Prevalence, Pattern and Outcome of Congenital Anomalies among Babies admitted in a Neonatal Unit in Southern Nigeria

ABSTRACT

Aim: This study was carried out to determine the prevalence, pattern and outcome of congenital anomalies among neonates admitted in the neonatal unit of the Rivers State University Teaching Hospital.

Study Design: A prospective study

Place and Duration of Study: This study was carried out in the Special Care Baby Unit of the Rivers State University Teaching Hospital over a three-year period from 1st June 2018 to 31st May 2021.

Methodology: A questionnaire was used to collect data on the babies with congenital anomalies from their mothers/caregivers. Data was analysed using SPSS version 23.

Result: The prevalence of congenital anomalies in the study period was 5.5%, more preponderant among males 48(50.5%), term babies 56(58.9%) and among singleton pregnancies 82(86.3%). Most of the anomalies were major defects 66(69.5%), occurred more frequently in the musculoskeletal system 36 (33%), cardiovascular (13.8%) and urogenital systems (13.8%). Hypertension (30.3%) and diabetes mellitus in pregnancy were the commonest complications of pregnancy found among mothers whose babies had congenital anomalies. Seven (7.4%) babies with birth anomalies died in the study. There was no significant association of sex, gestational age, birth weight with congenital anomalies (*P* value > .05)

Conclusion: The prevalence of congenital anomalies in this study was low being 5.5%. Although majority of the babies had major defects, the neonatal outcome was fair with mortality of 7.4%.

Keywords: Congenital anomalies, Prevalence, Pattern, Outcome, Neonatal unit, Nigeria.

INTRODUCTION

Every parent desire to have a perfectly normal child after the 9 months of gestation. However, incidences of children delivered with anomalies have been documented in literature from the 16th century and over the years, its' existence have been well defined and documented [1].

Congenital anomalies (CA) in children have been defined as functional and/or structural abnormalities or defects that occurred in the child prenatally during the intrauterine life and identified before birth during prenatal screening exercises, at birth or later at infancy [2,3].

These defects can be classified as major defects (which are usually severe and could cause long term morbidity or mortality) or less debilitating minor defects. They could also be classified as external defects which are obviously seen on the child or internal defects which are detected by physicians during examination or investigation of the child [3,4]. Examples of external defect are anencephaly, spina bifida, omphalocele, cleft lip and palate among others. Internal defects on the other hand include congenital heart diseases, tracheoesophageal fistula, intestinal stenosis or atresia among others [3].

The causes of congenital anomalies or birth defects are multifactorial ranging from environmental teratogens to nutritional, genetic anomalies, infectious causes, drugs, alcohol, maternal illnesses in pregnancy (DM), advanced maternal age, consanguinity among

others. Sometimes the cause of the birth defect is obvious and readily detected and at other times, the cause may remain unknown. Some of the causes can be prevented such as food fortification programs with folic acid to prevent neural tube defects, vaccination with rubella vaccine prevents congenital rubella syndrome, early diagnosis and treatment of sexually transmitted diseases, good antenatal care, avoidance of alcohol and exposure to teratogenic agents such as pesticides in pregnancy and the control of diabetes in pregnancy [2,3,4,5].

Congenital anomalies contribute significantly to childhood morbidity and mortality. Besides, it is a contributor to long term disability with negative impact on the child, the family, the finances of the family, the health sector and the global society at large [2,3,5]. In 2016, the world health organization reported that 295,000 children died in the neonatal period from Congenital anomalies [2]. The prevalence rates of birth defects are variable in different regions of the world. Adane et al [5] in their systematic review and metanalysis of births in sub-Saharan Africa reported a prevalence of 20.4 per 1,000 live births. In Nigeria, hospital-based studies have reported prevalence rates between 0.43% to 6.3% [4,6,7,8,9].

The prevalence of congenital anomalies is not only variable across different regions but also over time in the same location. The reason for this may be as a result of increasing insults to the developing foetus, an increase in the ability in making diagnosis of such defects as a result of improved skills among health care workers, improved screening and diagnostic tools, implementation of various screening programs and improved reporting [10,11]. In Denmark, the prevalence of multiple congenital anomalies in babies increased from 18.5 per 1,000 live births before the implementation of a screening program to 21.9 per 1,000 live births 10 years after the implementation of the program [12]. In Rivers State, Nigeria, a ten-year (1993-2003) retrospective review of birth defects in the University of Port Harcourt Teaching Hospital (UPTH) was 0.4% and 0.2% in the Braithwaite Memorial Specialist Hospital, now the Rivers State University Teaching Hospital [13]. A decade later, the prevalence in UPTH had increased to 2.07%. Seventeen years after the first study, no other study have been carried out to ascertain the trend and pattern of congenital anomalies in the Rivers State University Teaching Hospital. This study was therefore carried out by the researchers to bridge the gap.

MATERIALS AND METHODS

This was a prospective study carried out over a three-year period between 1st June 2018 and 31st May 2021.

The study was carried out in the Special Care Baby Unit (SCBU) in the Rivers State University Teaching Hospital (RSUTH). All sick babies aged 0-28 days at the time of presentation were admitted into the SCBU, a 30-bed facility managed by a team of 3 Paediatric neonatologists, senior and junior residents, house officers, neonatal nurses and other ancillary staff. It operates a 24-hour service with the complementary staff working in various shifts. The unit serves not just the hospital community, but it is also a referral centre for sick babies from secondary and primary health centres in Rivers State, Nigeria.

The study population was made of all children aged 0-28days admitted in the special Care baby unit in the Rivers State University Teaching Hospital.

A convenient sampling method was used to recruit participants in the study. All babies with congenital anomalies admitted into the SCBU were consecutively recruited into the study.

All babies aged 0-28days at admission into the SCBU and those whose mothers gave informed consent were recruited. Babies whose mothers refused to participate in the study were excluded from the study.

Ethical approval from the study was obtained from the Ethics Committee of the Hospital.
At the beginning of the study, the researchers trained the residents and the house officers posted to the unit on the study protocol and use of the research questionnaire. This training was repeated for all new residents and house officers that were posted to the unit during the study period.
A questionnaire was developed to collect data for the study and was pretested before the commencement of the study. Information obtained with the questionnaire included demographic data from the baby and mother, pregnancy and delivery history, complications of pregnancy, the consumption of alcohol and cigarettes during pregnancy. The baby was then weighed and examined thoroughly from head-to-toe for the presence of external or visible birth defects by the junior and senior resident and findings documented in the research instrument. Each child is reviewed within 24 hours of admission by a consultant neonatologist to confirm diagnosis. The babies were thereafter admitted and requested to carry out appropriate diagnostic tests and followed up in the unit. Babies with no obvious external anomalies but who developed symptoms and signs suggestive of an internal congenital anomaly were sent for appropriate diagnostic tests and the results recorded in the questionnaire.
All babies with birth defects were given appropriate care and treatment involving relevant specialist care. Those that required treatment modalities that were not available in our hospital were referred to other treatment centres for optimal care. Babies that were managed in SCBU were monitored daily during the admission period and the outcome of the baby recorded in the questionnaire at the time of discharge or demise of the baby.
All data were recorded in an Excel spread sheet and analysed with statistical Package for Social Sciences Version 23. All variables were described using frequency and percentages. Fishers' Exact test was adopted to determine the association between selected congenital anomalies and child's socio-demographic features and other variables. The test of association was said to be significant if the *P* value was less than .05 at 95% confidence interval.

RESULT

Characteristics of the Study Population

There were 1,732 admissions during the period of study of which 95 had congenital anomalies, giving a prevalence rate of congenital anomalies among babies admitted in the neonatal unit of RSUTH as 5.5%. Majority of the babies with congenital anomalies presented in the first 6 hours of life 57 (60.0%) with a median age at presentation of 3 hours and slight male preponderance 48 (50.5%). Most were born at gestational age of 37-42 weeks, 56 (58.9%) with mean gestational age of 37.3 $\pm$ 5.0 weeks. Birth weights of 2.5-3.9kg ,52 (54.8%) was commonest (mean birth weight being 2.8 $\pm$ 0.9kg) with vertex presentation predominating 78 (82.1%). Caesarean Section 63 (66.3%) was the predominant mode of delivery with most being singleton 82 (86.3%), Table 1.

Table I: Characteristics of the Study Population

Variables	**Frequency, n=95**

(%)	
Age at Presentation (hours)	
< 6	57 (60.0)
7-12	14 (14.7)
> 12	24 (25.3)
Sex	
Male	48 (50.5)
Female	47 (49.5)
Gestational Age (weeks)	
< 37	34 (35.8)
37-42	56 (58.9)
> 42	5 (5.3)
Birth Weight (kg)	
< 2.5	31 (32.6)
2.5-3.9	52 (54.8)
≥ 4.0	12 (12.6)
Type of Presentation	
Vertex	78 (82.1)
Breech	17 (17.9)
Mode of Delivery	
Spontaneous Vertex Delivery	31 (32.6)
Caesarean Section	63 (66.3)
Instrumental	1 (1.1)

Number of Fetus	
Singleton	82 (86.3)
Multiple	13 (13.7)

Maternal Socio-Demographic Characteristics

The mothers of babies with congenital anomalies were mainly of age group 18-35years, 65 (68.4%) with mean age of 32.2 $\pm$ 5.4years and mostly had secondary level of education 47 (49.5%). Majority of the mothers were into business/trading 35 (36.8%), were married 85 (94.4%) and were multiparous 40 (52.6%), Table II.

Table II: Maternal Socio-Demographic Characteristics

Variables.	**Frequency, n=95(%)**
Maternal Age (years)	
18-35	65 (68.4)
> 35	30 (31.6)
Maternal Educational level	
No formal education	1 (1.0)
Primary	2 (2.1)
Secondary	47 (49.5)
Tertiary	45 (47.4)
Maternal occupation	
Civil Servants	5 (5.3)
Public Servants	17 (17.9)
Business/Trader	35 (36.8)
Health workers/Professionals	8 (8.4)
Artisans	9 (9.5)
Unemployed/Housewives/Students.	21 (22.1)

Marital Status, n=90	
Un-married	5 (5.6)
Married	85 (94.4)
Parity, n=76	
Primiparous	36 (47.4)
Multiparous	40 (52.6)

Maternal Pregnancy Complications

The commonest pregnancy complication among mothers whose babies had congenital anomalies were hypertension (30.3%), Diabetes mellitus (18.2%) and Oligohydramnios (18.2%) while the least was smoking (3.3%), Figure 1.

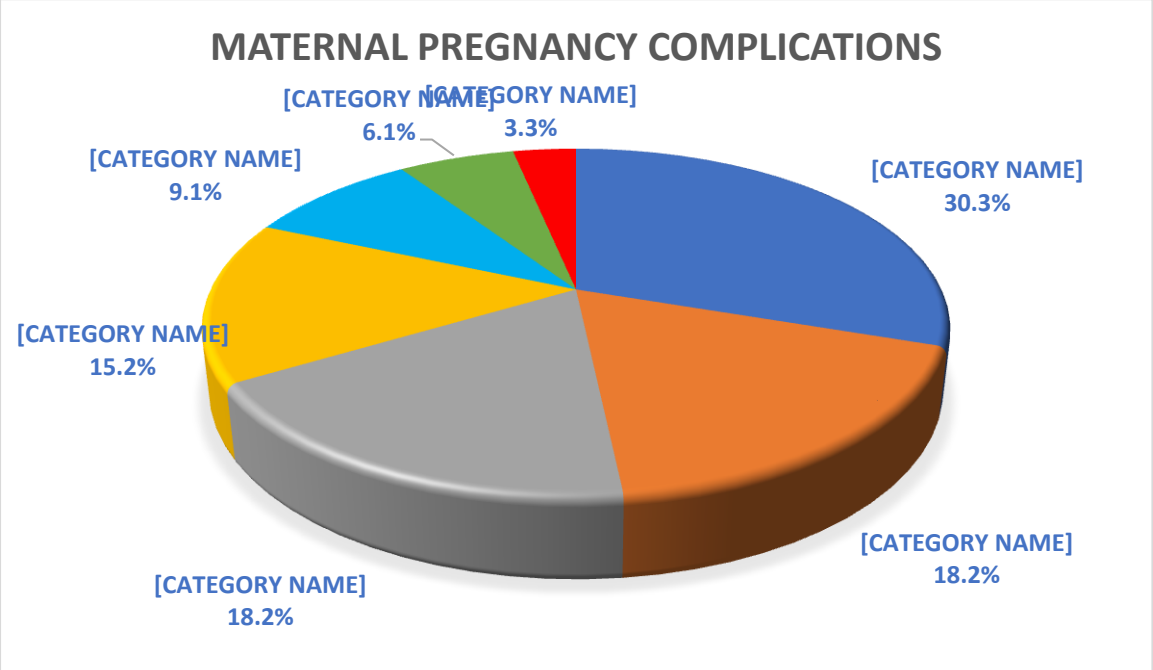


Figure 1: Maternal Pregnancy Complications

Pattern of Congenital Anomalies

Of 95 babies with congenital anomalies, 83 (87.4%) had single defects while 12 (12.6%) had multiple defects. Sixty-six (69.5%) babies had major defects while 29 (30.5%) had minor defects.

Anomalies of the musculoskeletal system was the commonest, 38 (34.2%) followed by anomalies of the cardiovascular system 15 (13.5%) and urogenital system 15(13.5%) while the least were anomalies of the integument 5 (4.5%) and orofacial anomalies 5 (4.5%). The

pattern of the anomalies of the cardiovascular system were not highlighted as Echocardiography was not done, Table III.

Table III: Pattern of Congenital Anomalies

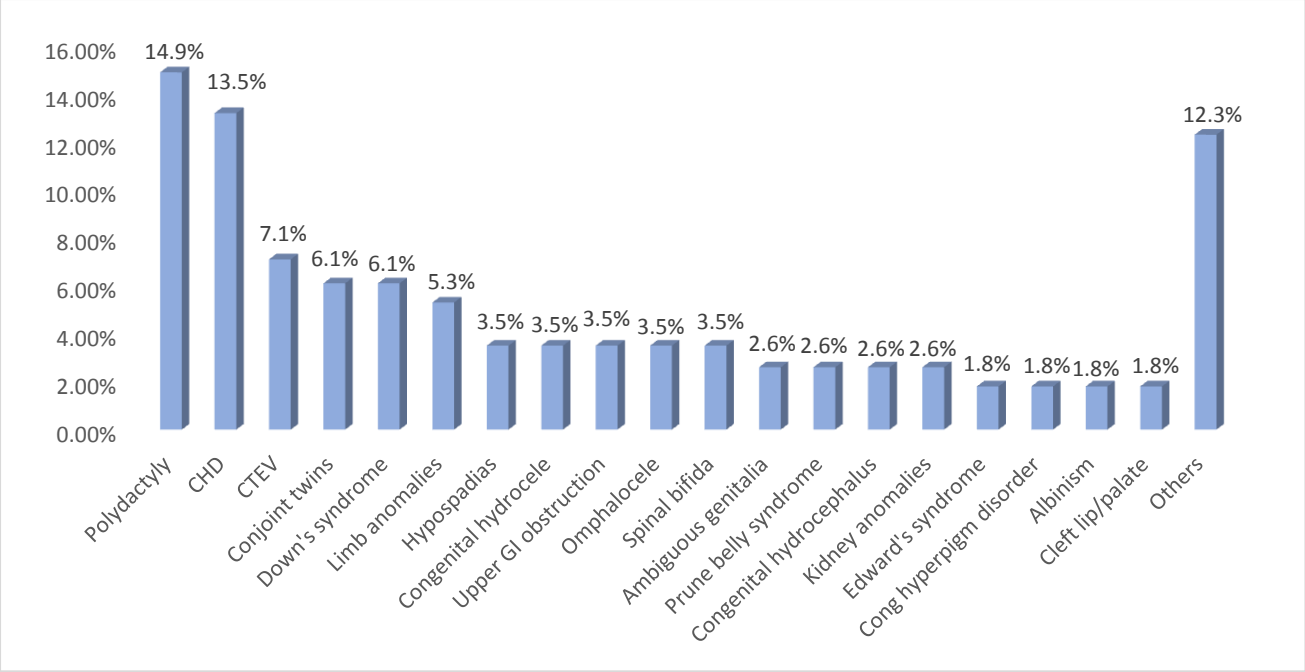
Variables	Frequency, n=114 (%)
Musculoskeletal System, n=38 (34.2%)	
Polydactyly.	17 (44.7)
Congenital talipes equinovarus	8 (22.2)
Upper/Lower limb anomalies	6 (16.6)
Conjoint twins	2 (5.6)
Developmental aplasia of the hip	2 (2.8)
Osteogenesis imperfecta	2 (2.8)
Syndactyl	1 (2.8)
Cardiovascular system, n=15 (13.5%)	
Urogenital System, n=15 (13.5%)	
Hypospadias	4 (26.7)
Congenital hydrocele	4 (26.7)
Ambiguous genitalia	3 (20.0)
Kidney anomalies	3 (20.0)
Epispadias	1 (6.6)
Gastrointestinal tract/abdominal anomalies, n=13 (11.7%)	
Upper GI obstruction	4 (30.8)
Omphalocele	4 (30.8)
Prune belly syndrome	3 (23.0)
Lower GI obstruction	1 (7.7)

Tracheoesophageal fistula	1 (7.7)
Syndromes, n=11 (9.9%)	
Down's syndrome	7 (63.6)
Edward's syndrome	2 (18.2)
Crouzon syndrome	1 (9.1)
Beckwith welderman syndrome	1 (9.1)
Central nervous system, n=9 (8.1%)	
Spinal bifida	4 (44.5)
Congenital hydrocephalus	3 (33.3)
Encephalocele	1 (11.1)
Holoprocencephaly	1 (11.1)
Integumentary system, n=5 (4.5%)	
Congenital hyperpigmentation disorder	2 (40.0)
Albinism	2 (40.0)
Collodion baby	1 (20.0)
Orofacial, n=5 (4.5%)	
Cleft lip/palate	2 (40.0)
Congenital arrhinia	1 (20.0)
Cystic hygroma	1 (20.0)
Ear malformation	1 (20.0)

GI=Gastrointestinal

Common Congenital Anomalies

The commonest individual congenital anomalies observed were polydactyl (14.9%), congenital heart disease (13.5%) and congenital talipes equinovarus (7.1%), Figure 2.



CHD=Congenital heart disease, CTEV=Congenital talipes equinovarus, GI=Gastrointestinal

Figure 2: Common Congenital Anomalies

Outcome of Babies with Congenital Anomalies

Of 95 babies with congenital anomalies, 59 (62.1%) were discharged home, 7 (7.4%) died, 11 (11.6%) were discharged home against medical advice while 18 (18.9%) were referred to other health facilities, Table IV.

Table IV: Outcome of Babies with Congenital Anomalies

Variables	Frequency, n=95(%)
Outcome	
Discharged	59 (62.1)
Died	7 (7.4)
DAMA	11 (11.6)
Referred	18(18.9)

DAMA=Discharged against medical advice

Association between Socio-Demographic Characteristics and Outcome of Babies with Congenital Anomalies in the Musculoskeletal, Cardiovascular and Urogenital systems

Sex, gestational age and birth weight of babies were not significantly associated with congenital anomalies of the musculoskeletal, cardiovascular and urogenital systems (*P* value > .05).

Maternal age > 35years was significantly associated with congenital anomalies of the urogenital system (*P* value=.022) while unmarried marital status was significantly associated

with cardiovascular system anomalies (*P* value=.020). There was significant association of outcome in babies with musculoskeletal (*P* value <.001) and urogenital anomalies (*P* value .013), Table V.

Table V: Association between Socio-Demographic Characteristics and Pattern of Congenital Anomalies in the Musculoskeletal, Cardiovascular and Urogenital systems

Variables	**MSS**			**CVS**			**Urogenital**		
	Yes (%)	**No(%)**	**P value**	**Yes(%)**	**No(%)**	**P value**	**Yes(%)**	**No(%)**	***P* value**
Sex									
Male	21(55.3)	27(47.4)	.532	6(40.0)	42(52.5)	.412	8(61.5)	40(48.8)	.552
Female.	17(44.7)	30(52.6)		9(60.0)	38(47.5)		5(38.5)	42(51.2)	
GA (weeks)									
< 37	13(34.2)	21(36.8)	.830	7(46.7)	27(33.8)	.386	3(23.1)	31(37.8)	.367
≥ 37	25(65.6)	36(63.2)		8(53.3)	53(66.3)		10(76.9)	51(62.2)	
Birth weight (kg)									
< 2.5	13(34.2)	18(31.6)	.636	7(46.7)	24(30.0)		6(46.2)	25(30.5)	.306
2.5-3.9	19(50.0)	33(57.9)		5(33.3)	47(58.8)	.133	7(53.8)	45(54.9)	
≥ 4.0	6(15.8)	6(10.5)		3(20.0)	9(11.3)		0(0.0)	12(14.6)	
Maternal age (years)									
18-35	27(71.1)	38(66.7)	.822	10(66.7)	55(68.8)	1.000	5(38.5)	60(73.2)	**.022**
> 35	11(28.9)	19(33.3)		5(33.3)	25(31.3)		8(61.5)	22(26.8)	
Marital status									
Unmarried	0(0.0)	5(9.4)	.075	3(23.1)	2(2.6)	**.020**	0(0.0)	5(6.3)	1.000
Married	37(100.0)	48(90.6)		10(76.9)	75(97.4)		11(100.0)	74(93.7)	

Duration of stay(days)									
1-10	25(65.8)	40(70.2)	.660	6(40.0)	59(73.8)	**.015**	9(69.2)	56(68.3)	1.000
> 10	13(34.2)	17(29.8)		9(60.0)	21(26.3)		4(30.8)	26(31.7)	
Outcome									
Discharged	30(78.9)	29(50.9)		9(60.0)	50(62.5)		5(38.5)	54(65.9)	
Died	3(7.9)	4(7.0)	**<.001**	1(6.7)	6(7.5)	.865	4(30.8)	3(3.7)	**.013**
DAMA	5(13.2)	6(10.5)		1(6.7)	10(12.5)		1(7.7)	10(12.2)	
Referred	0(0.0)	18(31.6)		4(26.7)	14(17.5)		3(23.1)	15(18.3	

GA=Gestational age; DAMA=Discharged against medical advice

Association between Socio-Demographic Characteristics and Outcome of Babies with Congenital Anomalies in the Gastrointestinal, Central Nervous Systems and babies with Syndromes

Sex, gestational age, birth weight, maternal age and marital status had no significant association with congenital anomalies of the gastrointestinal tract, central nervous system and babies with syndromes (*P* value >.05).

Babies with anomalies of the gastrointestinal tract had significantly longer duration of stay, > 10 days (*P* value=.016). There was significant association of outcomes in babies with anomalies of the gastrointestinal (*P* value=.004) and central nervous systems (*P* value=.015), Table VI.

Table VI: Association between Socio-Demographic Characteristics and Outcome of Babies with Congenital Anomalies in the Gastrointestinal, Central Nervous Systems and babies with Syndromes

Variables	**GIT**			**CNS**			**Syndromes**		
	Yes(%)	**No(%)**	**P value**	**Yes(%)**	**No(%)**	**P value**	**Yes(%)**	**No(%)**	***P* value**
Sex									
Male	7(58.3)	41(49.4)	.759	4(44.4)	44(51.2)		4(36.4)	44(52.4)	.355
Female	5(41.7)	42(50.6)		5(55.6)	42(48.8)	.740	7(63.6)	40(47.6)	
GA(weeks)									

< 37	6(50.0)	28(33.7)	.338	3(33.3)	31(36.0)	1.000	3(27.3)	31(36.9)	.741
≥ 37	6(50.0)	55(66.3)		6(66.7)	55(64.0)		8(72.7)	53(63.1)	
Birth weight(kg)									
< 2.5	3(25.0)	28(33.7)		4(44.4)	27(31.4)		4(36.4)	27(32.1)	
2.5-3.9	9(75.0)	43(51.8)	.278	5(55.6)	47(54.7)	.619	6(54.5)	46(54.8)	1.000
≥ 4.0	0(0.0)	12(14.5)		0(0.0)	12(14.0)		1(9.1)	11(13.1)	
Maternal age(years)									
18-35	7(58.3)	58(69.9)	.509	4(44.4)	61(70.9)	.135	6(54.5)	59(70.2)	.315
> 35	5(41.7)	25(30.1)		5(55.6)	25(29.1)		5(45.5)	25(29.8)	
Marital status									
Unmarried	1(9.1)	4(5.1)	.487	0(0.0)	5(6.1)	1.000	0(0.0)	5(6.3)	1.000
Married	10(90.9)	75(94.9)		8(100.0)	77(93.9)		11(100.0)	74(93.7)	
Duration of stay(days)									
1-10	12(100.0)	53(63.9)	**.016**	7(77.8)	58(67.4)	.715	8(72.7)	57(67.9)	1.000
> 10	0(0.0)	30(36.1)		2(22.2)	28(32.6)		3(27.3)	27(32.1)	
Outcome									
Discharged	4(33.3)	55(66.3)		2(22.2)	57(66.3)		7(63.6)	52(61.9)	
Died	1(8.3)	6(7.2)	**.004**	2(22.2)	5(5.8)	**.015**	1(9.1)	6(7.1)	.653
DAMA	0(0.0)	11(13.3)		1(11.1)	10(11.6)		2(18.2)	9(10.7)	
Referred	7(58.3)	11(13.3)		4(44.4)	14(11.3)		1(9.1)	17(20.2)	

GA=Gestational age; DAMA=Discharged against medical advice

DISCUSSION

The prevalence rate of congenital anomalies of 5.5% among babies admitted into the neonatal unit of the Rivers State University Teaching Hospital was comparable with the 5.51%, 6.3% and 6.9% documented in Kano [14], Ogbomosho [9] and Ile-Ife [15] in Nigeria respectively but higher than the 4.4%, 2.8%, 2.2%, 0.7%, 0.4% and 0.36% documented in Kano [7], Akwa Ibom [16], Anambra State [17], Enugu [18],[19] all in Nigeria and Iraq [20]

respectively. It was however lower than the 11.1%, 12.2%, 13.9% and 19.4% reported in Ibadan [21], Yenagoa [22], Maiduguri [23] in Nigeria and Kenya [24] respectively. This varying prevalence rates could be attributed to the difference in geographic locations which suggest genetic and environmental risk factors, variation over time as well as different methodologies used. The relatively low prevalence of congenital anomalies in the present study could be because only inborn neonates who were all booked cases were included in the study unlike most other studies were both inborn and outborn babies were recruited. In addition, still births and abortuses were not included in the present study as previous studies [25],[26] have shown CA to be higher among still births and abortuses. The prevalence of CA in the present study may have thus significantly underestimated the actual value being also a hospital-based study. It is pertinent to note that the high prevalence of 13.9% reported in Maiduguri [23], Nigeria was attributed to the low antenatal care in the North as well as the possibility of consanguineous relationships.

There was slight male preponderance in the present study. Similar male preponderance was also documented by Ekwunife et al [17], Ajao & Adeyemo [9], Ayede et al [27], Mushuda et al [28], Saib et al [29], Abdolahi et al [30] and Abdou et al [31]. In contrast, female preponderance was documented by Tunde-Oremode et al [22] and Wagathu & Ongeso [24]. The reason for this difference could not be ascertained.

More than half of the neonates with CA had birth weights greater than 2.5kg as also observed in other parts of Nigeria [9],[18] and Africa [24][29]. This finding in the present study is not surprising as most neonates with CA were delivered at term ie gestational age of 37-42weeks. Another study [32] however documented neonates with birth weights less than 2.5kg accounting for more CA. In the latter study, close to a third of the neonates were delivered prematurely at gestational age of less than 37weeks.

Mothers of neonates with CA were mostly within the age group of 18-35years in the present study. Similarly, Mushuda et al [28] in Tanzania observed 76.7% of mothers whose babies had CA were within the age group of 20-35years while Wagathu & Ongeso [24] in Kenya observed 88.4% of the mothers were within the age group of 16-35years. Interestingly, Ekwunife et al [17] in Anambra State in Nigeria reported a significant association of lower maternal age with CA. Contrary to the above findings, Ekwochi et al [18] in Enugu reported maternal age $\geq$ 35years being more likely to have babies with CA (P value < 0.05). The reason is not far-fetched as 45% of CA in the latter study was syndromic of which 47% had Down's syndrome which has been associated more with maternal age > 35years. This is because increased maternal age is associated with increase in chromosomal meiotic errors [33].

The commonest pregnancy complication in mothers of neonates with CA in the present study was hypertension (30.3%) followed by Diabetes mellitus (18.2%) and oligohydramnios (18.2%). Hypertension being the commonest pregnancy complication was also reported by Takai et al [7], Ekwunife et al [17], Abdou et al [31] and Wagathu & Ongeso [24] in Kano Northern Nigeria, Anambra Eastern Nigeria, Egypt and Kenya respectively. Interestingly, Ramakrishnan et al [34] in their systematic review found an association between maternal hypertension and cardiovascular system anomalies. Abdou et al [31] also reported that mothers of children with CA who had hypertension during pregnancy were significantly more than mothers in the control group. Findings of another study [35] suggested that antihypertensives led to an additional increase in the risk of congenital anomalies. In addition, Nelson et al [36] in Texas documented an increased rate of CA in mothers with pre-eclampsia. Pre-gestational Diabetes mellitus has been found to be one of the main

causes of CA accounting for up to 9-fold increase when compared to mothers without Diabetes mellitus [37]. In contrast, ingestion of herbs accounted for 41.0% of CA as reported by Oluwafemi & Abiodun [38] in Ondo State, Western Nigeria unlike in the present study where only 9.1% took herbs. This could be due to the difference in geographic locations and varying traditional practices. Smoking which was the least common (3.3%) in the present study, accounted for up to 11.0% in a study in Tanzania [28] whereas in Anambra State [17], Eastern Nigeria and Kenya [24] none of the women smoked cigarette. This is not a surprising finding as smoking is not a common habit in Africa as compared to the Western countries.

Majority (87.4%) of all the CA in the present study were single defects as observed in other studies [7,9,17,22,27,29,38]. Major defects in the present study accounted for more than 2/3rds (69.5%) of the CA admitted in the neonatal unit in the present study while in Anambra State [17] Eastern Nigeria, major anomalies accounted for up to 93.5%. This difference could be attributed to varying admission criteria in the different neonatal units.

Anomalies of the musculoskeletal system accounted for the commonest CA in the present study followed by anomalies of the cardiovascular and urogenital systems. Musculoskeletal anomalies being the commonest CA was also documented in Enugu [18,32] Eastern Nigeria, Kenya [24], South Africa [29], Iran [39] and India [40,41,42]. Contrary to the present study, anomalies of the cardiovascular system was documented as the commonest anomalies in Ogbomoso [9], Western Nigeria and Yenagoa [22], Southern Nigeria whereas anomalies of the central nervous system was the commonest in an earlier study in Port Harcourt [43] carried out about a decade ago, Iraq [20], Tanzania [28], Iran [30] and Ondo State [38] Western Nigeria. In addition, anomalies of the gastrointestinal system was reported as commonest anomalies in Eastern Nigeria [17,18], Northern Nigeria [7,23] and Egypt [31]. This varying pattern of CA could be attributable to the varying geographic locations, variation over time as well as varying pregnancy risk factors and differences in the classification of the anomalies. Polydactyl was the commonest individual CA observed in the present study followed by congenital heart diseases and congenital talipes equinovarus. Polydactyl was also observed by Saib et al [29] in South Africa as the commonest individual CA. In Yenagoa [22] Southern Nigeria however, Ventricular septal defect was the commonest individual CA observed. The reason for this difference is like the above.

There was no significant association of sex, gestational age, birth weight with congenital anomalies as similarly observed by Ajao & Adeoye [9] in Ogbomosho. This is however contrary to some other studies [7,15,18,44,45] which documented male association with CA.

Maternal age > 35years was observed to be significantly associated with anomalies of the urogenital system in the present study. This corroborates other studies [28,46,47,48] which also showed increased incidence of CA with increasing maternal age especially in mothers > 35years thus agrees with the known theory of advanced maternal age as a risk of CA [49] In addition, increased maternal age has been associated with an increase in chromosomal meiotic errors [33]. This therefore calls for a high index of suspicion in mothers > 35years who are pregnant.

The mortality rate of CA of 7.4% in the present study is comparable with the 8.5% reported by Takai et al [7] in Northern Nigeria but much lower than the 10.4%, 14.6%, 18.0%, 32.3% and 41.0% reported in Ogbomoso [9] Western Nigeria, Egypt[31], Ondo State [38] Southern Nigeria, Iran,[30] and Yenagoa [22], Southern Nigeria. This varying mortality rates could be because of the difference in the pattern of CA, its severity, the availability and expertise of personnel as well as the technological know-how of the neonatal unit. The relatively low

mortality rate observed in the present study could be because only inborn babies were recruited and as such presented early to the neonatal unit with majority presenting within the 1st 6 hours of life whereas in the other studies both inborn and outborn babies were recruited.

There was a high referral rate to other health facilities of 18.9% in the present study as compared to the 10.4% and 4.9% documented in Ogbomoso [9] Western Nigeria and Yenagoa [22] Southern Nigeria respectively. There were however no referrals in the study carried out in Northern Nigeria [7]. The high referral rate in the present study is not surprising as the Department of Surgery in our centre lacks manpower in the areas of paediatric surgery, neurosurgery and cardiothoracic surgery.

CONCLUSION

The prevalence rate of congenital anomalies among inborn babies admitted in the neonatal unit of the Rivers State University Teaching Hospital is 5.5% with slight male preponderance. The commonest pregnancy complication was hypertension followed by Diabetes mellitus and oligohydramnios while the commonest congenital anomalies was anomalies of the musculoskeletal system followed by cardiovascular and urogenital systems. Major congenital anomalies predominated as well as single defects. Sex, gestational age and birth weights of babies were not significantly associated with congenital anomalies. Maternal age > 35years were significantly associated with anomalies of the urogenital system. The mortality rate of congenital anomalies in RSUTH was 7.4% thus CA contribute greatly to neonatal morbidity and mortality and therefore of public health concern.

RECOMMENDATION

Simple preventive measures such as folic acid supplementation, infection prevention, abstinence from certain indulgence during pregnancy such as smoking, alcohol ingestion, use of herbs will prevent CA thereby reducing neonatal morbidity and mortality. Public enlightenment on the dangers of these unhealthy indulgence would also be relevant in the prevention of CA. In addition, prenatal screening of mothers at high risk would lead to early diagnosis and treatment.

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