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A Comparative Review of Cranial Surgeries in Two New Neurosurgery Centres in an Urban and Rural Environment in Southeast Nigeria

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ABSTRACT

Background: The Imo State University Teaching Hospital (IMSUTH), Orlu is rural based and commenced neurosurgical services in January 2016 whereas the Imo State Specialist Hospital (IMSSH), Owerri is in an urban environment and commenced neurosurgical services in April 2021. The demographics of cranial pathologies operatively managed in both hospitals were compared.

Aims: The study aimed to descriptively compare the number of cranial surgeries performed in both hospitals including the age, gender distribution and cranial pathologies of patients surgically managed in both hospitals.

Methods: The surgical records of all neurosurgery patients who had cranial operations at IMSUTH, Orlu, from January 2016 to June 2020 (42 months excluding 2018), and at IMSSH, Owerri, from April 2021 to July 2024 (40 months) were retrospectively reviewed.

Results: During the study periods, there were 26 cranial surgeries, in IMSUTH, Orlu giving an average of 1 cranial surgery in 2 months whereas there were 192 spine surgeries in IMSSH, Owerri, giving an average of 5 cranial surgeries per month. The mean age of the patients was 41 years for patients in IMSUTH and 39 years for patients in IMSSH, with a male to female ratio of 2:1 and 1.5:1 respectively. The mean age for male patients was 36 years for IMSUTH and 39 years for IMSSH while that of female patients was 51 years for IMSUTH and 32 years for IMSSH. The peak age range was in the age group 0-19 years for both IMSUTH (n=11, 42.3%) and IMSSH (n=69, 36%), followed by the age group 60 – 79 years for both IMSUTH (n=6, 23.1%) and IMSSH (n=55, 28.6%). The highest frequency of cranial surgeries was performed for hydrocephalus for IMSSH (n=85, 44.3%). This was followed by cranial haematoma (n=52, 27.1%), cranial tumours (n=33, 17.2%) and cranial infection (n=13, 6.8%). Although the findings in IMSUTH were similar, hydrocephalus (n=9, 34.6%) and haematoma (n=9, 34.6%) were the same in frequency, followed by cranial tumours (n=5, 19.2%) and cranial infection (n=3, 11.5%).

Conclusion: Cranial pathologies are not uncommon in our resource poor settings, especially in the urban environment and with a male preponderance for cranial surgeries. Congenital hydrocephalus is the most common cranial pathology in our paediatric age group, whereas chronic subdural haematoma is the most common cranial pathology in our elderly population. Trauma related cranial pathologies appear to be more common factors for cranial surgeries in rural settings relative to our urban settings.

KEY WORDS: cranial surgery, urban, rural, new neurosurgery center, southeast Nigeria

ABBREVIATIONS: IMSUTH, Imo State Universit Teaching Hospital; IMSSH, Imo State Specialist Hospital; M, Male; F, Female; MMC, Myelomeningocele; NPH, Normal Pressure Hydrocephalus; ASDH, Acute Subdural Haematoma; Subacute SDH, Subacute Subdural Haematoma; CSDH, Chronic Subdural Haematoma; AEDH, Acute Extradural Haematoma; ICH, Intracerebral Haematoma

INTRODUCTION

The Imo State University Teaching Hospital, Orlu, South-East Nigeria, was established in June 2004, as a tertiary healthcare institution affiliated to the Imo State University. It serves as a center for medical education, research and healthcare delivery in Orlu, which is considered a rural settlement. Orlu is the second largest city in Imo State with a population of 198,500 as of 2022 while the population of Imo State is estimated at 5.4 million as of 2022.[1,2]

The Imo State Specialist Hospital, Owerri, is a tertiary health facility established on 22nd January, 2018 and provides medical services, teaching and research in the field of medicine and related areas; and secondary and tertiary health care services. It is located

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in the urban environment of Owerri, the capital of Imo State, and the largest city in Imo State with an estimated population of 560,700 as of 2022.[1,2] Both IMSUTH and IMSSH are public hospitals and serves Imo and the neighbouring States of Rivers, Abia, Anambra and beyond.

Neurosurgery services commenced at IMSUTH, Orlu, in January 2016, after the construction of a neurosurgery theatre at the back of the main theatre complex in the hospital. In the determination and commitment of the hospital management to ensure a conducive working environment for neurosurgery services, funds were also released by the Imo State Government to the Hospital Management to procure neurosurgery instruments and equipment and this included cranial set, microneurosurgery set, spinal set, etc. There was in-house orientation/training of the perioperative nursing and intensive care unit staff prior to the commencement of neurosurgery services, and their contribution towards the take-off and success of neurosurgery services cannot be over emphasized

In October 2020, the author was seconded to IMSSH, Owerri, as the Chief Medical Director of the Hospital, and by April 2021, neurosurgery services were commenced at IMSSH. Outpatient consultations were first started and in the same month a cranial surgery was performed for the insertion of ventriculoperitoneal shunt in an infant with hydrocephalus. A review comparing the demographics of the cranial surgeries performed at both hospitals is presented here, after 40 months of cranial surgeries at IMSSH, Owerri. The different settings (rural and urban) for both hospitals was considered as a possible interesting factor in this comparison.

MATERIALS AND METHODS

Research Design

A descriptive retrospective study design was used.

Place and Period Of Study

This retrospective study was carried out at the Imo State University teaching Hospital, Orlu, and the Imo State Specialist Hospital, Owerri, over a period of 42 months (January 2016 to June 2020) and 40 months (April 2021 to July 2024) respectively.

Patient Selection

Surgical records of patients operated on for cranial pathologies at both hospitals were retrieved and data collected using a structured proforma. It is worth noting that the Neurosurgeon Surgeon went on Sabbatical leave in 2018, hence no cranial surgery was performed in 2018 at IMSUTH, Orlu. Also the resident doctors at IMSUTH, Orlu, embarked on a strike action from June 2020, hence there were no surgical services from the second week of June 2020 until my secondment from IMSUTH to IMSSH in October 2020.

Data Analysis

The data obtained was analyzed by the use of computer aided statistical analysis of the variables. Simple statistical calculations such as mean, frequency and percentages of variables were worked out.

Ethics

Approval for the study was obtained from the Human Research Ethics Committee (Medical).

RESULTS

During the 42 months study period at IMSUTH, Orlu, 26 patients had cranial surgeries, giving an average of 1 cranial surgery in 2 months. Whereas during the 40 months study period in IMSSH, Owerri, 192 patients had cranial surgeries, giving an average of 5 cranial surgeries per month. The summary of patient's characteristics for both hospitals is as shown in table 1.

Table 1: Summary of Patient Characteristics

Variables	Frequency	
	IMSUTH	**IMSSH**
Total number of patients	26	192
Male	18 (69.2%)	115 (59.9%)
Female	8 (30.8%)	77 (40.1%)

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M: F	2:1	1.5:1
Mean age (years)	41	39
Mean age for males (years)	36	43
Mean age for females (years)	51	32
Peak age range	0-19 (n=11, 42.3%)	0-19 (n=69, 36.0%)

The mean age of the patients that underwent cranial surgery during the study period was 41 years for patients in IMSUTH and 39 years for patients in IMSSH, with a male to female ratio of 2:1 and 1.5:1 respectively. The mean age for male patients was 36 years for IMSUTH and 43 years for IMSSH while that of female patients was 51 years for IMSUTH and 32 years for IMSSH. The peak age range at presentation was in the paediatric age group, 0 – 19 years for both IMSUTH (n=11, 42.3%) and IMSSH (n=69, 36%) (Table 2). This was followed by the elderly age group, 60 – 79 years for both IMSUTH (n=6, 23.1%) and IMSSH (n=55, 28.6%). The highest frequency of cranial surgeries was performed for hydrocephalus for IMSSH (n=85, 44.3%). This was followed by cranial haematomas (n=52, 27.1%), cranial tumours (n=33, 17.2%) and cranial infections (n=13, 6.8%) (Table 4). Although the findings in IMSUTH were similar, hydrocephalus (n=9, 34.6%) and haematoma (n=9, 34.6%) were the same in frequency, followed by cranial tumours (n=5, 19.2%) and cranial infections (n=3, 11.5%) (Table 3).

Among cases of hydrocephalus, hydrocephalus with co-existent myelomeningocele (MMC) accounted for the highest frequency in IMSUTH (n=5, 55.6%), while congenital hydrocephalus and other causes of hydrocephalus beside Normal Pressure Hydrocephalus (NPH) accounted for the highest frequency in IMSSH (n=58, 68.2%). Interestingly all the 5 cases of hydrocephalus with co-existent MMC at IMSUTH were in male children, while IMSSH had a male:female ratio of 2:1 for hydrocephalus with co-existent MMC (males, n=4; females, n=2). In both hospitals chronic subdural haematoma accounted for the highest indication for cranial surgeries among cranial haematomas; IMSUTH, n=4, 44.4%; IMSSH, n=27, 59.1%. Similarly in both hospitals, intracranial meningiomas (all histologically confirmed) accounted for the highest indication for cranial surgeries among cranial tumours; IMSUTH, n=3, 60%; IMSSH, n=13, 39.3% (Table 5).

Table 2: Comparison of age of patients at presentation

	Age Interval n (%)					
Hospital	**0 – 19**	**20 – 39**	**40 – 59**	**60 – 79**	**80 - 99**	**Total**
IMSUTH, Orlu	11 (42.3%)	2 (7.7%)	4 (15.4%)	6 (23.1%)	3 (11.5%)	26
IMSSH, Owerri	69 (36.0%)	23 (12.0%)	35 (18.2%)	55 (28.6%)	10 (5.2%)	192

Table 3: Age Distribution of Patients According to Cranial Pathology

	Age Interval						
Cranial Pathology	**0 – 19**	**20 – 39**	**40 – 59**	**60 – 79**	**80 - 99**	**Total**	**Percent%**
Hydrocephalus	7	-	-	2	-	9	34.6
Haematoma	-	1	3	3	2	9	34.6
Tumour	1	1	1	1	1	5	19.2
Cranial Infection	3	-	-	-	-	3	11.6
Total	11	2	4	6	3	26	100

Source: Imo State University Teaching Hospital, Orlu

Table 4: Age Distribution of Patients According Cranial Pathology

	Age Interval						
Cranial Pathology	**0 – 19**	**20 – 39**	**40 – 59**	**60 – 79**	**80 - 99**	**Total**	**Percent%**
Hydrocephalus	46	3	8	21	7	85	44.3
Haematoma	4	9	13	23	3	52	27.1

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Tumour	8	6	8	11	-	33	17.2
Cranial infection	6	2	5	-	-	13	6.8
Encephalocele	4	1	-	-	-	5	2.6
Decompressive Craniectomy	-	-	2	-	-	2	1.0
Arachnoid cyst	1	-	-	-	-	1	0.5
Aneurysm	-	-	1	-	-	1	0.5
Total							

Source: Imo State Specialist Hospital, Owerri

Table 5: Comparison of Patients' Distribution according to Cranial Pathology and Gender

Year		**IMSUTH**		**Total**	**Percent%**	**IMSSH**		**Total**	**Percent%**
Cranial Pathology\Gender		**M**	**F**			**M**	**F**		
Hydrocephalus		**7**	**2**	**9**		**46**	**39**	**85**	
	Hydrocephalus (congenital, etc)	2	1	3	33.3	29	29	58	68.2
	NPH	-	1	1	11.1	13	8	21	24.7
	Hydrocephalus + MMC	5	-	5	55.6	4	2	6	7.1
Haematoma		**8**	**1**	**9**		**39**	**13**	**52**	
	CSDH	4	-	4	44.4	20	7	27	51.9
	AEDH	-	1	1	11.1	7	1	8	15.4
	Subacute SDH	-	-	-	-	6	1	7	13.5
	ICH	-	-	-	-	3	3	6	11.5
	ASDH	4	-	4	44.4	3	1	4	7.7
Tumour		**2**	**3**	**5**		**14**	**19**	**33**	
	Meningioma	1	2	3	60	7	6	13	39.3
	Posterior fossa tumour	1	-	1	20	4	1	5	15.1
	Glioma	-	-	-		1	2	3	9.1
	Metastasis	-	-	-		-	3	3	9.1
	Pituitary Adenoma	-	-	-		1	1	2	6.1
	Craniopharyngioma	-	-	-		1	1	2	6.1
	Pineal Region	-	-	-		-	2	2	6.1
	Scalp Tumour	-	-	-		-	2	2	6.1
	Acoustic Schwannoma	-	-	-		-	1	1	3.0
	Multiple Myeloma (Skull)	-	1	1	20	-	-	-	-
Infection		**2**	**1**	**3**		**12**	**1**	**13**	
	Other Cranial Infections	-	-	-	-	6	1	7	53.8
	Brain Abscess	2	1	3	100	6	-	6	46.2
Encephalocele		**-**	**-**	**-**		**2**	**3**	**5**	
Decompressive Craniectomy		**-**	**-**	**-**		**1**	**1**	**2**	
Arachnoid Cyst		**-**	**-**	**-**		**1**	**-**	**1**	
Aneurysm		**-**	**-**	**-**		**-**	**1**	**1**	
Total		**19**	**7**	**26**		**115**	**77**	**192**	

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DISCUSSION

This study reviews and compares the cranial surgeries in the two tertiary public hospitals owned by the Imo State Government from the commencement of neurosurgery services in both health facilities. The author is the only neurosurgeon surgeon at IMSUTH, Orlu from the commencement of neurosurgery services at the hospital in January 2016, until his secondment to IMSSH, Owerri, in October 2020. He was mostly assisted by resident doctors in IMSUTH or other neurosurgeons from other hospitals depending on the case. A second neurosurgeon was employed at IMSSH, Owerri, and joined the author from July 2021, hence both neurosurgeons performed the cases at IMSSH either together or individually depending on the case, and are occasionally joined by other neurosurgeons or trainees from other hospitals within and outside Imo State. The findings from the study revealed a low spread of cranial pathologies in the rural environment of IMSUTH, Orlu compared to a wider spread of cranial pathologies in the urban environment of IMSSH, Owerri. Also there were fewer number of cranial surgeries in IMSUTH, Orlu, during the study period (n=26 over 42 months), which markedly contrasts to the higher number of cranial surgeries in IMSSH, Owerri, during the study period (n=192 over 40 months). The marked difference in utilization of the cranial services in both hospitals despite being in the same resource poor settings, in the same State and by the same lead neurosurgeon was an interesting study finding. The rural environment of Orlu where IMSUTH is located may be a significant factor to poor access to neurosurgery services at IMSUTH, in keeping with report by other authors that access to surgical care including neurosurgical care is poor in rural areas of the world.[2-5]

Also the findings in the study, show that there were more males (n=18, 69.2% in IMSUTH; n=115, 59.9% in IMSSH) than females (n=8, 30.8% in IMSUTH; n=77, 40.1% in IMSSH) with a male to female ratio of 2:1 in IMSUTH and 1.5:1 in IMSSH. This is similar to the findings by Udoh et al[6] in Benin City, Nigeria; Lasseini et al[7] in Sokoto, Nigeria and Adebe et al[8] in Addis Ababa, Ethiopia, who also had a male preponderance in their studies. Both IMSUTH and IMSSH had similar findings in their peak age range at presentation which was highest in the paediatric age group, 0 – 19 years (n=11, 42.3% for IMSUTH and n=69, 36% for IMSSH). This was followed by the elderly age group, 60 – 79 years for both IMSUTH (n=6, 23.1%) and IMSSH (n=55, 28.6%). These findings may reflect the general pattern in the presentation of cranial neurosurgery cases in Imo State in both rural and urban environment. Similar trend can also be noted for hydrocephalus in paediatric age, 0 - 19 years, which turned out as the highest indication overall for cranial surgeries in both health institutions (IMSUTH, n=7; IMSSH, n=46).

Chronic subdural haematoma, CSDH, accounted for the highest indication for cranial surgeries among haematomas in IMSSH, Owerri (n=27, 59.1%), while CSDH (n=4, 44.4%) and acute subdural haematoma, ASDH (n=4, 44.4%), had equal frequencies in IMSUTH, Orlu. In both hospitals, the cranial haematomas were more common in the middle age group, 40 - 59 years (IMSUTH, n=3; IMSSH, n=13) and the elderly age group, 60 – 79 years (IMSUTH, n=3; IMSSH, n=23). This is similar to the findings by Udoh et al[6] who noted in their study that operations for CSDH were performed mostly in the elderly (88 of 171, i.e. 51.5%). This is also similar to the findings in the study by Abebe et al[8] in Ethiopia who noted that burr holes for Neuro-trauma and subdural hematomas were the most commonly practiced neurosurgical procedures in their environment. And interesting observation in our the study is that although there were fewer number of surgeries for haematomas in IMSUTH (n=9) compared to IMSSH (n=52), surgeries for acute subdural haematoma, ASDH, were equal in number in both hospitals (n=4). ASDH is a neurotrauma related pathology and this may reflect the observation in a previous study in our environment which noted the decreasing trauma trend in our urban environment where commercial motorcycles have been banned, unlike in our rural environment where commercial motorcycle services still persist.[2] In both hospitals. intracranial meningiomas accounted for the highest indication for cranial surgeries among cranial tumours (IMSUTH, n=3, 60%; IMSSH, n=13, 39.3%). This is similar to the findings in the studies by Idowu et al[9] in Ibadan, Nigeria (35%), Idowu and Apemiye[10] in Lagos, Nigeria (30%) and Ibebuike et al[11] in Johannesburg, South Africa (31.8%) with meningiomas reported as the most common intracranial neoplasm in their studies.

CONCLUSION

The study revealed that cranial pathologies are not uncommon in our resource poor settings, especially in the urban environment and with a male preponderance for cranial surgeries. Also congenital hydrocephalus is a common cranial pathology in our paediatric age group, while chronic subdural haematoma is a common cranial pathology in our elderly population. Trauma related cranial pathologies appear to be more common factors for cranial surgeries in rural settings relative to our urban settings. It is hoped that the study findings will be helpful in guiding policy formulation and planning for the development of neurosurgery in our

environment, especially in improving access to neurosurgery care in the rural environments. Also a high index of suspicion is required for hydrocephalus in children and for chronic subdural haematoma in the elderly in our environments.

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Conflicts of interest
There are no conflicts of interest.

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