

## PATTERN OF REFERRALS OF HEAD INJURY TO THE UNIVERSITY COLLEGE HOSPITAL, IBADAN

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### ABSTRACT

**Background:** Although there are now many neurosurgical units in Nigeria, cases of head injury (HI) continue to present in the University College Hospital, UCH, Ibadan, from hospitals all over the country.

**Objective:** This report aims to highlight the contemporary patterns of referrals of cases of head injury for neurosurgery in Ibadan.

**Methods:** The study emanated from an analysis of registry of cases of head injury managed in our practice covering a 7-year period at the UCH Ibadan. The clinical/trauma-demography of cases of head injury referred were analyzed quantitatively and then compared with head injury cases that presented primarily to UCH Ibadan during the same period. An alpha value of <0.05 was considered significant for associations for pattern of referrals.

**Results:** Of the 1034 cases of head injuries in the registry, 23.6% presented primarily to UCH, Ibadan; 423 (40.1%) were from outside Ibadan/Oyo state. Most of the cases were earlier seen in other health facilities in four out of Nigeria's six geopolitical zones including other teaching hospitals with practicing neurosurgeons. The reasons for these inter-hospital, inter-state referrals included absence of neurosurgical expertise (67%) or lack of other logistics like neuroimaging, bed space and intensive care unit services. Head Injury was caused by road accidents in more than 85% of the cases. The patients referred inter-state had more severe injuries, more delayed attainment of critical milestones in their trauma care, and higher frequency of neurosurgical operative interventions. They also had worse in-hospital outcome and longer length of stay.

**Conclusions:** The University College Hospital, Ibadan continues to play a pivotal role in the management of head injury in Nigeria. The results support an urgent need for stakeholders in the health sector to provide all that is required to uphold the status of the Hospital as a center of excellence in neurosurgery and neurosciences.

**Keywords:** Head injury, Referrals, Neurosurgery, UCH, Ibadan

### INTRODUCTION

In the developing countries, also known as low-middle income countries (LMIC), head injury (HI) constitutes a sizeable proportion of the clinical caseloads of most neurosurgical units.<sup>1-3</sup> The optimal care of many cases of HI, especially the severe ones, is time bound. The time was put at 4 hours for traumatic acute subdural haematoma in a landmark publication some four decades ago.<sup>4</sup> In spite of the establishment of new neurosurgical units in many parts of Nigeria in recent years, referrals for the neurosurgical care of HI still present daily in the University College Hospital (UCH), Ibadan from many regions of the country. Many of these arrive late, and in sub-optimal clinical conditions.

This is a descriptive cross-sectional survey of a HI registry with the aim of establishing the pattern of referrals of HI for neurosurgery in Ibadan. This, it is hoped, would provide insights into more purposeful

allocation of health care resources for the management of HI in Nigeria.

### MATERIALS AND METHODS

This was a prospective study of consecutive HI patients managed in a neurosurgical practice at the University College Hospital, Ibadan between August 2009 and June 2016. The database of these cases of HI was examined for the referral patterns. Firstly, the cases of head injury presenting primarily and secondarily to the University College Hospital, Ibadan were sorted. Cases of HI that presented directly at the UCH, Ibadan were termed primary presentation. Those that had been seen in another health facility before presenting in UCH were the secondary ones. The sources of referrals of the latter were noted including types of health facilities (private, general hospitals or other tertiary facilities) from which they were referred for neurosurgical care,

and the state of origin in Nigeria where the trauma occurred. The number of health facilities (one, two and more) earlier visited before arrival in UCH, Ibadan, as well as whether there was any in-house neurosurgical service in any of these was also noted. The reason for the inter-hospital transfers from these other centers was also noted from the referral letters when available.

### Clinical/Statistical analysis

This was followed by an analysis of the demographic, clinical and trauma characteristics of the referred cases which were analyzed and compared with those of the cases presenting primarily in the UCH, Ibadan. This was with a view to noting any associations and or differences in the clinical-demographic trauma profiles between the two patient groups. Some of the parameters analysed in this respect were many of the known clinical determinants of outcome from HI: the presence of loss of consciousness (LOC), hypothermia (systemic temperature <35.0°C) hypotension/hypertension, tachycardia/bradycardia, high fever (systemic temperature >38.5°C), anaemia (packed cell volume less than 30%), pupillary anomalies/asymmetry of reaction (anisocoria), and the severity of the HI using the Glasgow coma scale (GCS). The Injury Severity Scores (ISS) providing a measure of severity of the overall injuries for patients with multi-organ trauma was also computed for each case. The ISS is scored from 0-75, higher figure denoting increasing severity of trauma.<sup>5</sup> Finally, the patients' in-hospital outcome at discharge or death was quantified using the dichotomized Glasgow outcome scale (GOS). Good outcome were cases in 'normal status' or 'moderate deficits' while poor outcome were those with 'severe deficits', 'vegetative states' and 'death'.<sup>6</sup>

### Data management

The clinical records of the cases had been captured consecutively in clinical summary forms, and were transferred to an electronic spreadsheet, using the SPSS version 21 (The SPSS Inc, IL, USA). It was thus a primary database. The data were analyzed with the same software and presented here in descriptive statistics including frequencies and proportions, means (standard deviation, SD), 95% confidence interval, CI, median (range). Categorical variables were explored for associations with the chi-squared test. Associations between parametric continuous variables were explored with the 2-tailed student-t test, and those between non-parametric variables with the Mann-Whitney-U test. An alpha value of <0.05 was deemed significant for associations.

## RESULTS

One thousand and thirty-four (1034) cases of HI were managed by us and had their clinical data captured in the registry. Of these, 611 (59.1%) sustained HI within Oyo state of Nigeria, the location of UCH, Ibadan and 423 (40.1%) were from outside the state. Nearly one-fifth (244/1034, 23.6%) of the cases of HI in this registry presented primarily in UCH, Ibadan. The other cases, as shown in table 1, had been seen in other health facilities including other tertiary teaching hospitals. Table 1 also shows the geographical regions of origin of these HI cases: 4 out of the 6 national geopolitical zones.

**Table 1:** Pattern of presentation of cases of head injury to the UCH, Ibadan

Variable	Number (%)
Head Injury patients' first medical contact (N=1034)	
UCH	244 (23.6)
Private Hospitals	484 (46.8)
General/District Hospitals	211 (20.4)
Other Tertiary Hospitals	95 (9.2)
Region of origin of out of state patients (N= 410)	
South West	381 (92.9)
South South	14 (3.4)
North Central	12 (3.0)
North West	2 (0.5)
Cotonou, Benin Republic	1 (0.2)
Number of medical facilities before UCH (N=399)	
1	246 (61.7)
2	116 (29.1)
3	34 (8.5)
4	2 (0.5)
5	1 (0.3)
Reason for referral (N=799)	
For expert neurosurgical care	536 (67.0)
For neuroimaging/neurosurgery	43 (5.4)
Lack of ICU/Bed space	27 (3.4)
Others	193 (24.2)
Head Injury out-of-state: cause of accident (N=422)	
Road traffic accident	361 (85.5)
Motor vehicular (177)	
Motorcycles (184)	
Assault	26 (6.2)
Falls	13 (3.1)
Others (occupational injury)	22 (5.2)

UCH =University College Hospital

**Table 2:** Out-of-state referrals of head injury to UCH, Ibadan, compared to primary UCH patients

	<b>MVA n (%)</b>	<b>MCA, n (%)</b>	<b>P value</b>	
<b>Cause of road accident</b>				
Accident within state, N = 472	183 (38.8)	289 (61.2)	<0.01	
Accident out of state, N= 361	177 (49.0)	184 (51.0)		
	<b>Driver/Rider</b>	<b>Passenger</b>	<b>Pedestrian</b>	
<b>Victims of MVA</b>				
Accident within state, N=182	15 (8.2)	72 (39.6)	95 (52.2)	<0.01
Accident out of state, N= 178	17 (9.6)	116 (65.2)	45 (25.3)	
<b>Victims of MCA</b>				
Accident within state, N=289	126 (43.6)	74 (25.6)	89 (30.8)	0.04
Accident out of state, N= 183	96 (52.5)	50 (27.3)	37 (20.2)	
<b>Some prognostic indicators</b>	<b>Present</b>	<b>absent</b>		
<b>High fever</b>				
Accident within state, N=587	116 (19.8)	471 (80.2)	<0.01	
Accident out of state, N= 397	138 (34.8)	259 (65.2)		
<b>Anaemia</b>				
Accident within state, N=425	93 (21.9)	332 (78.1)	0.03	
Accident out of state, N= 306	89 (29.1)	217 (70.9)		
<b>Anisocoria</b>				
Accident within state, N=602	161 (26.7)	441 (73.3)	0.01	
Accident out of state, N= 411	143 (34.8)	268 (65.2)		
<b>Severity of Head Injury</b>	<b>Mild</b>	<b>Moderate</b>	<b>Severe</b>	
Accident within state, N=611	354 (57.9)	145 (23.7)	112 (18.3)	<0.01
Accident out of state, N= 423	192 (45.4)	122 (28.8)	109 (25.8)	

*MCA =motorcycle accident; MVA =motor vehicle accident*

Close to 40% of these cases had multiple stops at other health facilities before arrival in our service. Reasons for the inter-hospital, inter-city/inter-state referrals of HI to UCH, Ibadan included the need for dedicated expert neurosurgical care in 67.0% (536/799); neuroimaging, especially cranial computed tomography (CT) scanning, lack of bed space for ward admission or intensive care unit (ICU) logistics for cases of severe HI; and many other reasons ('Others', Table 1). The latter included industrial strike actions preventing clinical practice in the respective health facilities; personal requests by patients and or their relations to be referred to Ibadan, or cases in which no referral information was documented for the patients from the primary care givers. The causes of HI are also shown; road traffic accidents accounted for more than 85% of the cases. The geographical origin of the HI cases is shown in Figure 1. Cases were referred from all the South West states and some cases from Oyo state outside the city of Ibadan; the South-South states of Edo and Rivers; North Central states of Kogi, Kwara, Niger, Plateau and Kaduna,

and the North West states of Katsina and Sokoto. The same figure shows (asterisk) that many of the sources of these referrals had their own neurosurgical services. None of the cases referred to UCH, Ibadan were turned back or referred to other centers.

#### **Cases of HI presenting in UCH from other states**

Seventy-seven percent (325/423) of these were males, 23% females. The mean age was 33.7 (SD, 17.2) years, with a range of 10 months to 84 years. Of the 423 cases, 399 (94.3%) were referred from other health facilities to our service. This means that 6% of the out-of-state cases of HI were transported inter-city/inter-state directly to the UCH. Although the proportions of the trauma caused by road traffic accident (RTA) and assault were similar between the two patient groups, statistical tests of associations revealed several areas of differences in the traumademography and clinical characteristics between the out-of-state cases of HI compared with the within-state patients managed in our service.

Falls accounted for lower proportion of the HI in the out-of-state cases (3.1% vs 13.3%, chi-square, 33.13,  $p < 0.001$ ); RTA was more frequently from motor vehicle crash in the out-of-state cases, and more of motorcycles in the within-state ( $p < 0.01$ ); Victims of motor vehicle accidents (MVA) were more likely passengers in the out-of-state cases, and more likely pedestrians in within-state cases ( $p < 0.001$ ), while the victims of the MCA were more likely the riders in the out-of-state cases, and also more likely pedestrians for the within-state ones ( $p < 0.04$ ), Table 2.

The presence of some determinants of outcome of HI also varied between the two patient groups. The presence of loss of consciousness (LOC), hypothermia, hypotension/hypertension, and tachycardia/bradycardia was similar between the two groups,  $p > 0.05$ . On the other hand, persistent coma 32.4% vs 24.0%,  $p < 0.001$ ; high fever 34.8% vs 19.8%,  $p < 0.01$ ; anaemia 29.1% vs 21.9%,  $p = 0.03$ ; and anisocoria 34.8% vs 26.7%,  $p = 0.01$  were more prevalent among the out-of-state HI patients, Table 2. In addition, the

out-of-state patients had higher proportions of more severe HI. Table 3 shows additional information in keeping with more severe, more unfavourable trauma-demography and the clinical characteristics of the out-of-state HI cases compared to the within-state group. The out-of-state cases suffered more severe trauma as reflected by higher ISS. They also suffered longer duration of LOC as well as more delayed attainment of critical milestones in their trauma care: time from trauma to definitive neurosurgical evaluation and treatment.

Surgical intervention was offered to a higher proportion of the out-of-state cases than the within-state ones, 18.9% vs 10.6%,  $p = 0.001$ . Whereas good in-hospital outcome was attained in a higher proportion of the within-state patients 78% vs 69%, poor in-hospital outcome occurred in a higher proportion of the out-of-state cases, 31% vs 22%,  $p = 0.001$ . The in-hospital length of stay (LOS) was longer ( $p < 0.01$ , Mann-Whitney U) in the out of state cases 15.5 (SD 23.0) days vs 9.5 (SD 15.5) days (95% CI -8.45, -3.59).

**Table 3:** Out-of-state referrals of head injury to UCH, Ibadan, compared to primary UCH patients

	Mean (SD)	95% CI	P value
Age of subjects (years)			
Accident within state	30.0 (19.7)		
Accident out of state	33.7 (17.2)	-6.02, -1.34	0.002*
Duration of trauma (hours)			
Accident within state	22.6 (49.6)		
Accident out of state	58.9 (86.4)	-44.71, -27.93	<0.01
Duration of LOC (hours)			
Accident within state	46.0 (121.0)		
Accident out of state	80.2 (175.3)	-53.92, -14.44	<0.01
Injury severity score			
Accident within state	23.8 (13.5)		
Accident out of state	27.5 (12.8)	-5.34, -2.06	<0.01*
Duration of stay in first health facility visited (hours)			
Accident within state	19.6 (38.3)		
Accident out of state	50.8 (73.0)	-39.93, -22.30	<0.01
Time from trauma to brain CT scanning (hours)			
Accident within state	54.7 (150.4)		
Accident out of state	70.8 (81.1)	-34.32, 2.07	<0.01
Time from trauma to surgical treatment (hours)			
Accident within state	81.6 (61.7)		
Accident out of state	111.7 (126.9)	-66.44, 6.20	0.1
Length of hospital stay (days)			
Accident within state	9.5 (15.5)		
Accident out of state	15.5 (23.0)	-8.45, -3.59	<0.01

CT = computed tomography; LOC = loss of consciousness; UCH = University College Hospital

\*Student-t test for the parametric variables. Mann-Whitney U, for the rest, the non-parametric ones.



**Fig.1:** The map of Nigeria showing geographical spread of sources of referrals of cases of head injury to the UCH, Ibadan.

- States from Nigeria referring head injury to Ibadan;
- \* Centers with active neurosurgical units/ departments)

## DISCUSSION

Head injury is a global public health concern that is much more pronounced in the LMIC.<sup>1,3,7,8</sup> It forms a sizeable proportion of the daily workload of most neurosurgical units, more than 60% in some units in Nigeria.<sup>2,9,10</sup> As recent as the turn of the millennium, only Ibadan, Lagos, Enugu and Sokoto had permanent neurosurgical coverage. However, the sub-specialty has continued to grow. As at today, the total number of practicing neurosurgeons in Nigeria is about 55. At the nation's current population size, this puts the neurosurgeon per population ratio in Nigeria to be about 1 to 3 million at least, still a far cry from the global benchmark of 1 to 100,000.<sup>11, 12</sup>

About a decade ago, with less than 10 neurosurgeons in Nigeria, the neurosurgical unit at the UCH, Ibadan, the nation's premier and foremost neurosurgical unit, was the most visibly active. At that time, cases of HI deemed more complex by the initial care givers and felt to need dedicated neurosurgical care presented in Ibadan from all over the country. Less formidable cases were handled by these non-neurosurgical specialists. Hence publications on HI during that epoch actually emanated from many non-neurosurgical physicians.<sup>13-16</sup>

A new dawn broke in Nigeria's neurosurgical personnel landscape in just about a decade ago. Firstly, computerized neuroimaging, CT scan and MRI, became more available and somewhat more affordable to many patients. But more importantly, new neurosurgical units opened in many parts of Nigeria, Figure 1. Presently, there are about 20 neurosurgical units in Nigeria. Many of the new centers, especially in the South East (SE), have taken over the care of most cases of HI originating therefrom that used to be referred to UCH, Ibadan. In addition, the number of publications on the subject of HI from these centers have risen significantly.<sup>2,9,17-20</sup> Notwithstanding these facts, the Ibadan Center appears to continue to maintain its preeminence in the management of head injury from the analysis reported here. Referrals to our unit for the care of cases of HI still come from as many as 14 states, encompassing 2/3 of the nation's geopolitical zones. They are mainly young adult males, victims of severe motorcycle and vehicular road accidents. They are more likely to have suffered more severe HI and general systemic trauma, and are more likely in need of operative neurosurgical interventions.

Partly due to the fact of the long-distance travel by many of them to access our unit out of their own states, they endured more delayed attainment of critical milestones in their trauma care: time from trauma to definitive neurosurgical evaluation and treatment. This may explain the delay in recovery after neurosurgical intervention, and the more prolonged in-hospital course, for this out-of-state cohort of patients.

A notable point about the referral patterns of these head injured patients is the number of health facilities some of the cases had first been received in. This ranged from 1 to 5. This may be attributable to the nation's disorganized healthcare pyramid.<sup>21</sup> In the absence of a well-structured referral pattern in the health systems, needless inter-hospital, inter-city/inter-state referrals of mild cases of HI, as well as undue delay in referring severe cases are a daily occurrence in our centre, almost the rule rather than exception.<sup>21</sup> This is an unfortunate feature of the trauma systems of most developing countries.<sup>22,23</sup> Some of these referrals also came from other tertiary hospitals with respectable complements of surgical subspecialty services.

The reasons for referrals from other university teaching hospitals, some with their own in-house neurosurgical service usually included lack of bed space for admitting the cases, lack of CT scanning, or lack of ICU for the care of the severely injured. With UCH Ibadan remaining a National referral center for neurosurgical care it is high time for our nation's policy maker in the health sector to provide all the resources and personnel needed to uphold the status of the UCH Ibadan as the nation's center of excellence in neurosurgery and neurosciences.

## CONCLUSION

In spite of the existence of many other neurosurgical units in Nigeria, cases of HI continue to be referred daily to UCH, Ibadan, from every region of the country. Many arrive late, with more severe head injury and systemic trauma. Determinants of poor outcome of HI were more prevalent in many of them and their in-hospital outcome was accordingly worse. It is time that the UCH Ibadan was made to be truly and functionally Nigeria's centre of excellence in neurosurgery and neurosciences.

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