the most commonly affected groups involved in head injury, the most frequent etiologic factor being RTA followed by assault.

We also observed the relative high frequency of RTA injury in young children. Thus, we emphasize on the need for concerted effort to reduce RTA as well as violence.

This study has shown a high frequency of CT confirmed injuries in almost all age groups. Various patterns of brain injuries, including those which needed immediate intervention, were also demonstrated, hence the use of CT for patients with head injury is highly recommended. The deficient recording of patient information is a concern which needs to be addressed.

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