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**Original article**

# Incidence of Cerebral Hemorrhage in Traumatic Patients using Computed Tomography in Tabuk City, Saudi Arabia

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## Abstract

Computed Tomography (CT) is the most commonly used imaging modality in the evaluation of cerebral hemorrhage in the head trauma patients. ***Objective:*** To study the incidence of a cerebral hemorrhage in traumatic patients using computed tomography. ***Method:*** This retrospective study was conducted at King Khalid hospital in Tabuk city, Saudi Arabia, in the radiology department, in the period from September 2018 to April 2020. The study was done by collecting 471 CT reports of patients all of them were exposed to head trauma with deferent reasons. The data were analyzed by Statistical Package for the Social Sciences (SPSS) program (ver. 20) and presented in tables and graphs according to the checklist which includes: patient age, gender, type of trauma, CT finding, and type of hemorrhage. ***Results:*** The most age group suffered from head trauma was less than 20 years percentage (55%), The male patients more exposed to head trauma than female patients with percentage (84.5%), the road traffic accident (RTA) is the most common type of trauma by percentage (63.5%), according to the CT finding; the cerebral hemorrhage represented (15.5%) with the highest percentage in a subdural hematoma (31.2%), the fracture represented (2.8%) while the normal appearance represented (81.7%) as the highest percentage. ***Conclusion:*** Most of the traumatic brain injury in patients caused cerebral hemorrhage and the CT scan reports show that: the common type of cerebral hemorrhage is subdural hematoma and it is common in males which exposed to (RTA) in the age group (21 - 40) years old.

***Keywords:*** ***Cerebral Hemorrhage, Traumatic Patient, Computed Tomography***

## Introduction

Cerebral hemorrhage is a critical clinical even that represents up to 15% of strokes. The frequency of ICH is around 25 for every 100,000 man-years, and it has a mortality of 40% inside one month of introduction (CH) may happen in numerous intracranial compartments and might be brought about by differing pathology[1].

Cerebral hemorrhage CH it is a kind of stroke, because of supply route harm to the cerebrum, causing an inside blast that outcomes in seeping in the encompassing tissues. This draining executes the synapses, and mind draining is designated "intracranial hemorrhage", or "intracerebral hemorrhage", which speaks to about 13% one of the reasons for strokes. At times an individual encounters a stun that disturbs the mind tissue and causes growing, and this condition is known as cerebral edema, and blood gathers as a mass speaking to the hematoma. This condition builds pressure on neighboring cerebrum tissue, which decreases the indispensable bloodstream and executes synapses, and draining can happen inside the mind, between the cerebrum and the films that spread it, and between the layers that spread the mind or between the skull and the cerebrum spread. There are four sorts of mind drain, arranged and named by where they happened, and they are epidural hematoma, subdural hematoma, subarachnoid discharge, and intracerebral discharge [2,3].

In a few sorts of writing the expressions "head injury (HI) and traumatic brain injury have been utilized reciprocally [4,5].

The fundamental outer reason for a head injury, and therefore cerebral hemorrhage is the road traffic accident RTA (representing about 60% of cases), falls (20-30%), savagery (10%), and work spot and sports-related exercises [6,7]. (10%)Computed Tomography (CT) is accentuated as it is the most generally performed strategy in the crisis assessment of patients with

suspected or known CH [8]. In auditing the standards of CT understanding of CH, the fundamental material science of X-beam imaging must be considered. Constriction, characterized as the expulsion of X-beam photons from the pillar, happens in biologic tissues. The weakening properties of tissue are connected to their nuclear number and physical thickness. At the end of the day, constriction of the X-beam pillar is dictated by the thickness of the electron mists in the tissues it crosses [9].

The constriction properties of intracranial blood are controlled by the total of globin particles in the hematoma [10], there is a straight connection between CT lessening, protein content (for the most part hemoglobin), and hematocrit [11]; nonetheless, ancient rarities found near the skull base can without much of a stretch copy drain on winding CT examines [12], immediately after the discharge, newly extravasated blood shows a uniquely heterogeneous appearance with blended thickness esteems in the scope of 40±60 Hounsfield units. During the early long stretches of the drain, the CT thickness esteems inside the hematoma quickly increment up to 60±80 HU, this is because of the arrangement of a meshwork of fibrin fibrils and globin atoms. The globin (protein) part of the hemoglobin has a high thickness [13].

## Material and method

***Research design:*** This retrospective study was performed in the period from September 2019 to April 2020 in the study setting.

***Setting and sample:*** The study was done in the radiology departments at King Khalid hospital in Tabuk City, Saudi Arabia. Forty hundred and seventy-one patient's medical CT records were collected, all of them were exposed to head trauma with deferent reasons.

***Data collection:*** The data was collected by using data sheets which included (patient age, gender, type of trauma, CT finding, and type of hemorrhage.)

**Computed Tomography (CT) Instrument**

The brain was imaged by using a 128 slice Toshiba Aquilion CT scanner.

**Technique was used**

***Patient position:*** The patient was supine with headfirst on the CT table with both legs extended, the head was rested in the head holder and fixed with tape

***Protocol:*** The center point was in the glabella; A slice thickness of 5 mm from the skull base to the vertex was applied to acquire images. No contrast media was administered due to the indications. The brain protocol included image sequences sagittal and coronal planes.

***Data analysis:*** The data were analyzed by the Statistical Package for the Social Sciences (SPSS) program (ver. 20) and presented in tables and graphs.

***Ethical consideration:*** The patient will be respected, and no patient information would be used without the patients and hospital permission.

## Result

**Table 1: distribution of study group according to age N= 471**

| Age | Frequency | Percent % |
|---|---|---|
| Less than 20 | 259 | 55.0 |
| 21-40 | 152 | 32.3 |
| 41-60 | 43 | 9.1 |
| More than 61 | 17 | 3.6 |
| Total | 471 | 100.0 |

*This table showed the most common age group among patient's reports was (less than 20) by percentage 259(55%), while the lowest age group was (More than 61) by percentage 17(3.6%).

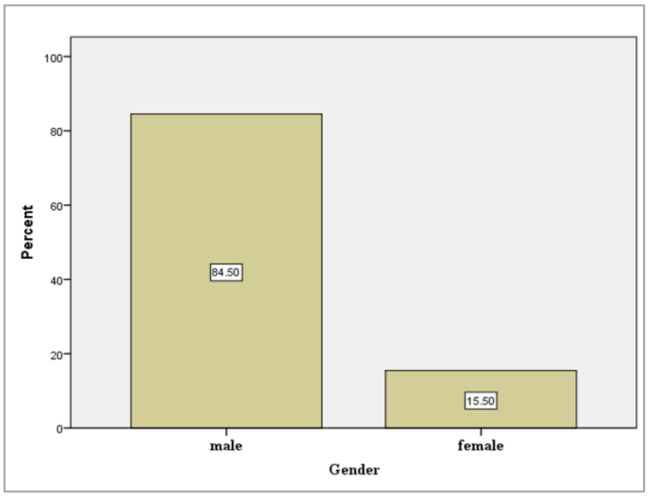


**Figure (1) distribution of study group according to the gender**

*This figure shown the most affected gender was male by percentage 398(84.5%), while the female was presented 73(15.5%).

**Table 2: distribution of study group according to CT finding N= 471**

| CT finding | Frequency | Percent % |
|---|---|---|
| Hemorrhage | 73 | 15.5 |
| Fracture | 13 | 2.8 |
| Normal | 385 | 81.7 |
| Total | 471 | 100.0 |

*This table showed the normal CT finding is 385(81%) as the highest percentage, the hemorrhage represented 73(15.5%), and the fracture represented 13(2.8%) as the lowest percentage.

**Table 3: distribution of study group according to type of hemorrhage N= 471**

| Type of hemorrhage | Frequency | Percent |
|---|---|---|
| Epidural hematoma | 3 | 4.6 |
| Hematoma | 17 | 26.5 |
| Hematoma right basal ganglia | 1 | 1.5 |
| Hematoma scalp contusion | 1 | 1.5 |
| Hemorrhage | 18 | 28.2 |
| Intracranial hemorrhage | 3 | 4.6 |
| Occipital Hemorrhage | 1 | 1.5 |
| Rt parietal hematoma | 1 | 1.5 |
| Subarachnoid hemorrhage | 3 | 4.6 |
| Subdural hematoma | 20 | 31.2 |
| Subganglion hemorrhage | 1 | 1.5 |
| Supra sella hemorrhage | 1 | 1.5 |
| Ventricular hemorrhage | 2 | 3 |

*This table showed the common type of hemorrhage is subdural hematoma by percentage 20(31.2).

**Table 4: correlation between the type of trauma and CT finding N=471**

| Cross tabulation | | | Type of trauma | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | RTA | Un known | Fall down | Head injury | Assault | |
| CT finding | Hemorrhage | Count | 55 | 7 | 9 | 2 | 0 | 73 |
| | | % | 75.3% | 9.6% | 12.3% | 2.7% | 0.0% | 100.0% |
| | fracture | Count | 9 | 1 | 3 | 0 | 0 | 13 |
| | | % | 69.2% | 7.7% | 23.1% | 0.0% | 0.0% | 100.0% |
| | normal | Count | 235 | 78 | 63 | 5 | 4 | 385 |
| | | % | 61.0% | 20.3% | 16.4% | 1.3% | 1.0% | 100.0% |
| Total | | Count | 299 | 86 | 75 | 7 | 4 | 471 |
| | | % | 63.5% | 18.3% | 15.9% | 1.5% | 0.8% | 100.0% |

*This table has shown the correlation between the CT finding and the type of trauma, the hemorrhage is common in the road traffic accidents (RTA) with non- significant relation between them P = 0.287

## Discussion

This retrospective study is conducted in the radiology department at King Khalid hospital in Tabouk city, Saudi Arabia in the period from February to April 2020 in the study setting. Forty hundred and seventy-one patient's medical CT records were collected, all of them were exposed to head trauma with deferent reasons.

According to the participant age in this study, less than 20 were represented 259(55%) as high percentage and more than 60 represented lowest percentage 17(3.6%), as in table(1), the male is more affected than female by percentage 398(84.5%) as in fig(1).

In this study the common CT finding of the head trauma was hemorrhage by percentage 73(15.5%), as in table (2), this result was consonant to study written by Jeremy J. Heit, et al (2016), they reported: '' Intracranial hemorrhage is common and is caused by diverse pathology, including trauma, hypertension, cerebral amyloid angiopathy, hemorrhagic conversion of ischemic infarction, cerebral aneurysms, cerebral arteriovenous malformations, dural arteriovenous fistula, vasculitis, and venous sinus thrombosis, among other causes''[14].

In this study the common type of brain hemorrhage that appear in the CT image was subdural hematoma by percentage 20 (31%), as in table (3), this result was consonant with study reported by Ummara Siddique, et al. (2016), they said: ''This study demonstrates that 15.3% of patients presenting with head trauma had intracranial haemorrhage (ICH) evident on CT scan. Subdural hemorrhage was the most frequent type of haemorrhage in this study. Intracranial haemorrhage present was mostly associated with road traffic accidents as compared to other traumatic injuries''[15].

In the correlation between the CT finding and the type of trauma, the study show the hemorrhage is common in the road traffic accidents (RTA) with non- significant relation between them P = 0.287, as in table (4), this result was relevant to the study written by Ummara Siddique, et al. (2016), they said: ''Intracranial haemorrhage present was mostly associated with road traffic accidents as compared to other traumatic injuries''[15].

## Conclusion

We conclude in our study that the cerebral hemorrhage is common in male rather than female, the common type is subdural hematoma , Intracranial haemorrhage present was mostly associated with road traffic accidents as compared to other traumatic injuries.

## Ethics approval and consent to participate

The data were collected after the approval of the hospital and the consents of the patients, without mentioning the names or identity of the patients.

## List of abbreviations

CT: Computed Tomography

RTA: Road Traffic Accident

CH: Cerebral Hemorrhage

IH: Head Injury

SPSS: Statistical Package for the Social Sciences

## Data Availability

The authors confirm that all data supporting the findings of the current study are available within the article. Also, all the data sets used and/or analysed during the current study are available from the corresponding author on a reasonable request.

## Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper

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## Authors' contributions

AMA suggested the research idea, TA, HY, OA, RN collected patients data, NE wrote the manuscript, EZ analyse the data, NA edited the manuscript. ''All authors read and approved the final manuscript."

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