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Computerized Tomography Findings in Patients Presenting with Head Injuries in Resource Constrained Community of West African Sub Region.

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ABSTRACT

Background: Computed Tomography (CT) is a vastly used and precious imaging investigation and its role is increasing and diversifying in the past decades, most especially in the assessment of head pathologies and accuracy in detecting fractures and intracranial bleeds. However, lack of pre-hospital care, ineffective ambulance system and lack of trauma centers coupled with poor infrastructure and increased criminal activities in our resource constrained community setting are major challenges in provision of optimal care to these patients. The aim is to analyze the pattern and findings of head computed tomography injuries in this community.

Methods: This study was a cross-sectional retrospective study. The data was collected from the records in a busy CT center in the community from 2020 to 2024. Three hundred and eighty-five (385) CT exam records were used for the study. After ethical approval, the demographic information such as patient I.D, age, gender, requests, clinical indications for the exams and findings were collected using data capture sheet. Data was represented using tables, frequencies and percentages. SPSS version 23.0 was used for statistical analysis.

Results: There were 254 males and 131 females with age range <1 to 99years. The most prevalent indication for head CT was Road Traffic Accidents (RTAs) with18.4%, while normal study with 24.7% was the commonest findings. The age category of 20-39 was more exposed to RTA. Thirty nine with 39 and males were found to be more exposed with 62. Normal study was found to be more prevalent in the age category of 0-19 with 47 and males were also more exposed with 55.

Conclusion: This study showed that head injury secondary to RTAs is the major indication for head CT while the commonest report finding is normal study. The community major means of transportation is motorcycle popularly called Okada riders in the local community. The operators and passengers hardly use protective head helmets. Therefore, this study will guide requesting physicians in sending CT requests and also guides policy making on effective use of traffic system with view of changing the tide.

INTRODUCTION

Computed Tomography (CT) is a vastly used and precious imaging investigation that presents medical benefit in clinically justified situations [1]. Since its introduction in the seventies, computed tomography has been utilized in radiological sub-specialties such as CT angiography and pulmonary embolism detection [2]. Traditionally, images of the head were obtained using skull radiography but now with the introduction of computed tomography and Magnetic Resonance Imaging (MRI) the former is no longer considered [3]. Although computed tomography is preferred because of the following advantages; it is available, faster, highly sensitive and accurate in detection of intracranial lesions and it is not contraindicated in patients with metallic foreign bodies (e.g. cardiac pacemakers and gunfire fragments) unlike magnetic resonance imaging which is contraindicated [3].

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

In diagnostic radiography, there are several imaging modalities usually adopted for the investigation of traumatic head injuries, but the choice of one modality over another depends on the following; the availability, speed of image acquisition, nature of the information to be obtained, age of the subject, as well as cost of the procedure [4].Computed tomography has become a significant imaging modality in current medication and its use has expanded exponentially over the previous decades [5]. Magnetic resonance imaging (MRI) can also be used for the assessment of traumatic head injury especially if soft tissues are of major interest [4]. Doctors are frequently required to settle on choices with respect to referrals for CT, and this choice depends on numerous elements, for example, clinical history, patient request, physical assessment and other clinical contemplations [6]. In addition, CT suite allows the introduction of life-support gadgets such as oxygen cylinder and monitoring equipment [4]. Head injury is recognized as a major public health problem worldwide and it is associated with high morbidity and mortality both in developed and developing countries [7].

Early diagnosis of head trauma by neuroimaging is therefore important to determine the presence and extent of the injury and aid in surgical management of the patients. Head injury involves a wide spectrum of injuries which may be classified as primary or secondary traumatic lesions [8]. Primary head injury is present at the time of trauma, it is transient and leads to an irreversible damage to the brain. Secondary brain injury usually results from the accompanying perilesional edema or raised intracranial pressure or parenchyma ischemia affecting different parts of the brain [8]. Common etiological factors of head injury include road traffic accidents, assaults, falls and stab wounds [9]. According to WHO, head injury will surpass many diseases as the major cause of death and disability by the year 2020 [10]. Neuroimaging is also invaluable in follow up to identify the sequelae and in guiding rehabilitation of the patient where necessary [11].

However, lack of pre-hospital care, ineffective ambulance system and lack of trauma centers coupled with poor infrastructure and increased criminal activities in our setting are major challenges in provision of optimal care to these patients [12]. This calls for urgent planning of preventive strategies to address these challenges as major head injury can be prevented.

METHODS

The study was a cross-sectional, retrospective study. A secondary source of data was used.

The study was carried out in Waves Medical Diagnostic and Research Center, Nnewi, Anambra state. Data was obtained from the archives which involved studying radiology request forms and the CT results of patients who underwent head CT in Eastern region of Nigeria.

These comprise of head CT examinations performed in the study location that where successfully done. In addition, requests for CT exam are received from various health centers within and outside the zone.

Simple random sampling method was employed to obtain subjects for the study. The choice of simple random sampling method is to give all the patients that fit the inclusion criteria equal chance of being recruited into the study [13].Only patients (across ages and gender) that underwent successful head CT examination in study area were included in the study. Only head CT request examinations with complete record were recruited. Patients without complete demographic and clinical history were excluded.

The data was recorded and a collected on a well-structured data capture sheet that contains patient I.D', gender, age, request, clinical indications and report findings

The data obtained was expressed using tables, frequencies and percentages. The patterns of findings were presented in frequencies and percentages. Clinical indications and findings were presented in a tabular form of 20year age interval. Similarly, their clinical indications and report findings distribution were presented based on gender.

Following ethical approval and meeting satisfactory inclusion criteria, the following information were recorded using a data capture sheet. Patient I.D, Patient Age, Patient Gender, Clinical indication, CT request (Brain CT as usual) and findings.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

RESULTS

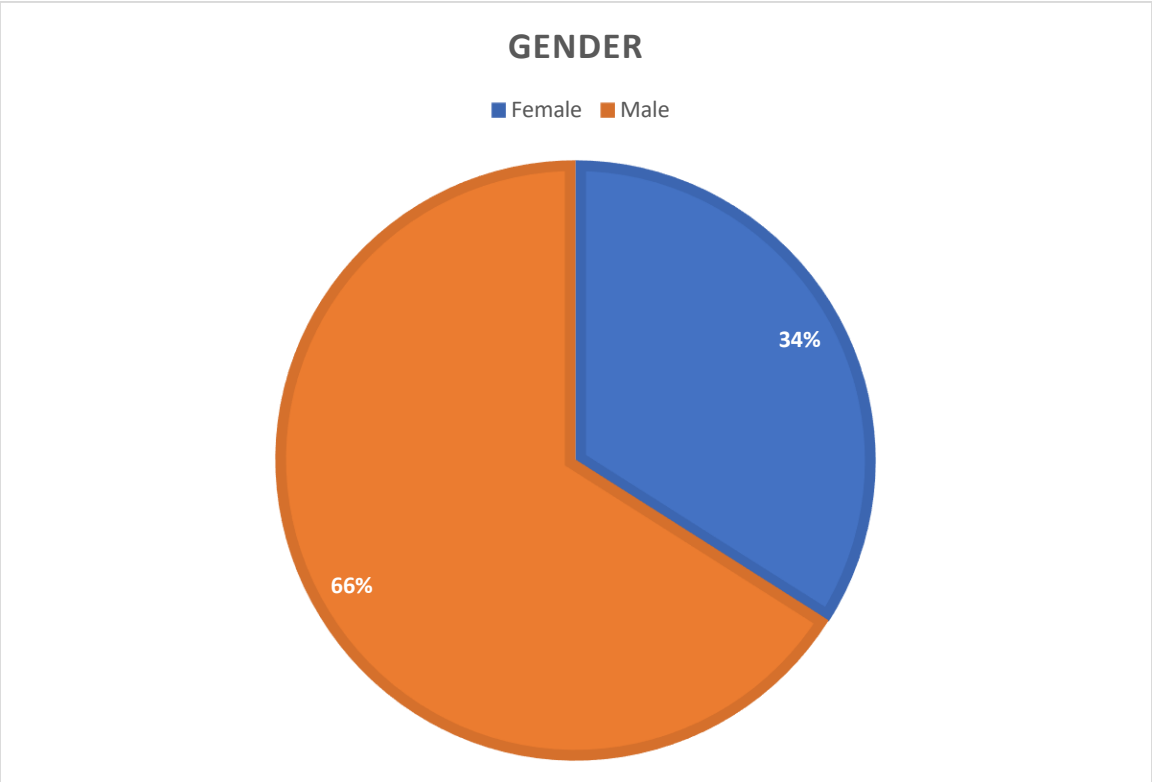
A total of 385 patients record with request for head CT were recruited into the study. Males accounted for 66% (n=254) while the female 34% (n=151). Participants were grouped in 20 year interval with an age range of <1-99years. Mean age was 33.8years, table 1. The most prevalent clinical indications for Head CT scan were Road Traffic Accidents (RTA) with 18.4%. The least was found to be limbs deformity, collapse and aneurysm, table 2. The commonest finding was normal study 24.7% and was Dandy Walker Syndrome 0.3%, table 3.

The CT report findings and indications were presented based on age and gender, (tables 4, 5,6 and 7). RTA and normal study are the most prevalent report findings and indications.

In comparison to other similar local works some clinical indications and pathological findings were seen to reveal throughout the compared works, while few were seen to be present or absent in both cases, the opposite was also true table 8 and 9.

Table 1: Age and gender distribution

Age (Year)	Male (n)	Female (n)	Total	Percentage
<1-19	80	41	121	31.43
20-39	79	35	114	29.61
40-59	‘51	32	83	21.56
60-79	40	19	59	15.32
80-99	4	4	8	2.08
Total	254	131	385	100



ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

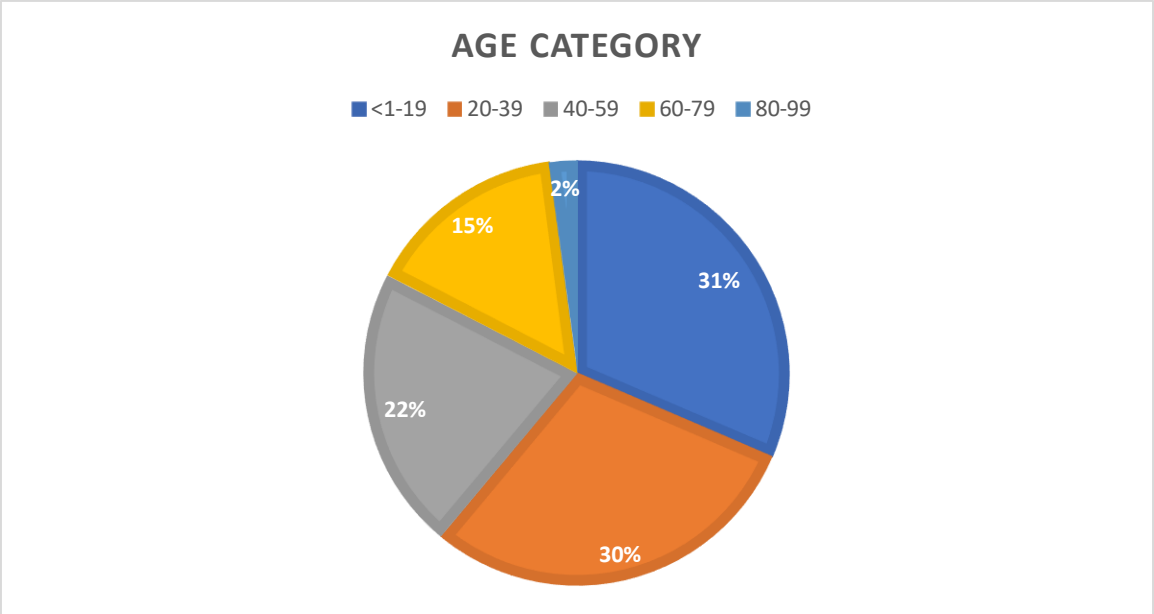


Figure 2: Age category

Table 2: Distribution of Clinical indications

Clinical indication	Frequency	Percentage
CVA	49	12.7
RTA	71	18.4
Hydrocephalus	24	6.2
Fall	22	5.7
Hemiplegia	3	0.8
Limbs deformity	1	0.3
Hypertension	18	4.7
Collapse	1	0.3
Convulsion	6	1.6
Stroke	55	14.3
Persistent headache	47	12.2
Trauma	17	4.4
SOL	12	3.1
Seizure	24	6.2
Cerebral palsy	8	2.1
Cerebral abscess	5	1.3

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

Hematoma	8	2.1
Cerebral infarct	3	0.8
PTBI	2	0.5
Hemorrhage	3	0.8
Cerebral syndrome	5	1.3
Aneurysm	1	0.3
Total	385	100

Distribution of CT report findings

Findings	Frequency	Percentage
Hydrocephalus	28	7.3
Hemorrhage	23	6.0
Fracture	44	11.4
Normal study	95	24.7
Cerebral infarct	89	23.1
Brain atrophy	51	13.2
Cerebral abscess	9	2.3
Hematoma	41	10.6
Dandy walker	1	0.3
Hygroma	2	0.5
Edema	2	0.5
Total	385	100

Table 4: Clinical indications based on age

Clinical Indications	Age					Total
	0-19	20-39	40-59	60-79	80-99	
CVA	4	9	18	14	4	49
RTA	20	39	11	1	0	71
Hydrocephalus	19	5	0	0	0	24
Fall	14	5	1	2	0	22

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

Hemiplegia	0	1	1	1	0	3
Limbs deformity	1	0	0	0	0	1
Hypertension	0	2	6	10	0	18
Collapse	0	0	1	0	0	1
Convulsion	4	1	1	0	0	6
Stroke	4	8	20	20	3	55
Persistent headache	14	20	9	4	0	47
Trauma	4	9	3	1	0	17
SOL	7	2	2	1	0	12
Seizure	16	2	4	2	0	24
Cerebral palsy	7	0	1	0	0	8
Cerebral Abscess	2	3	0	0	0	5
Hematoma	1	3	2	2	0	8
Cerebral infarct	1	1	0	0	1	3
PTBI	1	1	0	0	0	2
Hemorrhage	0	1	1	1	0	3
Cerebral syndrome	2	2	1	0	0	5
Aneurysm	0	0	1	0	0	1
Total	121	114	83	59	8	385

Table 5: CT Report findings based on age

Findings	Age					Total
	0-19	20-39	40-59	60-79	80-99	
Hydrocephalus	21	5	1	1	0	28
Hemorrhage	1	8	8	6	0	23
Fracture	18	22	3	1	0	44
Normal study	47	29	16	3	0	95
Cerebral infarct	12	13	35	24	5	89
Brain atrophy	8	9	11	20	3	51

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

Cerebral abscess	4	5	0	0	0	9
Hematoma	7	22	8	4	0	41
Dandy walker	1	0	0	0	0	1
Hygroma	0	1	1	0	0	2
Edema	2	0	0	0	0	2
Total	121	114	83	59	8	385

Table 6. Clinical indication based on gender

Clinical indication	Gender		Total
	Male	Female	
CVA	29	20	49
RTA	62	9	71
Hydrocephalus	15	9	24
Fall	18	4	22
Hemiplegia	3	0	3
Limbs deformity	1	0	1
Hypertension	12	6	18
Collapse	0	1	1
Convulsion	3	3	6
Stroke	33	22	55
Persistent headache	24	23	47
Trauma	12	5	17
SOL	7	5	12
Seizure	15	9	24
Cerebral palsy	3	5	8
Cerebral abscess	2	3	5
Hematoma	6	2	8
Cerebral infarct	3	0	3
PTBI	2	0	2

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

Hemorrhage	1	2	3
Cerebral syndrome	2	3	5
Aneurysm	1	0	1
Total	254	131	385

Table 7: CT report findings based on gender

Findings	Gender		Total
	Male	Female	
Hydrocephalus	17	11	28
Hemorrhage	16	7	23
Fracture	38	6	44
Normal study	55	40	95
Cerebral infarct	53	36	89
Brain atrophy	33	18	51
Cerebral abscess	4	5	9
Hematoma	34	7	41
Dandy walker	1	0	1
Hygroma	2	0	2
Edema	1	1	2
Total	254	131	385

Table 8: Comparison of clinical indications with similar works

Indications	Present Study	Onah et al., 2017	Erondu et al., 2011	Ugwu, 2014
Aneurysm	1	0	0	0
Cerebral abscess	5	0	5	0
Cerebral Infarct	3	0	0	0
Cerebral palsy	8	0	0	0
Cerebral syndrome	5	0	0	0
Collapse	1	0	0	0
Convulsion	6	0	0	0

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

CVA	49	2	24	58
Fall	22	0	0	0
Hemorrhage	3	0	0	0
Hematoma	8	0	47	0
Hemiplegia	3	2	0	0
Hydrocephalus	24	0	12	27
Hypertension	18	1	8	48
Limbs deformity	1	0	0	0
Meningitis	0	0	5	0
Persistent Headache	47	1	17	28
PTBI	2	0	0	0
RTA	71	10	0	94
Seizures	24	6	28	40
SOL	12	0	43	46
Stroke	55	6	3	0
Trauma	17	0	0	0

Table 9: Comparison of CT report findings with a similar works

Findings	Present study	Onah et al., 2017	Ugwu, 2014
Normal CT Scan	95	2	163
Brain Atrophy	51	1	69
Brain infarct	89	9	63
Fractures	44	7	0
Hemorrhage	23	8	0
Dandy walker	1	0	0
Hydrocephalus	28	1	37
Cerebral abscess	9	0	11
Edema	2	0	0

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

Hematoma	41	0	0
Hygroma	2	0	0
CSOM	0	0	5
Cyst	0	0	19
Degenerative disease	0	2	0

DISCUSSION

Due to its increasing popularity, Computed Tomography (CT) has become an integral part of modern medicine [5]. Deciding on a referral for a CT procedure is a very important decision that physicians make. It is often based on several factors such as a medical history patient's request and [6]. Globally, head injuries remain an important public health problem and contribute significantly to high morbidity, mortality and long-term disability [14].

In the present study, Road Traffic Accidents (RTA) was found to be the commonest clinical indication for head CT in the study area. This may be attributed to poor road network system in the community, use of motorcycles and unlicensed drivers and riders. A similar pattern was obtained and reported by a number of studies conducted across different locations. [4]. in Rivers state, Nigeria, [15]. in Eastern Nepal, India, [12] in Mwanza, Tanzania, [16] in Bauchi state, Nigeria, [5] in Enugu state, Nigeria, [8] in Ibadan, Nigeria, [10] in Erbil, Iraq, [11] in Abuja, Nigeria. In literature, it was reported that the reason for these findings between this study and cited studies may be presumably due to poor car maintenance, bad roads, the use of alcohol and illicit drugs while driving and speeding. However, a contrary finding reported by [17]. in Israel does not agree with this study where headache was the main clinical indication for head CT. This may not be perhaps difficult to comprehend because of the difference in level of road user's literacy, effective and rich data for checking road offenders and strong institutions to execute offenders and world class transport system could be the reason RTA is not the most common clinical indication in Isreal.

Similarly, the present study revealed normal study to be the most common finding in the study area. This may not be due to overuse or lack of screening protocols because most accident cases with head injuries should be screened to avoid later complications. This goes along the line of the work of [5] in Enugu state, Nigeria. Conversely, divergent findings were reported by a number of studies. [12] in Mwanza, Tanzania had scalp hematoma as the most common finding, [16] in Bauchi state, Nigeria had infarction. [15] in Eastern Nepal, India recorded scalp lesion. [11] in Abuja, Nigeria recorded abnormal scan. The reason for this may be as a result of the following: Over enhanced use of CT for diagnosis without prioritizing radiation hazard. Adequate clerking prior to CT request might have ruled out possibility. Relative affordability of CT.

This study also identified the age category of 20-39years as most frequent and most exposed to RTA while 60-79years to be the least. This is as a result of young men likely to be risk-taking, travel more, most active and productive part of the society with the nature of extended family making them more exposed. This explained the reason why they have the highest findings. This agrees with studies reported by, [8, 4, 10 and 11]. Also, males happen to be the gender most exposed to RTA and this is also backed by the above studies and this may be as a result of the fact that men are mostly the ones driving the cars, motorcycles and bicycles. Normal study was seen to be prevalent in patients between the age categories of 0-19years with male having the most frequency based on gender.

Clinical indications of present study were compared to other studies by [16, 18, and 5]. RTA was seen to be present in all except that of [18] which was the most common. Stroke being the second most prevalent was seen in both works of [16 and 18] but absent in that of [5]. The least indications (aneurysm, collapse and limbs deformity) were absent in compared studies.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

Furthermore, findings of present study were also compared to a study by [16 and 5]. Normal study was present in all studies and is the most prevalent in both present study and that of [5]. Brain infarct was the second most common finding in present study and it was found to be present in all studies being the most common in the study conducted by [16]. Dandy walker was the least and it was absent in both studies.

Policy makers should find a way to tackle and address the root cause of RTAs in the society.

Substantial number of CT examinations were found to be normal study hence raising question to radiation concerns.

CONCLUSION

This study showed that head injury secondary to RTAs is the major indication for head CT while the commonest report finding is normal study. The community major means of transportation is motorcycle popularly called Okada riders in the local community. The operators and passengers hardly use protective head helmets. Therefore, this study will guide requesting physicians in sending CT requests and also guides policy making on effective use of traffic system with view of changing the tide.

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Declarations:

In accordance with the principles of the Declaration of Helsinki, the study protocol was reviewed and approved by an independent ethics committee of the Faculty of health sciences and Technology, College of Health Sciences Nnamdi Azikiwe University Nigeria. **Protocol number: FHST/REC/024/1027.** Data were retrospectively collected and analyzed ensuring the confidentiality and privacy of the patient's information.

Consent to participate. Not applicable.

Clinical trial number: Not applicable.

Conflict of interest:

The authors declared no conflict of interest.

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