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The Practice of Neurosurgery in Edward Francis Small Teaching Hospital of Banjul, the Gambia

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Abstract: The management of neurosurgical pathologies has become a priority in our regions. Over the years the number of patients consulting in neurosurgical clinics continues to rise. Publications and studies of neurosurgical activities are rare in sub-Saharan Africa and almost inexistent in the Gambia in particular hence the impetus for this study: The Practice of Neurosurgery in EFSTH (Edward Francis Small Teaching Hospital) of Banjul, the Gambia. The objective of this study was to report on all the neurosurgical activities of the Neurosurgery unit of EFSTH of Banjul over an 18-month period. A retrospective study of all the neurosurgical activities of the EFSTH over a period of 18-month was carried out. Data were obtained from the medical records of the hospital categorized according to age groups. Consultation, admission, surgery, morbidity and mortality were evaluated. We included all patients managed in the Neurosurgery unit and excluded patients with insufficient data or missing folders. The Neurosurgery unit had a total of 2,038 patients giving an average of 113 patients seen per month of whom 399 (19.57%) were hospitalized and 127 (6.23%) benefitted from neurosurgical intervention. Morbidities and mortalities of 19 and 47 are respectively. Pediatric population with ages ranging from 0-9 years dominated in our admissions. Male: Female ratio was 2:1. The clinical features in our studies varied according to the diverse pathologies encountered in the study. Imaging was dominated by CT scan 168 cases (61%), X-Rays 102 cases (37%). Pathologies seen in the Outpatient consultations were mainly degenerative pathology 938 (46%), Trauma 391 (21%), Hydrocephalus and other CNS (Central nervous system) Malformations 325 (16%). Hospitalizations were mostly dominated by Trauma 300 (75.18%), Hydrocephalus and other CNS Malformations 41 (9.77%), degenerative disease 26 (6.52%). Neurosurgical interventions were mainly trauma 47 (37%), Hydrocephalus and other CNS Malformations 39 (31%), Degenerative 15 (12%). Neurosurgical procedures mainly comprised of Burr hole 18 (14%), Spina bifida repair 17 (13%), Craniotomy 13 (10%), Ventriculoperitoneal shunt 13 (10%), Spinal internal fixation 12 (9%) and elevation of depressed skull fracture 11 (8%). Morbidities encountered included surgical site infection 6 (4.51%), CSF (cerebrospinal fluid) leak 6 (4.51%) shunt infection 3 (2.26%). Mortality was mostly from Trauma 33 (8%), Infection 5 (1.25%) and Hydrocephalus and Other CNS Malformations 4 (1.5%) of the total admissions. Conclusions: Lack of materials (bipolar cautery, operating microscope, (C-arm fluoroscopy in the first 7 months of the study)), consumables (surgical, surgical cotton, gel foam, bone wax etc.) had been an enormous challenge the neurosurgical unit of EFSTH had faced. This study therefore demonstrates the great need of a permanent Neurosurgeon and neurosurgical team in the Gambia.

Key words: Traumatic, degenerative, CNS malformation, hydrocephalus.

1. Introduction

Considered in Africa as a luxurious speciality, the development of neurosurgery has witnessed two different evolutions [1]. In the Maghrebs and in South Africa its evolution is more or less compared to the West while in Sub-Saharan Africa, the evolution and level of development in the speciality of Neurosurgery still remains modest [1-3].

Consequently, in all the countries of Sub-Saharan Africa, the standard indicators by the World Health Organization vis a vis: infrastructure, equipment and

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human resources are far from being realized. Thus, the Neurosurgeon to patient ratio still remains above 1:1,000,000; In the Gambia it is about 1:2,000,000 and in some countries there exists no Neurosurgeon at all for the entire population. Situated in the West coast of Africa (Fig. 1), the Gambia fondly called the "Smiling Coast of Africa", is the smallest country in Mainland Africa with a superficial area of 11.295 kilometres square and a population of 1.8 million (2009 estimation) extending about 400 km along its length. Its width varies from 24 to 28 km with a population density of 128 persons per kilometer square. It is surrounded by the Republic of Senegal on the North South and East and by the Atlantic ocean on the West [4, 5].

Records of neurosurgical activity (craniotomy) in EFSTH (Edward Francis Small Teaching Hospital) then called Royal Victoria Hospital dated as far back as the early 1970s by the late Dr. Ebrahima Malick Samba, a General Surgeon. During the 1980s the neurosurgery unit headed by the first Neurosurgeon Dr. Ulric Jones [2] became functional until early 1990 when Dr. Ulric Jones retired. Suffice to say that other general surgeons who worked in the hospital including visiting surgeons from different parts of the globe also performed basic neurosurgical interventions [6-8].

The list of Surgeons that managed neurosurgical conditions in EFSTH cannot be exhaustive in this study. However it is worth mentioning Drs Solanki, Esangbedu, Azmy, Roberts, Samateh et al. the Cuban and Nigerians and those from the West. This history is similar to other countries such as Brazil [6], Austria [7] and England [8].

The rebirth of modern neurosurgery in EFSTH of Banjul the Gambia was occasioned by Humanitarian Missions called the Banjul Neuromission, pioneered and headed by a Senegalese professor of Neurosurgery (Prof. Youssoupha Sakho HOD, Department of Neurosurgery of Grand Yoff general Hospital of Dakar Senegal) from 2011. The neuro mission comprised of outpatient consultations and surgeries in EFSTH. Secondly, due to the enormous work of the neuro missions in EFSTH, the head of Department of Neurosurgery of Fann University Teaching Hospital and Coordinator of the Neurosurgery Residency of Universite Cheikh Anta Diop of Dakar, Prof. Seydou Boubacar Badiane, proposed a neurosurgery rural posting as part of fulfillment of the requirements of the residency program. This posting was validated by the Faculty of Medicine, Pharmacy and odonto-stomatology of Cheikh Anta Diop University of Dakar. A final year resident (author) was then sent to EFSTH for 6 months with supervision by Universite Cheikh Anta

Fig. 1 Map of the Gambia.

Diop. Thirdly, following the completion of his residency training program, the author was appointed as Consultant Neurosurgeon in EFSTH where he walked for a period of one year.

1.1 Objective

The objective is to report the practice of Neurosurgery in EFSTH of Banjul, the Gambia over a period of 18 months.

2. Material and Methods

We conducted a retrospective, descriptive and analytic study of the neurosurgical activities of EFSTH of Banjul within a period of 18 months:

- Three Neuro missions of 27 days organised by Prof. Youssoupha Sakho as a humanitarian gesture where he comes from Dakar with a team and some equipment to manage neurosurgical cases.

1st Neuromission (13-18 November 2011);

2nd Neuromission (28 April-5th May 2013);

3rd Neuromission (19th-31st January 2014).

- Neurosurgery Rural Posting: 6 months (1st April-30th September 2014).

This corresponded to the fourth period of neurosurgical activity in EFSTH which had also benefitted from a permanent presence of a final year Neuosurgery Resident with a visiting consultant for an optimal management of neurosurgical patients under the directives of Prof. Seydou B. Badiane of Universite Cheikh Anta Diop.

- Appointment of a Consultant Neurosurgeon: one year (1st June 2015-1st June 2016).

During this one-year period the hospital appointed the author as the consultant neurosurgeon overseeing all neurosurgical cases under the Department of Surgery and the unit of neurosurgery again had a neurosurgery coverage of one year.

2.1 Inclusion Criteria

It is comprised of all the patients seen in consultations, hospitalized and or operated in the Neurosurgery Unit of the EFSTH.

2.2 Exclusion Criteria

We excluded all the patients whose folders were missing from the Medical records office of the Hospital and those whose folders were incomplete.

Data were collected from the folders of the patients in the Record office of the EFSTH. Patients were categorized according to the different age groups, consultations, admissions and neurosurgical intervention. The different pathologies (trauma, hydrocephalus and other CNS (central nervous system) malformations, degenerative, tumoral, infectious and vascular), morbidities and mortalities were also evaluated.

Data analysis was done through Microsoft word and excel.

3. Results

3.1 Out Patient Consultation

3.1.1 Epidemiological Aspect

The total number of patients who consulted in the Neurosurgical unit of EFSTH during the period under review was 2,038 giving a mean of 113 patients per month. The sex ratio was 1.38 in favor of men.

3.1.2 Pathologies Seen

Out of the total number of patients seen in consultation, degenerative pathology was the most frequent 938 cases 46%, trauma was second 391 cases (21%), hydrocephalus and other CNS malformation was third 325 cases (16%), infectious pathology 122 cases (6%), tumoral pathologies 94 cases (5%) and other unclassified pathologies 162 cases (8%).

3.2 Hospitalisation

3.2.1 Epidemiology

The entire surgical department had about 2,494 admissions during the study period: General surgery 1,072 (43%), Orthopedics 773 (31%), Neurosurgery 399 (16%), Maxillofacial 125 (5%), Urology 100

(4%), ENT 95 (3%). The average monthly admission for the neurosurgical unit was 22 patients with a male predominance of 2.5.

3.2.2 Pathologies in Admission

These comprised of trauma 300 cases (75.18%), hydrocephalus and other CNS malformations 41 cases (9.77%), tumoral pathologies 29 cases (7.27%), degenerative 26 cases (6.52%), infection 26 cases (6.52%), vascular pathology with 4 cases (1%).

3.3 Neurosurgical Interventions

Out of the 399 hospitalized patients 127 (31.8%) had a neurosurgical intervention with a male predominance of 2. The ages with the highest interventions were, 0-9 years 34, 10-19 years: 23, and 30-39 years: 16 (Fig. 2).

Operated pathologies were, trauma 47 (37%) (Figs. 3-8), hydrocephalus and other CNS malformations 39 (31%) (Figs. 9 and 10), degenerative 15 (12%) (Fig. 13), infection 14 (11%) (Figs. 11 and 12), tumoral pathologies 11 (9%) (Fig. 14), vascular pathology 2 (2%).

A total of 17 neurosurgical procedures were done out of which the most common comprised of: Burr hole 18 cases (14%), spina bifida repair 17 cases (13%), craniotomy 14 cases (11%), laminectomy 13 cases (10%), ventriculoperitoneal shunt 13 cases (10%), spine internal fixation 12 cases (9%), elevation of depressed skull fracture 11 cases (8%) (Table 1).

3.4 Imaging

Two hundred and seventy five (275) neuroimaging were done amongst which CT Scan 168 cases (61%), X-Rays 102 cases (37%) and MRI 5 cases (1.8%).

3.5 Morbidity

Nineteen (19) morbidities were recorded during the study period (Fig. 15). Surgical site infection 6 cases (31.58%), CSF (Cerebrospinal fluid) leak 6 cases (31.58%), shunt infection 3 cases (15.80%), shunt migration 1 case (5.26%), paralytic ileus 1 case (5.26%), burst abdomen 1 case (5.26%).

3.6 Mortality

Forty-seven (47) deaths were registered giving 11.77% of the total admissions. Deaths were due to: Traumatic 34 cases (72.3%) out of which traumatic brain injury 23 cases (48.9%) and spinal injury 11 cases (16.9%), hydrocephalus 3 cases (6.38%), spina bifida 3 cases (6.38%), infection 3 cases (6.38%), Tumor 2 cases (4.25%), vascular 1 case (2.1%) and degenerative 1 case (2.1%).

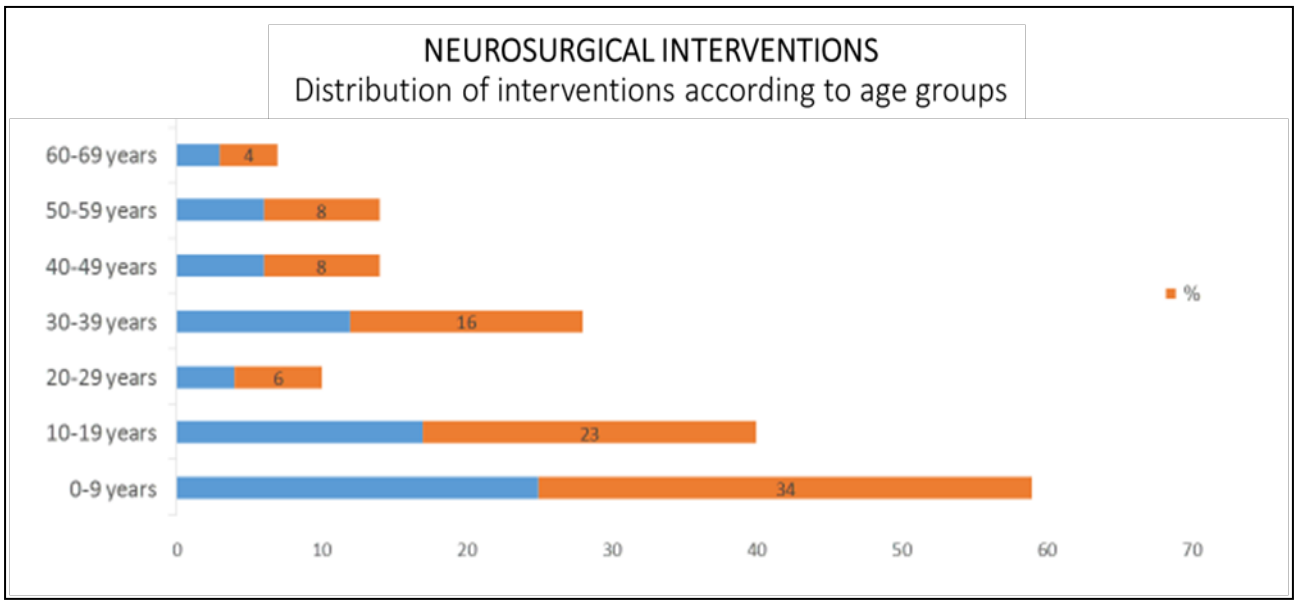

Fig. 2 Distribution of interventions according to age groups.

Table 1 Types of neurosurgical procedures.

Type of operation	Number	%
Burr hole	18	14
Spina bifida repair	17	13
Craniotomy	14	11
Laminectomy	13	10
Ventriculoperitoneal shunt	13	10
Spinal internal fixation	12	9
Elevation of depressed skull fracture	11	8
Tumor resection	7	5
External ventricular drain	7	5
Duraplasty	5	4
Shunt revision	2	2
Discectomy	5	4
Cephalocele repair	5	4
Superior sagittal sinus reconstruction	1	1
Lumber fenestration	1	1
Cranioplasty	1	1
Tong placement for traction	1	1

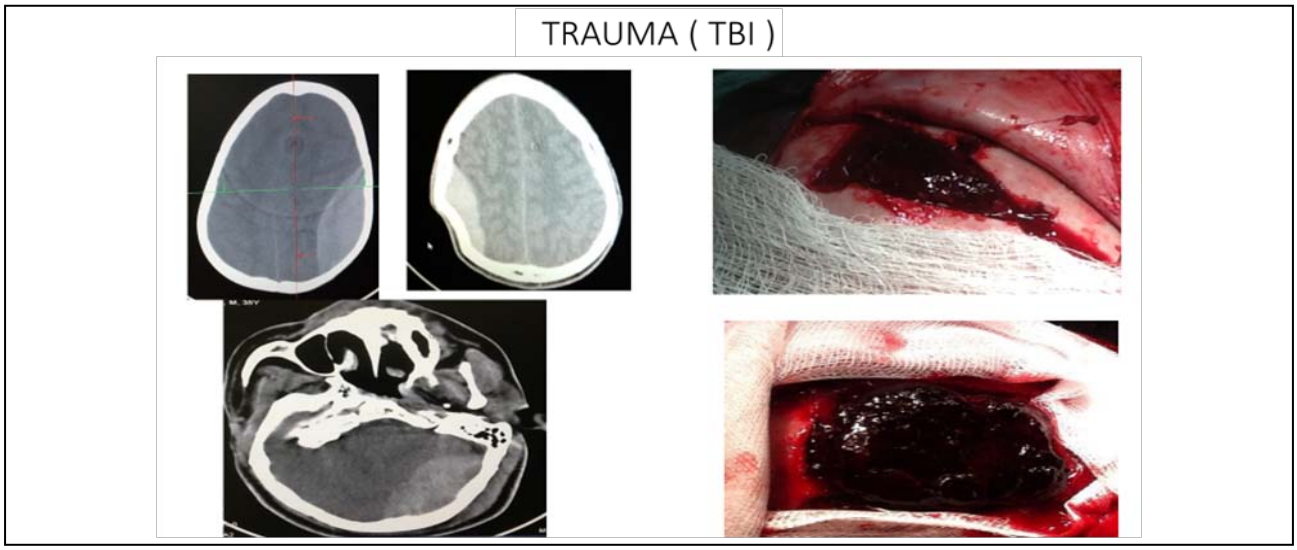

Fig. 3 CT scan and intraoperative images of extradural hematoma.

Fig. 4 Intraoperative images of cranioplasty fall from height with bone defect for 11 years.

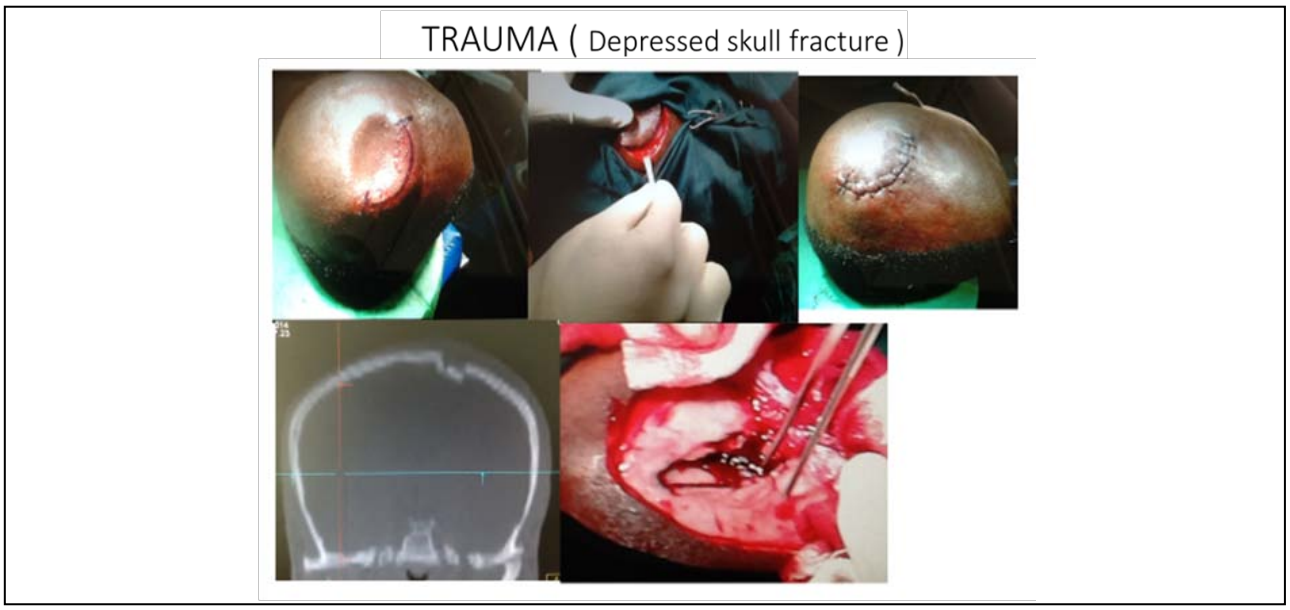

Fig. 5 CT and intraoperative images of compound depressed skull fracture.

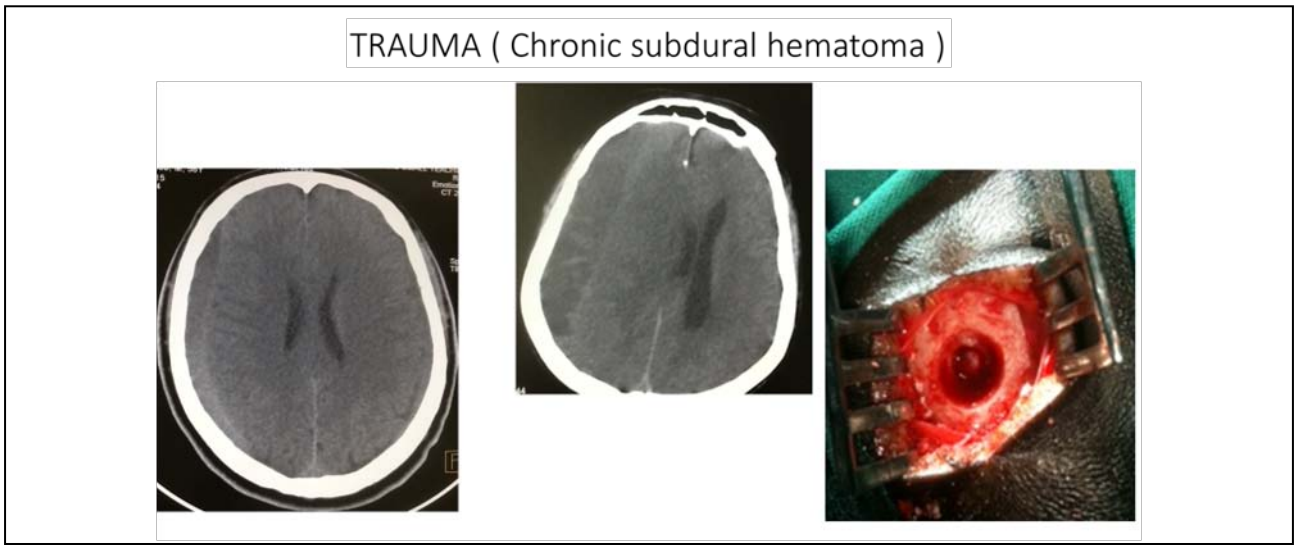

Fig. 6 CT and intraoperative images of chronic subdural hematoma.

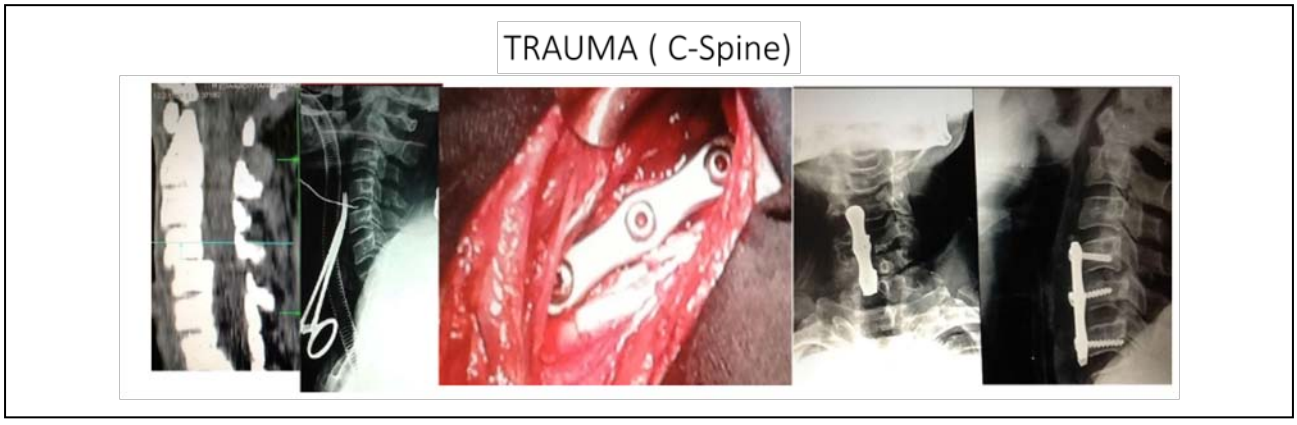

Fig. 7 CT, intraoperative and post operative imaging of C-spine fracture dislocation.

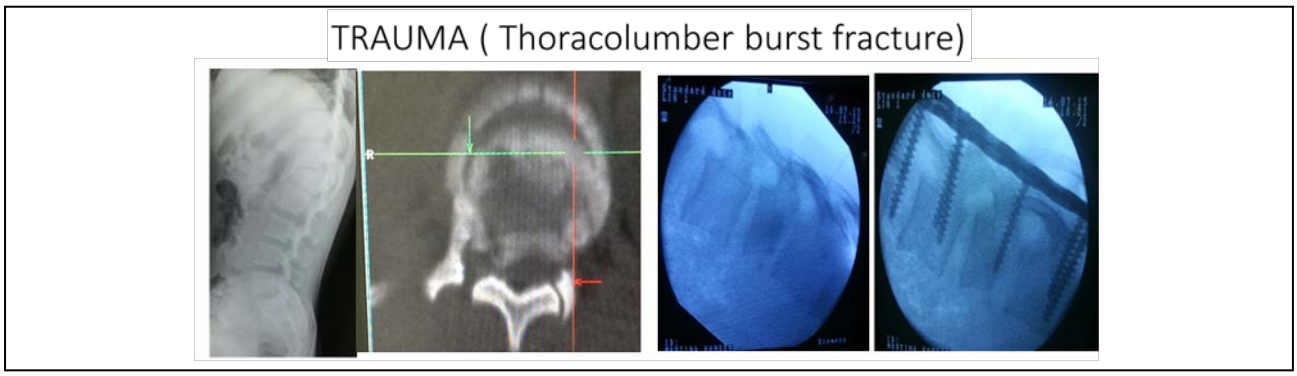

Fig. 8 CT, intraoperative localisation and post operative images of thoracolumbar burst fracture.

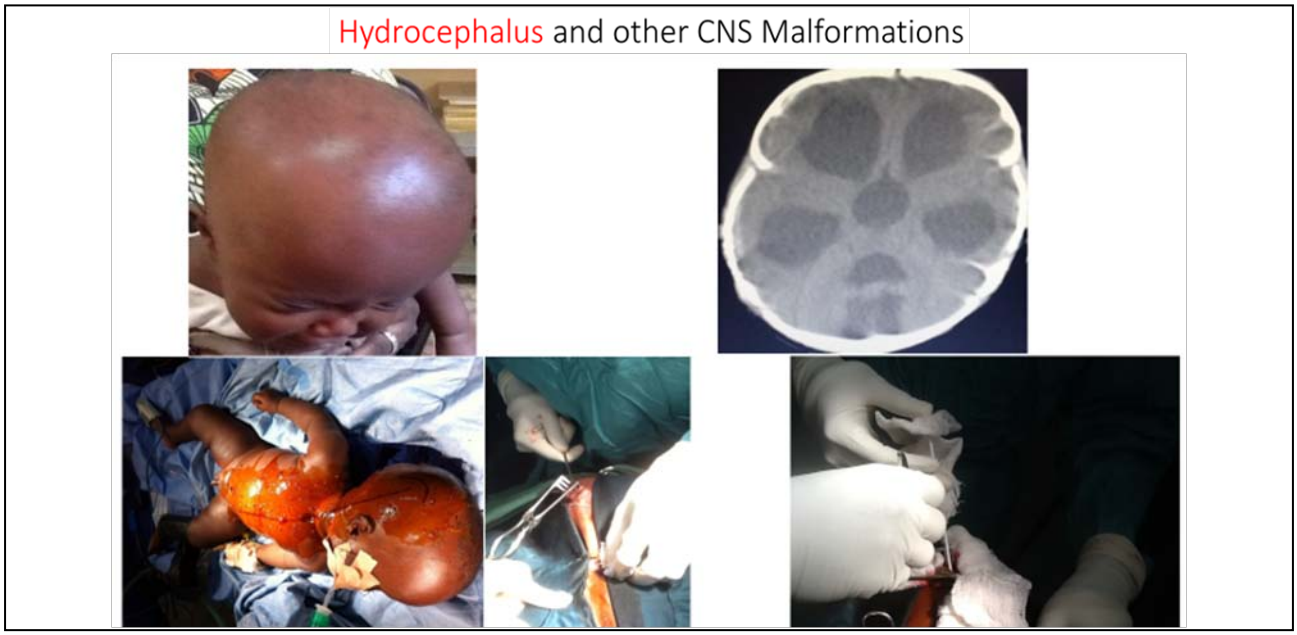

Fig. 9 CT and intraoperative mages of patient with hydrocephalus and ventriculoperitoneal shunt insertion.

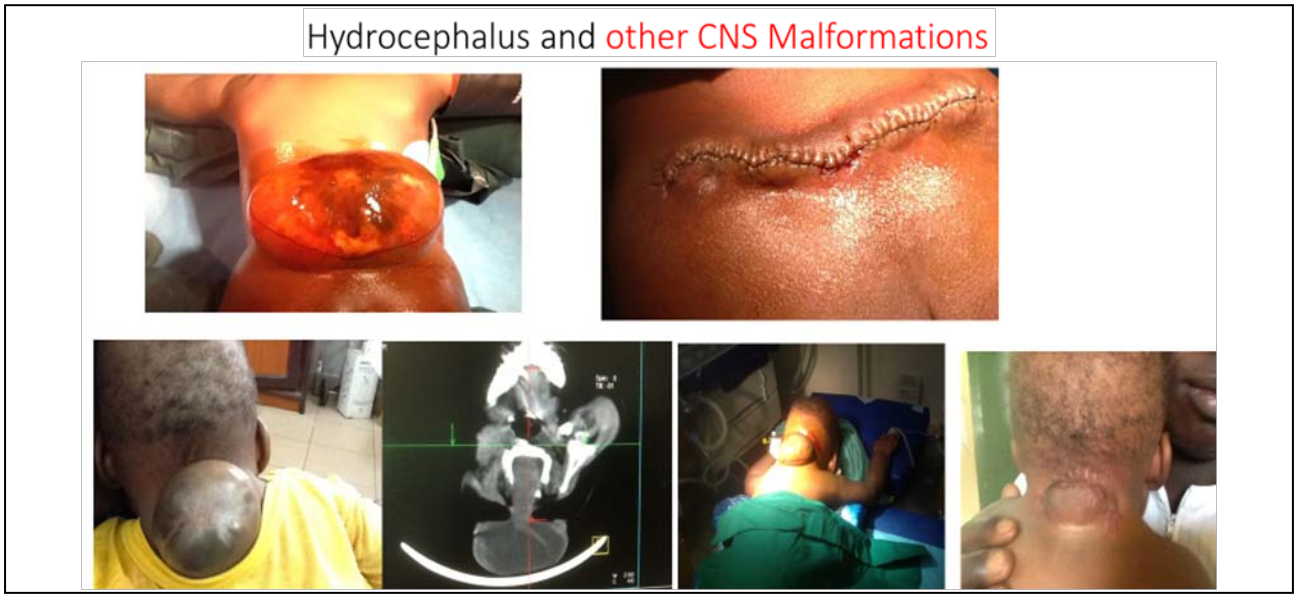

Fig. 10 Preoperative and post operative images of Spina Bifida and cervical meningocele.

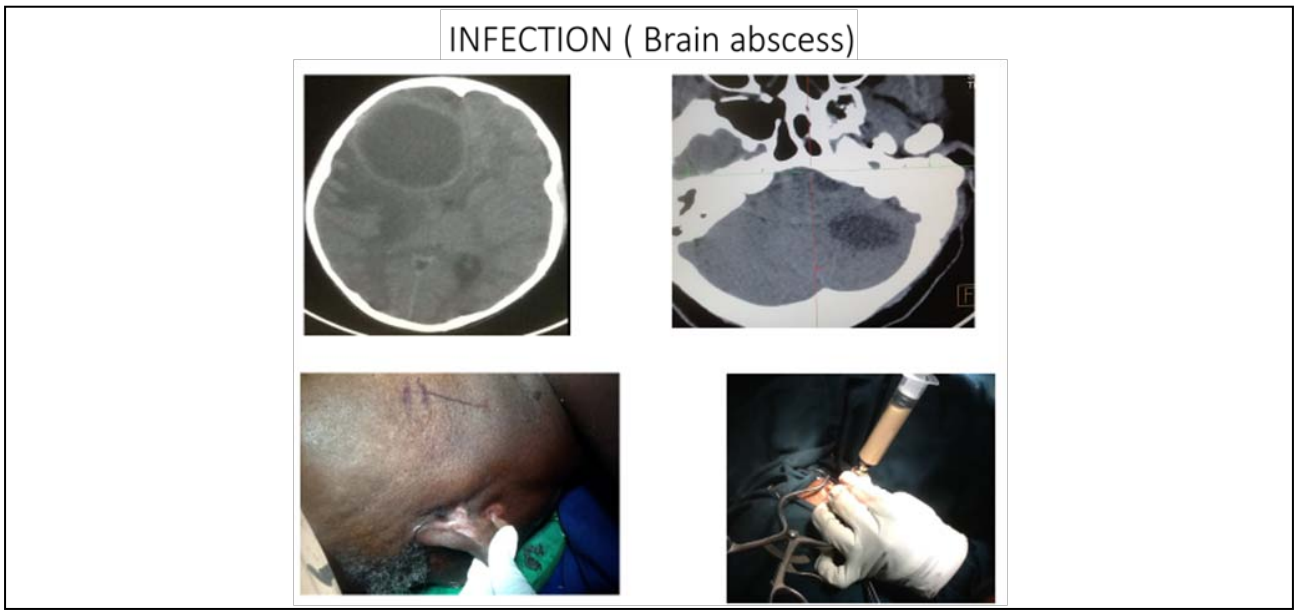

Fig. 11 CT images of right frontal and posterior fossa brain abscess and intraoperative images of the latter.

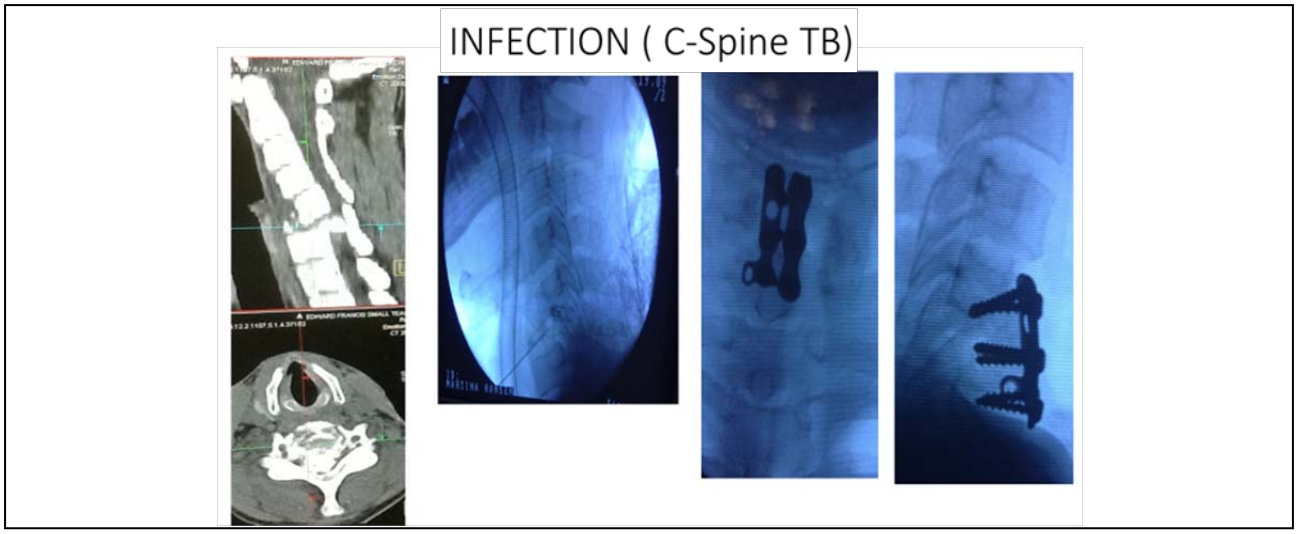

Fig. 12 CT, intraoperative localization and post operative images of TB of the Spine.

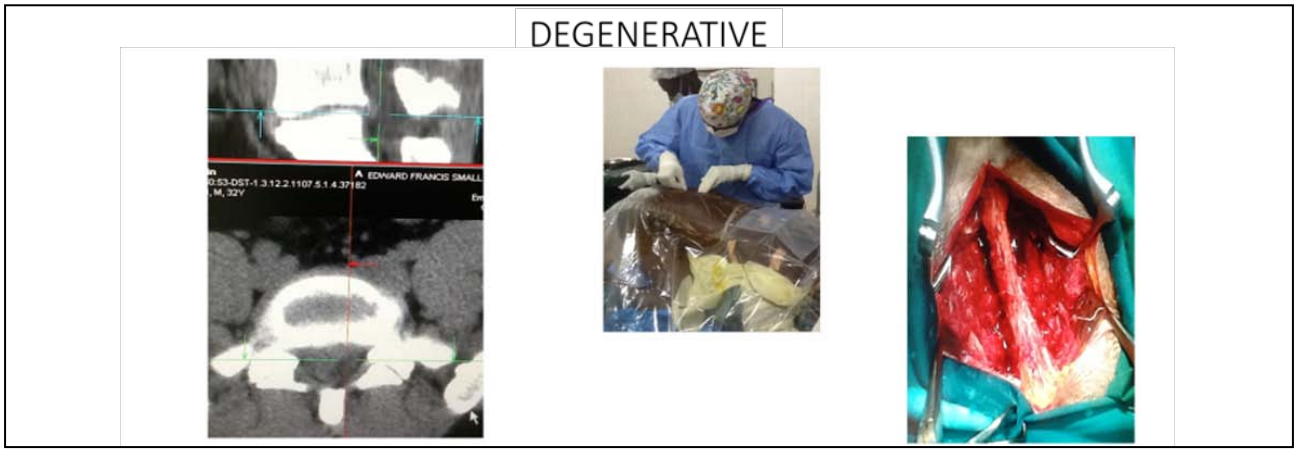

Fig. 13 CT and intraoperative imaging of disc herniation.

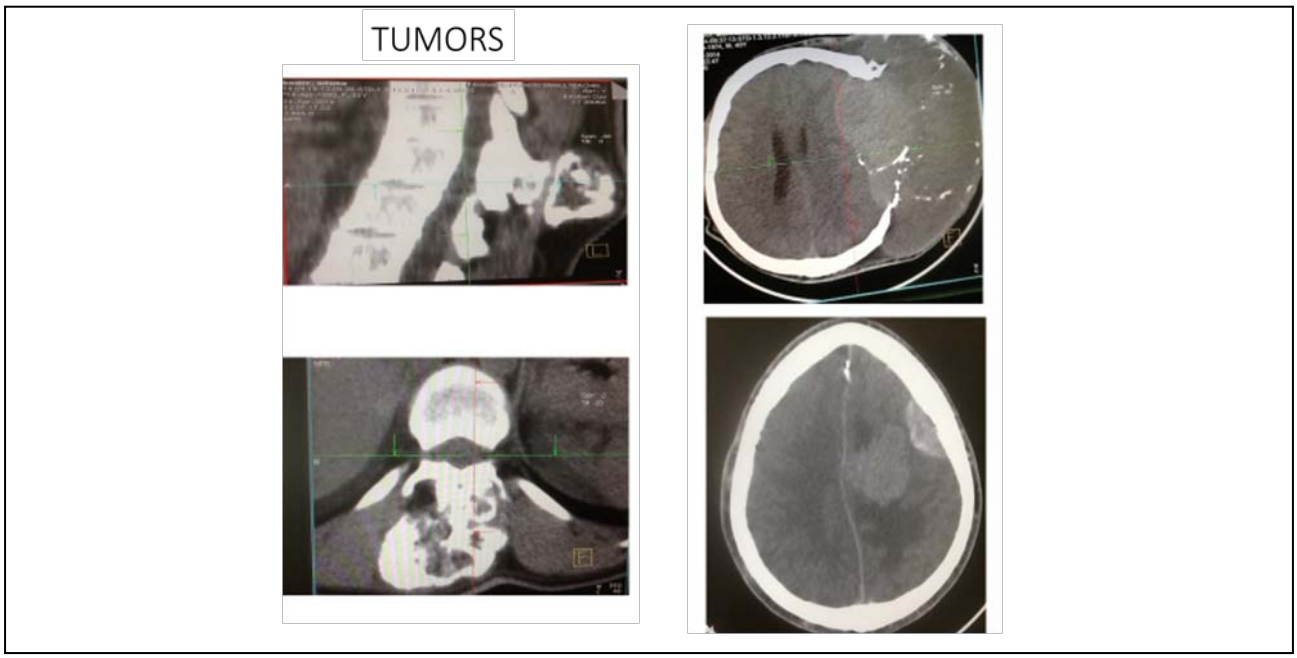

Fig. 14 CT images of spinal chondroblastoma, exteriorized meningioma and multiple meningiomas in a neurofibromatosis patient.

Fig. 15 Morbidity images of wound dehiscence, surgical site infection and skin erosion in ventriculoperitoneal shunt.

4. Discussion

The crude birth rate is estimated at 46 per 1,000 inhabitants while the fertility rate 5.4 births per female. The high fertility rate is indicative of the young composition of the population. About 44% of the population is less than 15 years and 19% between 15 to 24 years [5, 9]. The health system operates in three levels notably: primary, secondary and tertiary. The third levels of the health care system are principally run by 5 major general hospitals that are operated by the government of the Gambia. In addition, the Medical Research Council under the auspices of the United Kingdom Government and other health facilities are privately or NGO operated. EFSTH is the main referral and only Teaching Hospital and it is

situated in the capital of Banjul.

The management of neurosurgical patients in the Gambia is indeed challenging due to the following factors: global organization and the political orientation of the health system.

Prehospital management of patients is substandard. Thus, there are no standardized paramedical systems of transport of trauma patients who constitute 75.18% of the admissions in our study. In addition the population lacks information on the risk of transporting traumatized patients by non medical means as a result is seen transporting their patients by themselves to the health facilities thus causing additional injuries. These patients arrive at the hospital in very bad conditions [10-16].

CT Scan is indispensable in the management of trauma patients in neurosurgery. The availability of emergency CT scans after 1,600 hours could sometimes be difficult. After receiving neurosurgical patients in the ER, the Neurosurgery unit is then called to review however in the absence of a Neurosurgeon, these patients are managed by the General surgeons [6-8]. Lack of adequate materials, qualified staff, intensivists occasions adverse consequences in the management of these patients. The transport of patients within the hospital by the orderlies who lack the training on transporting trauma patients especially neuro trauma has a risk of aggravating the injuries.

Of course this is compounded by the lack of neurosurgical equipments and consumables. However, with all these limitations we have been able to use the meagre resources to practice neurosurgery in EFSTH of Banjul.

4.1 Out Patient Consultation

The total number of patients who consulted in the outpatient of the Neurosurgical unit of EFSTH during the period under review was 2,038 giving a mean of 103 patients per month. This percentage is due to several reasons: being the main referral Hospital, EFSTH receives all the patients from the country and sometimes neighboring countries, in addition it was the only center providing neurosurgical services suffice [17] to say this percentage will surely increase as the notion of neurosurgical diseases and available of treatment is only known by a few within the country. Neurosurgical departments of other centers in Africa also experience a high rate of consultation The Department of Neurosurgery of University Teaching Hospital Muhammed VI of Marrakech Morocco receives an average of 3,200 cases per year [12]. The above showed that neurosurgical pathologies constitute a frequent motive for consultation [1, 12, 18, 19]. Male predominance has also been reported by other authors [11, 12]. In our context degenerative and trauma, the two most common pathologies are male related due to their way of life [1].

We also had a significant number of unclassified pathologies which were due to diverse symptoms without underlying neurosurgical pathology also evident by the lack of neurologists and a neurology department as a result of the neurosurgery unit in some cases of receive such patients.

4.2 Hospitalisation

The total number of admitted patients in our unit was 399 giving 22 admissions in a month and 20% of all the patients seen in consultation. Sixteen percent (16%) of all the patients admitted in the Department of Surgery of EFSTH were under our unit which was the third following general surgery and orthopedic attesting to the burden of neurosurgery pathologies. During our period of study, male gender predominance was also seen as a consequent of trauma which was the highest pathology in admissions with 75.18% [10, 11, 20, 21], contrary to the pathologies seen in consultations. Hydrocephalus and other CNS malformations as well as degenerative pathologies 9.77% and 6.52% followed respectively. Although degenerative pathologies dominated in the consultations most of them were amenable to

conservative treatment and since the study period was short a long term follow up of some who would eventually fail the conservative treatment could not be assessed. Most patients cannot afford the cost of CT scan which serves as a delay or barrier diagnosis [22] of other pathologies such as tumors, infection and vascular pathologies, thus their respective low percentages.

4.3 Surgical Intervention

Trauma was the most common pathology that required neurosurgical intervention 37% among all the pathologies operated in the study, most of which was traumatic brain injury [23] followed by spine injury [24, 25]. The high proportion of the later was due to falls from height. Spinal internal fixation posed a very difficult challenge during the first 7 months of the study due to lack of C-Arm as a result localization of spinal levels was done by a mobile X-Ray that contributed to very prolonged surgeries however after that the hospital had a C-Arm and it enhanced our spine management better. In the hydrocephalus and other CNS malformations [26-28], spinal dysraphysm dominated and this is obvious due to the low standard of living, lack of adequate antenatal and folic acid supplimentation [13]. The number of hydrocephalus patients managed was small compared to most centers. This was because shunts were not available during some part of the study and even when they were available were not within reach for most of the population. As opposed to most centers where brain tumor surgery is main stay of day to day neurosurgical operations we had less tumor surgeries limited first by diagnostic limitation (Lack of MRI, cost of CT), lack of equipments (Operating microscope, craniotome, bipolar cautery among other consumables) as well as a good neuro intensive care.

The neurosurgical procedure that was most commonly done was burr hole 14% which was done for most of the pathologies including brain abscesses, chronic subdural hematomas, drainage of large cystic sellar lesions, EVD (external ventricular drain) etc. As discussed earlier repair of spina bifida was the second most common procedure 13% due to the reasons stated thus there is great need for neuro health promotion especially the use of follic acid for the child bearing mothers. The high prevalence of trauma is reflected in the number of our craniotomies (still done by the use of manual drills and gigli saw) and spinal fixation. Laminectomies for mostly lumber canal stenosis and discectomies for disc herniations dominated our degenerative pathologies.

Suffice to say that the cost of neurosurgery intervention in EFSTH is within the reach of nearly all in the country as the charges set by the government are absolutely low especially in the pediatric population.

4.4 Imaging

Since the advent of CT scan in 2007 donated by the Taiwanese government, it has become the main diagnostic imaging thus comprising 61% of all our imaging. However due to its cost, its use is limited. Functionally, after 1,600 hrs its services are close and only available in emergency which sometimes is hard to have. As a result our approaches have been in all moderate level and sometimes severe traumas an X-ray is done, the services of which are available for 24 hours and if the X-ray shows any feature of fracture or anomaly we mandatorily ensure that a CT is done. The indication of X-ray in spine still has its benefits especially in our regions. There are no MRI services available in the Gambia thus the 5 MRIs in the study were done either in neighboring Senegal or other countries abroad.

4.5 Morbidity

This was made up of 4% of the total admissions dominated by surgical site infection and CSF leak [29-31]. Limitation of the hospital in the availability of aseptic materials perioperatively and the behavior of the personnels towards aseptic techniques is a

contributing factor for the former. Faced with the dilemma of an acute hydrocephalus in a comatous patient either by an obstruction or by acute intraventricular hemorrhage needing an urgent EVD, we were compelled in the absence of EVDs to use the smallest size pediatric endotracheal tube as a temporizing mechanism pending arrival of shunt or allowing evacuation of bleeding, consequently the after mat was marked by CSF leak. Suffice to say the test was life saving in two cases. Other morbidities were shunt related however for a single shunted patient who was severely malnourished had paralytic ileau, CSF leak, burst Abdomen and skin erosion.

4.6 Mortality

Mortality rate was 11% of the admissions and was mostly trauma 72%. Those high frequencies in traumatic pathologies are accounted by the high rates of road traffic accidents in our regions associated with a disorganized urbanization associated with disregard to the codes of conduct and traffic rules. In addition the rate of fall from trees especially among children has also contributed to increased trauma. Similar findings were also seen in Dakar [1]. Most of the patients are presenting in severe coma with acute subdural hematoma with severe parenchymal involvement, considering its guarded prognosis, the lack of a standard neurointensive care, our approach is usually abstention from any surgical intervention and they comprised majority of deaths. The ICU (intensive care unit) of the Hospital that serves all the department of the hospital has limited ventilators as a result some of these patients in severe coma remain unventilated. Those with falls from height usually have cervical spine injury [14] presenting with breathing disorders also formed an important component of these deaths. Infections mostly from empyemas and brain abscesses sometimes diagnosed when the patients are already in coma could be difficult to reverse in our condition. However in shunt infection we do not have the luxury of immediately removing the shunt considering the fortune it cost to have as a result our approach is always to first treat with antibiotics which in few cases too could be a challenge thus resulting in deaths.

5. Conclusion

The burden of neurosurgical pathologies on our population is enormous. However, since it has been considered as a luxurious speciality our governments more often than not would prefer to invest in the other domains thus leaving neurosurgery unattended.

The results of this study are a clear indication that the need for a permanent neurosurgeon in EFSTH of Banjul the Gambia is paramount and by extension in all countries of the sub Saharan Africa. In light of the above the following are recommendations drawn from this study:

(1) Train more neurosurgeons and the entire neurosurgical team [32].

(2) Improve the emergency services, imaging and ensuring the availability of a functioning MRI.

(3) Institute a paramedical system for the prehospital care of the patients.

(4) Transform the neurosurgical unit into a full department.

(5) Have in possession the adequate number of both medical and paramedical staff according to international standards.

(6) Improve the management of traumatic brain and spine injury by emphasizing the reception of patients and transport within the hospital melieu.

(7) Upgrade and improve the record system of the hospital.

(8) Secure neurosurgical equipments and consumables.

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