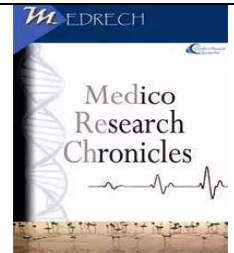




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PATTERN AND PREDISPOSING FACTORS OF NEUROLOGICAL DISORDERS IN A NEUROLOGY OUTPATIENT CLINIC IN PORT HARCOURT, NIGERIA

*West Boma Awoala, Onubogu Uchenna Chinweokwu

Department of Paediatrics, Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria

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ABSTRACT

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Corresponding author*

West Boma Awoala

Background: Neurologic disorders are a major cause of morbidity and disability in childhood. With this in mind, understanding the present trends of neurologic disorders in any locality would help in the designing and implementation of preventive health strategies.

Objectives; To determine the pattern and predisposing factors of neurologic disorders presenting at the Paediatric neurology outpatient department of the Rivers State University Teaching Hospital in Port Harcourt, Nigeria.

Methodology: This was a prospective study carried out in the Paediatric neurology clinic of the Rivers State University Teaching Hospital from January 2015 to December 2017.

Results: A total of 21,600 patients were seen in the Paediatric outpatient department in the period under review out of which 303 (1.4%) were children with neurologic disorders, 7 patients were excluded from the analysis. Their mean age was 3.5 ± 3.7 yrs with a M:F ratio of 1.5:1. Antenatal care was done in a hospital by 244 (82.4%) of the mothers while 78(26.4%) children were delivered by Traditional birth attendants (TBA) or unqualified attendants and 196(66.2%) were born at term via spontaneous vaginal delivery 229(77.4%).

Single neurologic disorder was seen in 171(57.8%) children. The common neurologic disorders were Seizure disorders 152(51.4%), cerebral palsy 141(47.6%) and microcephaly 87(29.4). The identifiable predisposing factors were perinatal asphyxia 91(30.7%), meningitis 80(27%) and neonatal jaundice 37(13%).

Conclusion. Seizure disorders and cerebral palsy are the commonest neurologic disorders in Port Harcourt, Nigeria. The predisposing factors are mostly preventable.

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INTRODUCTION

Neurologic disorders are seen commonly in children especially in developing countries.¹⁻⁵ They are a major cause of morbidity and disability in childhood.^{6,7} They account for more than 20% of the world's disease burden with Africa contributing a greater percentage.^{8,9} Children are commonly affected as the developing brain of children are faced with numerous injuries during the prenatal, perinatal and postnatal periods resulting from disease conditions like intrauterine infections, perinatal asphyxia, neonatal jaundice, central nervous system infections, etc. This could be attributable to the fact that a large number of pregnant women in developing countries do not register for antenatal care and still deliver at home.^{10,11} Other factors that contribute to the high prevalence of neurologic disorders include poverty, high level of illiteracy, traditional and cultural beliefs, and practices, unavailability of basic health care facilities as well as lack of skilled birth attendants within short distances, inadequate transportation and high cost of medical care.

The pattern of neurologic disorders may vary from one geographic location to another as well as over time. The present study was therefore carried out to determine the pattern and predisposing factors of neurologic disorders presenting at the Paediatric neurology outpatient department of the Rivers State University Teaching Hospital in Port Harcourt, Nigeria. This study will be useful in understanding the present trends of neurologic disorders in Port Harcourt, Nigeria and thus help in the designing and implementation of preventive health strategies.

MATERIALS/METHOD

This was a prospective study carried out in the Paediatric neurology unit of the Braithwaite Memorial Specialist Hospital now upgraded to the status of a Teaching Hospital

i. e. Rivers State University Teaching Hospital from January 2015 to December 2017. The Paediatric neurology clinic was established a year before the commencement of the study and it is being run by a consultant with a special interest in Paediatric Neurology and a resident doctor. The pediatric neurology clinic which takes place once a week, on Wednesdays, attends to an average of 4-6 new patients per week. Referrals are usually gotten from the Paediatric outpatient department, discharged cases from the Paediatric inpatient wards with neurologic disorders as well as from primary health center, general hospitals and private health facilities in the state. Prior to this time, neurologic disorders were being referred to the University of Port Harcourt Teaching Hospital which is a much bigger center with more Paediatric neurologists (3 consultants) and more residents.

Rivers State University Teaching Hospital is a tertiary health facility owned by the Rivers State government in the South-south geopolitical zone in Nigeria. It is a 375 bedded hospital and serves as a referral center for all the government-owned primary health care facilities, general hospitals, cottage hospitals and private health facilities in the state as well as neighboring states.

New cases with neurologic symptoms were consecutively recruited. A total of 303 patients whose caregivers gave consents were recruited for the study. Information obtained included biodata, presenting complaints, family and social history, pregnancy and birth history, a past medical history which were recorded in the proforma. Social class was determined using the classification by Olusanya *et al.*¹² The total Social class score which ranged from 1 to 5 in order of descending privileges was divided into 3 equal parts to get upper, middle and low socioeconomic classes. The diagnosis was made clinically and supported by other investigations as deemed fit such as

Electroencephalography (EEG), brain MRI, brain CT, skull x-ray, serum electrolytes, etc. Children whose clinical conditions required multidisciplinary evaluation were referred to the appropriate specialist so as to establish a definitive diagnosis and institute appropriate management. Such specialist included the physiotherapist, ENT surgeons, orthopedic surgeon, Ophthalmologists, etc. However, there is no neurosurgeon, speech therapist and child psychologist in our center so such patients were referred to the other tertiary hospital in the state.

Data was entered into an excel spreadsheet and analyzed using IBM SPSS Statistics version 23. Results were presented in frequency tables, percentages and bar charts. P values ≤ 0.05 were considered significant at a 95% confidence interval.

RESULTS

Characteristics of the study population

A total of 21,600 patients were seen in the Paediatric outpatient department in the period under review out of which 303 (1.4%) were children with neurologic disorders, 7 patients were excluded from analysis due to incomplete information while the remaining 296 patients were analyzed. The ages of the

296 patients ranged from 1 month to 14 years while the median age was 21 months and a mean age of 3.5 ± 3.7 yrs. Children aged 1 to 5 yrs constituted the most number 132 (44.6%), and the least age category was >10 yrs, 25 (8.4%). There were 179 (60.5%) males with a M: F ratio of 1.5:1. Most of the patients lived in urban areas 186 (62.8%), with birth orders of 1st to 2nd borns, 195 (65.9%) and most were of middle social class, 139 (47.0%). The highest educational qualification attained by most of the mothers was primary education, 167 (56.4%). Majority of the mothers, 264 (89.2%) had a documented history of antenatal care (ANC) and 244 (82.4%) had their ANC in a hospital setting 244 (82.4%) with primary healthcare centers being the most common place for ANC, 88 (29.7%). Only 214 (72.3%) mothers could recall the gestational age of their children at delivery. Seventy-eight (26.4%) and the were delivered by traditional birth attendants or unqualified attendants and 196 (66.2%) were born at term via spontaneous vaginal deliveries 229 (77.4%). One hundred and fifty-one (51.0%) of the children had a normal birth weight 151 (51.0%) and a single neurologic disorder 171 (57.8%), (Table 1).

Table 1: Characteristics of the study population

Variable	Study population, N=296(%)
Age (years)	
< 1	92 (31.1)
> 1 to 5	132 (44.6)
>5 to 10	47 (15.9)
>10	25 (8.4)
Gender	
Female	117 (39.5)
Male	179 (60.5)
Residence	
Urban	186 (62.8)
Rural	110 (37.2)
Birth order	
1 st to 2 nd	195 (65.9)

3 rd to 4 th	78(26.4)
5 th to 6 th	14(4.7)
>6 th	9(3.0)
The social class of parents	
Upper class	45(15.2)
Middle class	139(47.0)
Lower class	112(37.8)
Level of Education	
No formal education	8(2.7)
Primary	167(56.4)
Secondary	7(2.4)
Tertiary	114(38.5)
Place of ANC	
Tertiary hospital	55(18.6)
The secondary health care center	34(11.5)
The primary health care center	88(29.7)
Private Hospital	67(22.6)
TBA/Unqualified attendants	20(6.8)
No care	32(10.8)
Gestational age at delivery	
Preterm	16(5.4)
Term	196(66.2)
Post date	2(0.7)
Unknown	82(27.7)
Mode of delivery	
SVD	229(77.4)
C/S	67(22.6)
Place of delivery	
Tertiary Hospital	50(16.9)
Secondary health care hospital	35(11.8)
Primary health care centers	64(21.6)
Private hospitals	69(23.3)
TBA/Unqualified attendant	78(26.4)
Birth weight	
0- < 2.5kg	47(15.9)
2.5 - < 4kg	151(51.0)
>4kg	61(20.6)
Unknown	37(12.5)
Number of disorders	
Single	171(57.8)
Multiple	125(42.2)

Table 2: Age and gender distribution of patients

Age (years)	Female	Male	Total (%)
< 1	35	58	93(31.4)
> 1 to 5	51	82	133(44.9)
> 5 to 10	18	29	47(15.9)
> 10	12	11	23(7.8)
Total (%)	116(39.2)	180(60.8)	296(100)

P = 0.6, df = 3.

Types of Neurological disorders

The most common neurologic disorder was seizure disorders 152 (51.4%) followed by cerebral palsy 141(47.6%) while the least observed was Craniosynostosis 1 (0.3%), (Table 3).

Table 3: Types of Neurologic disorders

Type of Neurologic disorder	Female	Male	Total (%)
Seizure disorder	60	92	152(51.4)
Cerebral palsy	55	86	141(47.6)
Microcephaly	37	50	87(29.4)
Macrocephaly	20	26	46(15.5)
Speech impairment	17	27	44(14.9)
Hearing impairment	6	9	15(5.1)
Movement disorder	3	4	7(2.4)
Speech impairment	2	5	7(2.4)
Stroke	4	3	7(2.4)
Muscle dystrophy	1	1	2(0.7)
Speech impairment	2	5	7(2.4)
Stroke	4	3	7(2.4)
Muscle dystrophy	1	1	2(0.7)
Squint	1	2	3(1.0)
Craniosynostosis	1	0	1(0.3)

Investigations performed by the study population

Of 152 patients with seizure disorders, 70 (46.0%) carried out EEG, 60 (39.5%) did serum calcium levels, 57 (37.5%) serum

magnesium whereas only 10 (3.4%) of the 296 children carried out either brain MRI or CT. Among the sixty who did their serum calcium levels, most, 35(58.3%) had normal calcium levels (Table 3).

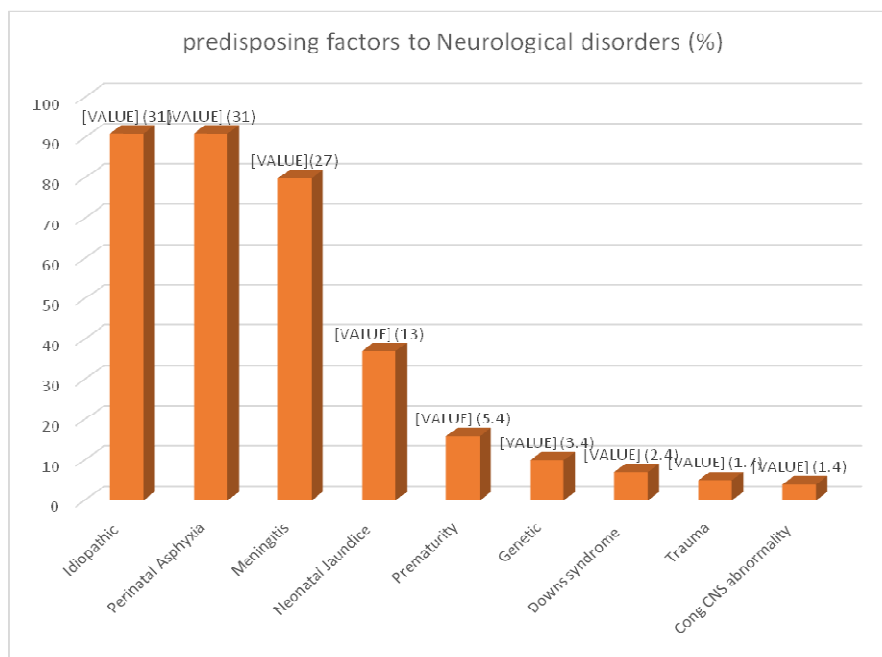
Table 4 Investigations performed by the study population

Investigation	Frequency, n(%)
Electroencephalogram	70(46.0)
Brain MRI/CT	10(3.4)
Serum Calcium	60(39.5)
Hypercalcemia	2(3.3)
Hypocalcemia	23(38.3)
Normocalcemia	35(58.3)
Serum Magnesium	57(37.5)
Low Mg	1(1.8)
Normal Mg	56(98.2)
High Mg	0(0.0)

Predisposing factors of Neurological disorders

Perinatal asphyxia 91(30.7%) and idiopathic causes were the most common identifiable

predisposing factors to neurologic disorders, while congenital CNS abnormality was the least 4(1.4%) (Figure 1).

**Figure 1: Predisposing factor for Neurological disorders**

Children with a risk factor of perinatal asphyxia were significantly more likely to have cerebral palsy (OR: 4.2, (2.5, 7.3) and microcephaly (OR: 3.1, (1.7, 5.5). They were also less likely to have macrocephaly (OR: 0.4,

(0.19, 0.92) when compared with other types of neurologic disorders. Those with a risk factor of the past history of meningitis were significantly more likely to have cerebral palsy (OR: 1.9, (1.17, 3.3) and microcephaly (OR:

2.3, (1.3,1.4). Children with a past history of Neonatal jaundice were significantly more likely to have cerebral palsy (6.9 (2.8, 17.4)

and less likely to have seizure disorders and macrocephaly (0.46, (0.2, 0.95), Table 4 as their neurological disorder.

Table 5: Types of Neurologic disorders significantly associated with predisposing factors

Variable		Prevalence (%)	P value	OD	95% CI
Perinatal Asphyxia					
Cerebral palsy	Yes	65(46.1)	0.0001	4.2	2.5, 7.3
	No	26(16.8)			
Microcephaly	Yes	43(49.4)	0.0005	3.1	1.7, 5.5
	No	35(23.7)			
Macrocephaly	Yes	9(19.6)	0.02	0.4	0.19, 0.92
	No	69(36.5)			
Meningitis					
Cerebral palsy	Yes	48(34.0)	0.01	1.9	1.17, 3.3
	No	32(20.6)			
Microcephaly	Yes	35(40.2)	0.003	2.3	1.3, 1.4
	No	33(22.3)			
Neonatal Jaundice					
Seizures disorder	Yes	13(8.6)	0.035	0.46	0.2, 0.95
	No	24(16.7)			
Cerebral palsy	Yes	31(22.0)	0.0001	6.9	2.8, 17.4
	No	6(3.9)			
Macrocephaly	Yes	1(2.17)	0.007	0.1	0.01, 0.82
	No	32(16.9)			
Idiopathic					
Seizures disorder	Yes	57(37.5)	0.01	1.9	1.2, 3.2
	No	34(23.6)			
Cerebral Palsy	Yes	19(30.7)	0.0001	0.18	0.1, 0.32
	No	72(46.5)			
Macrocephaly	Yes	43(43.5)	0.003	2.6	1.3, 5.3
	No	42(22.2)			

DISCUSSION

The total number of new patients who attended the Paediatric neurology clinic within the time frame was 303 of which 296 were recruited giving a prevalence rate of 1.4%. This prevalence is one of the lowest observed in and outside Nigeria. This could be due to the fact that the unit is relatively new and still developing. The observed prevalence in the present study was lower than the 6.7% and 10% observed in an earlier study carried out in Port Harcourt, Nigeria¹ and Zambia¹³ respectively. This difference could be attributed to the fact that both inpatients and outpatients were studied in the later studies, unlike the present study where only patients who presented in the outpatient department were studied. Other studies showed much higher prevalences of 14.5%, 20.15%, 21.0%, 21.3% in Nepal¹⁴ Cameroun¹⁵ and Nigeria^{3,16} respectively.

The largest group of children with neurological disorders was observed within the 1st 5 years of life. This finding was consistent with findings in other parts of Nigeria^{1,2,16,17} and Egypt.¹⁸ This is not surprising as the developing brain of young children is prone to injuries during the prenatal, perinatal and postnatal periods. It is also pertinent to note that symptoms arising as a result of neurologic disorders are more obvious in the younger age groups during the period of rapid brain development.

Neurological disorders were observed more in males than in females as seen in many other studies.^{1-3,4,16,19,20} This could be attributed to the assumption that male children are more readily brought to the health facilities for medical attention than females especially in developing countries due to social habits, cultural beliefs, and practices in which the male child is valued more than the female child. However, a retrospective study in Cameroun¹⁵ reported female preponderance. The reason for this difference could not be ascertained.

More than two-thirds of patients with neurologic disorders reside in urban areas. This was also observed in Zaria² Nigeria and Cameroun.¹⁵ This could be because such tertiary health facilities where specialized services are provided are usually situated in the urban areas, not within reach of those living in rural areas. The high cost of health care and inadequate transportation services especially in developing countries could also be responsible for the relatively lower proportion of rural dwellers seen in the neurologic clinic as observed in our study among the patients with who presented to the hospital with a lower percentage of neurologic disorders.

Babies whose mothers had primary education and families with the middle social class were mostly affected in the present study. This could be as a result of their low level of education, awareness, and poverty.

The most prevalent neurologic disorder observed in the present study was a seizure disorder followed by cerebral palsy accounting for 51.4% and 47.6% respectively. This was also observed in other parts of Nigeria,^{1,3,16} Eritrea,⁴ Sudan¹⁹ and Egypt.¹⁸ Seizure disorder were reported to be the commonest neurologic disorder also in Gambia⁷ and India.²⁰ The high prevalence of seizure disorders as seen in most centers could be due to the increasing awareness of seizure disorders being a treatable medical condition as against previous belief that it was caused by witchcraft and the manipulation of evil spirits.²¹ Contrary to the above reports, cerebral palsy was observed to be the commonest neurologic disorder in Zaria² and Calabar²² while in Cameroun,¹⁵ headaches were reported as the commonest neurologic disorder. These varying reports could be due to the different geographic locations, socio-cultural differences and time variation. It is also interesting to note that the high prevalence of cerebral palsy in Zaria, Nigeria could be attributable to the practice of child/teenage marriages as well as the practice of delivering

their babies at home. At this very young ages, the pelvic outlet is still inadequate (cephalopelvic disproportion) predisposing their babies to perinatal asphyxia and consequent cerebral palsy. In Cameroun however, the study population ranged from 1-97 years unlike the present study were only the pediatric age group was studied.

The commonest predisposing factors to neurologic disorders were perinatal asphyxia, meningitis and neonatal jaundice accounting for 30.7%, 27.0%, and 12.5% respectively. A study on epilepsy in Sagamu,¹⁷ Nigeria reported the same predisposing factors. This is not surprising as the majority of babies in the present study with neurologic disorders were delivered by traditional birth attendants/unqualified attendants 26.4%, followed by deliveries in private hospitals (23.3%) and primary health centers (21.6%) where skilled manpower and facilities for surgical intervention may not be readily available. It is pertinent to note that in the present study, deliveries in tertiary health facilities and secondary health centers had the least percentages of children with neurological disorders, 16.9%, and 11.8% respectively. It is worthy of note that there was no known predisposing factor in about 30.7% of cases. This is also not surprising as neurological services are faced with some logistics especially in developing countries where investigations required for diagnosis are very expensive and thus unaffordable by most of the patients who have to pay out of pocket for health care as seen in the present study where only 46.0% could afford EEG and 3.4% brain MRI/CT. Also a lot of the investigations needed to make the diagnosis are not available as seen in our center where genetic studies and other high tech imaging studies were unavailable.

Further analysis showed that in the present study, patients with perinatal asphyxia as risk factors were more predisposed to

cerebral palsy and microcephaly but were less likely to predispose to macrocephaly. This is not surprising as asphyxia leads to hypoxia in the developing brain leading to brain damage and consequent neurologic sequelae such as cerebral palsy and reduced brain growth (microcephaly). Meningitis which is inflammation of the meninges leads to a severe reduction in the blood pressure and blood flow to the brain leading to severe neurologic damage as seen in our study where we observed a significant predisposition to cerebral palsy and microcephaly. Patients with neonatal jaundice were also observed to be significantly associated with cerebral palsy and less likely to seizure disorders and macrocephaly. This is because bilirubin which is extremely toxic to the developing brain gets deposited in the deep nuclei of the brain, mainly the basal ganglia which is responsible for balance, coordination, hearing and eye movement. Idiopathic causes were significantly associated with seizure disorders and macrocephaly and less likely to cerebral palsy.

CONCLUSION/RECOMMENDATIONS

Neurologic disorders in children constitute a major cause of morbidity and disability. Seizure disorders and cerebral palsy are the commonest neurologic disorders in Port Harcourt, Nigeria. Preventable diseases like perinatal asphyxia, meningitis, and neonatal jaundice are the commonest implicated possible predisposing factors.

Improving skilled manpower, diagnostic facilities, promotion of multidisciplinary approach as well as increasing awareness of safe deliveries in the populace and improving the literacy rate will improve child health care in Port Harcourt, Nigeria.

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