

Original Research Article

Maternal and neonatal characteristics of babies admitted with congenital CNS anomalies in a tertiary hospital in North Central Nigeria

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ABSTRACT

Background: CNS anomalies are an important group of largely preventable congenital anomalies. Knowledge of maternal and neonatal sociodemographic characteristics could identify a pattern of population at risk in order to target preventive interventions.

Methods: This was a 3-year retrospective review of health records of all neonates admitted with CNS anomalies in Jos University Teaching Hospital (JUTH), Jos, central-Nigeria.

Results: Out of a total of 27 neonates with congenital CNS anomalies reviewed, 25 had neural tube defects, 1 hydrocephalos and 1 anencephaly. The peak age group of mothers were 20-29years (44.4%) and 30-39 years (44.4%). Twenty-two (81.5%) mothers had antenatal care (ANC). No mother booked in the 1st month and only 7 (25.9%) booked in the first trimester. Twenty-four (88.9%) mothers took folic acid during pregnancy. No mother had periconceptional folic acid use. There were 11(40.7%) home births with 14(87.5%) of the 16 hospital births taking place in lower tier health facilities. Twenty-six (96.3%) mothers had vaginal delivery. An obstetric ultrasound scan was reported by one (3.7%) mother and did not detect the anomaly. Five (18.5%) of the mothers had HIV infection. Twenty-six were term with a male: female ratio of 1.1:1. The median age at presentation was 2 (interquartile range 1, 8) days.

Conclusions: Neonates with congenital CNS anomalies in JUTH frequently had mothers aged <35 years who did not receive preventive care before and during delivery. We therefore recommend interventions to improve the efficiency of health care delivery to cater for this gap.

Keywords: Central nervous system anomalies, Maternal sociodemographic

INTRODUCTION

Central nervous system (CNS) congenital anomalies are one of the commonest abnormalities congenital malformations.¹⁻³ They contribute to long-term disability, which may have significant impacts on individuals, families, health-care systems, and societies. Although approximately 50% of all congenital anomalies cannot be

linked to a specific cause, 7-8% are as a result of gene mutations or chromosomal defects and 20-25% are due to multifactorial causes.⁴⁻⁶ Folic acid deficiencies especially during the first month of gestation when neurulation takes place has been associated with development of neural tube defects (NTDs), the commonest CNS anomalies. Other factors thought to be associated with CNS anomalies include vitamin B12 deficiency, infections early in pregnancy and exposure to teratogens

(carbamezipine, valproate and clomiphene).⁶⁻¹⁰ It is generally known that dietary intake of folic acid is deficient in most populations especially in low and middle income countries(LMICs)¹¹ Pre-conceptional use of folic acid and food fortification with folic acid have been reported to reduce the incidence of neural tube defects in some developed countries and has formed part of national recommendations and guidelines.¹²⁻¹⁴ However, a good proportion of women use folic acid after the first month when it is too late to influence the development of NTDs.^{15,16} Awareness of the maternal and neonatal characteristics of congenital anomalies in an area can be useful in the implementation of preventive and control programs. We therefore set out to describe the maternal and neonatal sociodemographic characteristics of neonates admitted with congenital CNS anomalies at the Jos University Teaching Hospital (JUTH), Jos to provide baseline data for further evaluation of possible risk factors.

METHODS

This was a retrospective study of all neonates admitted to Jos University Teaching Hospital (JUTH) with congenital CNS anomalies between October 2013 and September 2016. JUTH is a 500 bed-space tertiary level public hospital in Jos, North- Central Nigeria which serves as a referral center for many states in North-central Nigeria. The neonatal unit has 30 bed spaces and neonates with surgical conditions are usually co-managed with other specialties.

All neonates admitted with CNS congenital anomalies into the neonatal were identified from the admission registers. Maternal demographic and obstetric data were extracted from the case notes and admission registers. Gestational age was routinely calculated from last menstrual period or new Ballard score. The unit diagnostic protocol includes a CT scan of the brain and spinal cord. Birth defects were classified in line with the ICD 10 version 2016 classification.¹⁷ Data was entered into a Microsoft office Excel sheet and analyzed using SPSS 17.0. Descriptive data were presented in frequency tables.

RESULTS

There were 27 neonates admitted with congenital CNS anomalies during the period under review. Twenty-five (92.8%) had neural tube defects, 1 hydrocephalos and 1 anencephaly (Table 1).

Table 1: Types and frequencies of CNS anomalies in studied neonates.

Type of CNS anomaly	Frequency (n=27)	Percentage (%)
Neural tube defects	25	92.8
Hydrocephalos alone	1	3.7
Anencephaly	1	3.7

Mean maternal age was 28.2±5.9 years with 14 mothers (44.4%) aged between 20 and 29years and 14 mothers (44.4%) aged 30-39 years. Only one mother was aged ≥40 years. Twenty-two (81.5%) of the mothers attended antenatal care (ANC). None of the mothers booked in the 1st month and only 7 (25.9%) booked in the first trimester. Twenty-four (88.9%) mothers took folic acid during pregnancy. None of the mothers had documentation of folic acid use prenatally or during the first month of pregnancy. There were 11 (40.7%) home births with 14 (87.5%) of the 16 hospital births taking place in lower tier health facilities including PHCs. Vaginal deliveries accounted for 26 (96.3%) of the mode of delivery. An obstetric ultrasound scan was reported by one (3.7%) mother, but the scan did not detect the anomaly. Five (18.5%) of the mothers had HIV infection. All HIV mothers were on cotrimoxazole (CTX) and highly active anti-retroviral therapy (HAART) (Table 2).

Table 2: Maternal sociodemographic characteristics of neonates with CNS anomalies.

Variable	Frequency (n=27)	Percentage (%)
Mean Age of Mothers (±SD) in years	28.2± 5.9	
Age group of mothers		
20 -29 years	12	44.4
30-39 years	12	44.4
≥40 years	1	4.0
Missing	2	7.4
ANC booking		
Unbooked	5	18.5
<1 month	0	0
1-3 months	7	25.9
4-6 months	13	48.1
>6 months	2	7.4
Folic acid use in pregnancy		
Yes	24	88.9
No	3	11.1
Mode of delivery		
Vaginal delivery	26	96.3
Caesarean section	1	3.7
Place of birth		
Tertiary Hospital	2	7.4
Public secondary hospitals	5	18.5
Private hospitals	7	25.9
Primary health care centers	2	7.4
Home	11	40.7
HIV infection		
Yes*	5	18.5
No	21	81.5

*All the mothers were on HAART (Zidovudine (AZT)/Tenofovir TDF), lamivudine (3TC) and Nevirapine (NVP)/Efavirenz (EFZ) and on co-trimoxazole (CTX).

With regards to the neonates, there were 14 males with a male: female ratio of 1.1:1. The median age at

presentation was 2 (interquartile range 1, 8) days. The peak gestational age of the neonates was 38-40 weeks (26, 96.3%) and 19 (70.4%) had admitting weights of 2500-4000g. There was a history of birth asphyxia in 4 (14.8%) babies (Table 3).

Table 3: Characteristics of neonates with CNS malformations.

Variable	Frequency (n=27)	Percentage (%)
Median age in days (interquartile range)	2 (1.8)	
Sex		
Male	14	51.9
Female	13	48.1
Gestational age (in weeks)		
36-37	1	3.7
38-40	26	96.3
Weight on admission (g)		
<2500	7	25.93
2500-4000	19	70.37
>4000	1	3.70
Presence of asphyxia		
Yes	4	14.8
No	23	85.2

DISCUSSION

Neonates with CNS anomalies in our study were almost entirely term babies with predominantly (70%) normal weights. This proportion of term and low birth weight is similar to a report of 90.9% term births in a study in north-west, Nigeria but higher than 57% delivered at term and 52% being low birth weight reported in another study.^{18,19} The studied neonates generally presented within the 1st week of life which is much earlier than reported from studies in Lagos where mean age of presentation was 5.6 months.²⁰ In another study, 86% presented after the first month of life.²¹ The rather early presentation of the studied neonates may stem from the fact that the general public perception was that babies born with these major congenital defects require urgent care and that JUTH serves as the only neurosurgical referral site in the state where patients enjoy subsidized cost of care from the government. This compares favorably with reports from large cities where delay may be underpinned by seeking care in other health facilities and the high cost of health care.

In this study, most mothers with neonates with CNS anomalies were aged <35 years which mirrors the age group of mothers giving birth in the population and depicts simple mass effect and has been similarly reported in other studies.^{22,23} In one report, maternal age >35 year (and >40 years) was associated with reduced risk for congenital anomalies. This evidence generally challenges previous reports of increased risk of congenital anomalies with increasing maternal age.²⁴⁻²⁶

Also, it has been argued that the influence of increasing maternal age is mainly seen in chromosomal anomalies such as the trisomies.²⁷ Therefore, since the etiology of NTDs (the main form of CNS anomalies) are largely non-chromosomal, there may be a negligible influence of advanced maternal age. However, Czeizel A reported an increased risk of NTDs with advanced maternal age.²⁵ Factors such as dietary intake of folic acid and other vitamins and socioeconomic status may also account for higher incidence of CNS anomalies in younger women.¹⁶

Our study also reported that most of the mothers did not have antenatal care or booked at an age too late to influence development of CNS anomalies. Also, even though a high proportion had folic acid supplementation in pregnancy, it was started at an age too late to prevent CNS anomalies. This is the same pattern seen in other studies.^{16,28,29} Therefore for preventive interventions to be effective, they have to be targeted at women of child bearing age or the general population. Pre-conceptional folic acid supplementation has been shown to reduce NTDs but requires that the women are knowledgeable about it and that pregnancies are planned. However, this may be impracticable as a high proportion of pregnancies are unplanned and there is prevalent ignorance and poor health seeking behavior among women in LMICs. Therefore, the realistic community based approach to preventing NTDs will be food fortification as exemplified by national programs on fortification of grains with folic acid in Canada and USA.^{13,30,31}

Also, in our study, a good proportion (5/27) of neonates with CNS anomalies were born to mothers who were HIV infected. This finding raises the question of the possibility of maternal HIV infection being an independent risk factor for NTDs or the possibility of antiretroviral drugs or CTX increasing the risk of NTDs. CTX is a drug with anti-folate effect. Czeizel AE et al, in a case-control study evaluating the teratogenic effect of CTX in Hungarian women reported a significant increase in the incidence of major congenital anomalies mainly congenital heart defects among women who used CTX in pregnancy.³² Another study among HIV pregnant women reported that while single use of ARVs in first trimester was not associated with increased risk of congenital anomalies, the use of ARVs and anti-folate drugs in first trimester was associated with an increased risk of the same.³³ Use in pregnancy of anti-folate drugs has also been reported not to increase risk of NTDs.³⁴ However, that study had a small sample size with 18 NTDs among cases and 16 NTDs among control.

In spite of the fact that only 18.5% of index pregnancies were unbooked, over 40% had home delivery, none had prenatal ultrasonic diagnosis and only 7.4% were delivered in a tertiary hospital. These underscore, a population with poor health seeking behavior and a weak health system unable to identify and adequately care these high risk pregnancies.

CONCLUSION

Neonates with congenital CNS anomalies are commonly delivered to women younger than 35 years who commence folic acid supplementation when it is too late to prevent these anomalies and often have antenatal care and delivered at home or in health facilities not able to care for these high risk deliveries. Mothers with HIV infection contributed a significant proportion to these anomalies. Therefore, interventions promoting periconceptional folic acid supplementation, early prenatal diagnosis, maternal utilization of health care facilities with an efficient referral system are recommended to prevent and effectively manage CNS anomalies. It will also be worthwhile to further explore the interaction between HIV infection, ARVs and CTX and risk for CNS anomalies.

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