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Congenital Anomalies at Benue State University Teaching Hospital, Makurdi, Benue State: A Three-year Review

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Authors' contributions

Author MOO designed the study wrote the protocol and wrote the first draft of the manuscript. Authors GIT and AM performed the statistical analysis and managed analyses of the study. Authors II, AOS and ROA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To describe the pattern of congenital anomalies as seen in Makurdi, Benue State.
Study Design: Retrospective descriptive study.
Place and Duration of Study: Special Care Baby Unit(SCBU) of Benue State University Teaching Hospital from June 2013 to July 2016.
Methodology: This was data analysis through data review of three years from the past records. Data on an antenatal visit, maternal age and parity of mother, sex, gestational age, weight on admission, age at admission, a birth position of the baby, type of congenital anomaly, and outcome were extracted.
Results: A total of eight hundred and forty-three babies were admitted into the SCBU of the hospital over a three-year period from June 2013 to July 2016. Seventy-two of them were found

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with congenital anomalies giving a prevalence rate of 8.5%.43 (59.7%) were males, and 29(40.3%) were females.22(30.6%) of the babies had a birth weight <2500g while 50(69.4%) had a birth weight >2500g.The mean birth weight in (kg) was 2.73 SD $\pm$ 0.67, 95% CI (2.57, 2.88). Sixty-seven (93.0%) of the babies were delivered at a gestational age between 37-40 weeks. 52 (72.2%) mothers attended ANC while 20 (27.8%) of them did not.The most affected systems were the central nervous system(CNS)28(38.9%),musculoskeletal system (MSS) 21(29.2%), gastrointestinal tract (GIT) 21(29.2%),genitourinary system(GUS)5(6.9%) and cardiovascular system(CVS)2(2.8%).The highest occurring anomaly among the top three systems was, myelomeningocele 21 (29.7%) for CNS, anorectal malformation 14 (19.4) for GIT and gastroschisis 8 (11.1%) for MSS. The outcome showed that 39 (54.2%) of the cases were discharged, 6 (8.3%) were referred, 12 (16.7%) discharged against medical advice, and 15 (20.8%) died.

Conclusion: The study showed that CNS anomalies were the most common congenital malformations noted in the study. Therefore, adequate antenatal care and fortification of staple foods are advocated.

Keywords: Congenital anomalies; newborns; SCBU; Benue; Nigeria.

1. INTRODUCTION

Congenital anomalies are defined as abnormalities of body structure or function that are present at birth and are of prenatal origin [1]. Congenital anomalies are important causes of infant and childhood deaths, chronic illnesses and disability. An estimated 9 million infants are born annually with a serious birth defect [2-4]. According to the World Health Organization (WHO) in 2016, an estimated 303,000 newborns die within 4 weeks of birth every year worldwide due to congenital anomalies [5]. The most common and severe congenital anomalies are heart defects, neural tube defects and Down's syndrome. Although congenital anomalies may be the result of one or more genetic, infectious, nutritional or environmental factors, it is often difficult to identify the exact causes. Some congenital anomalies can be prevented. Vaccination, adequate intake of folic acid or iodine through fortification of staple foods or supplementation, and adequate antenatal care are just three examples of preventive methods. [1].

The prevalence of congenital anomalies varies from country to country and cannot be ascertained in Nigeria since most studies are hospital-based. It is believed that between 2-4% of live-born infants and 15-20% of stillbirths have a significant birth defect from data available from other parts of the world. [6-8]. Obu, H.A et al. in Enugu, South Eastern Nigeria gave a prevalence of congenital anomalies as 2.8% of total admissions in the neonatal unit during the study period [9] while Onankpa BO in a tertiary hospital in Northern Nigeria gave a prevalence of 2.1% [10].

The present study was carried out to assess the prevalence and pattern of congenital anomalies in Makurdi, Benue State. There is no formal documentation of congenital anomalies in this part of Nigeria.

2. METHODOLOGY

This retrospective descriptive study was carried out at the Special Care Baby Care Unit of Benue State University Teaching hospital (BSUTH), Makurdi, Benue State. The teaching hospital became operational in January 2012. Benue State has an estimated 2017 total population of 5,840,420 which is projected from 2006 population census and is a state in the middle belt region of Nigeria. The Special Care Baby Unit (SCBU) provides care for babies born within and outside the hospital and also receives referrals from the different parts of the state and surrounding states.

Study Design: We carried out a retrospective descriptive study in which a review of the records of all newborns admitted in the SCBU of BSUTH, Makurdi over a three-year period from June 2013 to July 2016 was done.

Data Collection: This was a data review of three years from the past records. The diagnosis of congenital anomaly was based on clinical evaluation and ultrasound examination when required as documented by doctors in the patient's folders. Genetic screening and echocardiography could not be done due to lack of equipment and qualified staff. Patients history including antenatal visit, family history of consanguinity, maternal age and parity of mother were obtained from these folders. Further

information obtained included the maternal age, gestational age, weight on admission, birth position of baby, type of congenital abnormality and treatment outcome. The pattern of congenital anomalies was classified according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Version for congenital malformations, deformations and chromosomal abnormalities [11]

Data Analysis: The data was analyzed using Epi Info Version 7.2. Proportions and 95% confidence interval (CI) were determined.

3. RESULTS AND DISCUSSION

A total of eight hundred and forty-three babies were admitted into the SCBU of the hospital over a three-year period from June 2013 to July 2016. Seventy-two of these examined were found with congenital anomalies giving a prevalence rate of 8.5%.

Table 1 shows the general characteristics of the neonates with congenital anomalies. Among the seventy-two studied, 43(59.7%) were males and 29(40.3%) were females. The age at admission was between one day and twenty-seven days with a median age at admission as 4.8 days. Sixty-seven (93.0%) of the babies were delivered at a gestational age between 37-40 weeks. A birth order of three to four accounted for 18(25.0%) of the total admissions.

Table 2 showed the mean age at admission was 4.79 days while the mean birth weight in (kg) was 2.73 SD $\pm$ 0.67, 95% CI (2.57, 2.88). The mean maternal age was 26.5 years SD$\pm$ (5.3) 95% CI 25.3-27.7.

Table 3 shows the pattern of congenital anomalies and the sex distribution, the most affected systems were the central nervous system (CNS) 28(38.9%), musculoskeletal system (MSS) 21(29.2%), gastrointestinal tract (GIT) 21(29.2%), genitourinary system (GUS) 5(6.9%) and cardiovascular system (CVS) 2 (2.8%).

Table 1. General characteristics of neonates

Characteristics	N= 72 (%)
Gender	
Male	43 (59.7)
Female	29 (40.3)
Age group at admission (days)	
0-6	56 (77.8)
7¬13	11 (15.3)
14-20	2 (2.7)
21-27	3 (4.2)
Early age admission (≤ 6 days)	56 (77.8)
Late age admission (> 6 days)	16 (22.2)
ANC	
Yes	52(72.2%)
No	20(27.8%)
Gestational age at birth	
≤ 36 weeks	5 (7.0)
≥ 37 weeks	67 (93.0)
Birth weight (g)	
1000-1900	10 (13.9)
2000-2900	39 (54.1)
3000-3900	19 (26.4)
4000-4900	4 (5.6)
Birth weight group (g)	
< 2500	22 (30.6)
≥ 2500	50 (69.4)
Birth order among siblings	
1¬2	41 (56.9
3¬4	18 (25.0)
5¬6	10 (13.9)
7¬8	2 (2.7)
9¬10	1 (1.4)
Group birth order among siblings	
≤ 4	59 (81.9)
> 4	13 (18.1)

Table 4 the highest occurring anomaly among the top three systems were myelomeningocele 21(75.0%) for CNS, anorectal malformation 14(19.4%) for GIT and gastroschisis 8 (11.1%) with the sex distribution included.

Table 2. Infant and maternal continuous variables measure

Variable	Mean	Median	Mode	Std. dev.	95% CI
Age at admission (days)	4.8	3	1	5.43	3.6, 6.0
Birth weight (g)	2727	2700	2500	671.3	2572, 2882
Position among siblings	2.7	2	1	1.9	2.3, 3.14
Maternal					
Maternal age (years)	26.5	26	26	5.3	25.3, 27.7
Parity	2.7	2	1	1.9	2.3, 3.14

Table 3. General distribution of anomalies by system

Systems	No (%)	Sex	
		Male N (%)	Female N(%)
Central nervous (CNS)	28(38.9)	18(64.3)	10(35.7)
Musculoskeletal (MSS)	21(29.2)	7 (33.3)	14(66.7)
Gastrointestinal Tract (GIT)	21(29.2)	13 61.9	8 38.1
Genitourinary (GUS)	5 (6.9)	4 80)	1 (20)
Cardiovascular (CVS)	2 (2.8)	1 (50)	1 (50)
Skin	1 (1.3)	1 (100)	0(0.0)
Chromosomal	1 (1.3)	1 (100)	0(0.0)
Single system involvement	65(90.3)	41(63.1)	24(36.9)
Multiple systems involvement	7 (9.7)	2 (28.6)	5 (71.4)
Type of anomaly			
Major	70(97.2)	42 (60)	28 (40)
Minor	2 (2.8)	1 (50)	1 (50)

Table 4. Frequency distribution of major systems and associated diagnosis

		Sex	
System/Diagnosis	**No (%)**	**Male N (%)**	**Female N (%)**
CNS			
Myelomeningocele	21(75.0)	12 (52.1)	9 (42.9)
Spina bifida	3 (10.7)	3 (100)	0(0.0)
Meningoencaphalocele	2 (7.1)	2 (100)	0(0.0)
Frontonasal encephalocele	1 (3.6)	1 (100)	0(0.0)
Congenital hydrocephalus	1 (3.6)	0(0.0)	1 (100)
Total	**28 (100)**		
MSS			
Gastroschisis	8 (38.1)	4 (50.0)	4 (50.0)
Omphalocele major	4 (19.0)	1 (25.0)	3 (75.0)
Omphalocele minor	3 (14.3)	1 (33.3)	2 (66.7)
Bilateral talipes equinovarus	2 (9.5)	0(0.0)	2 (100.0)
Phocomelia	2 (9.5)	1 (50.0)	1 (50.0)
Thumb hypoplasia	1 (4.8)	0(0.0)	1(100.0)
Cervicofacial teratoma	1 (4.8)	0(0.0)	1(100.0)
Talipes deformity	1 (4.8)	1 (100.0)	0(0.0)
Total	**21 (100)**		
GIT			
Anorectal malformation	14(66.7)	9 (64.3)	5 (35.7)
Jejunal Atresia	2 (9.5)	0(0.0)	2(100.0)
Oesophageal atresia	2 (9.5)	2 (100.0)	0(0.0)
Tracheoesophageal fistula	2 (9.5)	2 (100.0)	0(0.0)
Bilateral cleft lip and palate	1 (4.8)	0(0.0)	1(100.0)
Total	**21 (100)**		
UGS			
Posterior urethral valve	3 (60.0)	3 (100.0)	0(0.0)
Hypospadias	2 (40.0)	2 (100.0)	0(0.0)
Total	**5 (100)**		

Table 5 shows the female neonates were about five times more likely to develop MSS anomalies compared to males OR 4.8, CI 1.6-14.3 P-value 0.007 and about equal risk of GIT anomalies.

Table 6 showed the treatment outcome 39(54. 2%) were discharged, 6(8.3%) referred, 12(16.7%) discharged against medical advice and 15(20.8 %) died.

The prevalence of congenital anomalies in the present study was 8.5% of total admissions in the neonatal unit over the study period. This is much higher than that reported in Enugu, South-

Table 5. Association of gender and major systems in congenital anomalies

Gender	System Involved		OR	95% CI	p-value
	No(%)	No (%)			
Sex	CNS Anomalies				
Female	10 (34.5)	19 (65.5)			
Male	18 (41.9)	25 (59.1)	0.7	0.2- 1.9	0.7
	GIT Anomalies				
Female	8 (27.6)	21 (72.4)			
Male	13 (30.2)	30 (69.8)	0.9	0.3- 2.5	1
	MSS Anomalies				
Female	14 (48.2)	15 (51.8)			
Male	7 (16.3)	36 (83.7)	4.8	1.6- 14.3	0.007

East Nigeria 2.8% [9], 2.1% in Sokoto [10] and 2.2 % in Calabar [12]. It is however lower than 30.9% reported by Eluwa et al in Cross river state of Southern Nigeria [13]. Similar studies in other parts of the world reported a prevalence of 2.5% in Egypt [14] and 6.8% [15] in India. A high prevalence of congenital anomalies of about 13% has also been reported among neonates admitted in neonatal intensive care units in low income countries [16]. The prevalence rate observed in this study does not reflect the picture in the general population as this was purely a hospital based study. The high prevalence in this study could be attributed to the fact that our hospital is the only referral tertiary hospital in our region and capable of providing Paediatric surgical care.

The three most affected systems in this study was the CNS followed by the MSS and GIT (Table 4). Our findings are similar to those reported in Tanzania, Kenya and India where CNS, MSS and GIT were the most affected systems. [8,17,18] Amongst the CNS, myelomeningocele was the commonest for the CNS, anorectal malformation for GIT and gastroschisis for MSS. [8,17,18]. Similar studies have reported that the MSS followed by the CNS systems are the body systems most commonly affected. [14,19] This is at variance with other studies which reported the GIT system having the highest occurrence [15,20]. Male preponderance was more in our study as reported in other studies [10,18,21]. Other workers have reported a female preponderance [22]. In this present series, we were able to establish the fact that the incidence of congenital MSS malformations was found to be higher in females compared to males and this was statistically significant(p=0.0007). Similar findings were reported by Gupta et al. [23]. This finding has raised some speculations and is thus recommended that sex distribution should be studied in every congenital malformation separately.

Table 6. Treatment outcome and some associated diagnosis

Outcome/diagnosis	No. (%)
Discharged	**39 (54.2)**
Myelomeningocele	14 (35.9)
Anorectal Malformation	10 (25.6)
Omphalocele Minor	3 (7.7)
Referred	**6 (8.3)**
Spina Bifida	2 (33.3)
Gastroschisis	2 (33.3)
Congenital Hydrocephalus	1 (16.7
Discharged against medical advice	**12 (16.6)**
Myelomeningocele	6 (50.0)
Anorectal Malformation	2 (16.7)
Phocomelia	1 (8.3)
Died	**15 (20.8)**
Gastroschisis	3 (20.0)
Oesophageal Atresia	2 (13.3)
Anorectal Malformation	2 (13.3)

In this study, the incidence of congenital malformations was significantly higher among the normal birth weight babies in comparison with low birth weight babies (LBW). This is due to the fact that very preterm babies born in our region don't usually survive and may not live long to present to the hospital. The association of LBW and malformations has been documented in other studies [14,24]. Regarding gestational age of the malformed neonates, we found an increased incidence of CAs among the term babies than preterm babies unlike Gupta et al. who documented a higher incidence among preterm neonates. [14]. The mortality was high in this study, 15(20.8%) of the neonates died. This could be related to the fact that some of them presented late and with complications and as a result outcome after surgery was poor. Adeboye et al. in their study recorded a low mortality rate

of 2.2% [25]. Regarding the other outcomes 39(4.2%) were discharged after repairing the anomaly, 6(8.3%) referred and 12(16.7%) discharged against medical advice.

The limited investigative ability at our hospital made it impossible to make some diagnosis. A retrospective study of this nature is bound to be faced with challenges as the investigators are not fully in charge of the processes. Retrieving patients' folders from the hospital records department was a problem as some of the folders retrieved contained inadequate information and this affected the quality of the study.

4. CONCLUSION

This hospital based retrospective descriptive study illustrated the pattern of congenital anomalies and their outcome in a tertiary institution in North central Nigeria. Data from this study showed that CNS anomalies were the most common congenital anomaly therefore adequate ANC and the fortification of staple foods should be promoted. The high prevalence of congenital anomalies in our facility calls for special attention to the problem. It is very important to develop strategies for prevention, early detection and timely management of the problem.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The analyses presented in this report consisted only of secondary unlimited data analysis, no contact with subjects occurred. However, the protocol for this study was reviewed, approved and monitored by the ethical committees of Benue State University Teaching Hospital Makurdi.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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