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PREVALENCE OF MAJOR CONGENITAL ANOMALIES IN A TERTIARY HEALTH FACILITY, RIVERS STATE NIGERIA

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ABSTRACT: *Congenital anomalies are structural or functional defects including metabolism, which can be diagnosed during intrauterine fetal life, at birth, or later in life. This study assessed the prevalence of major congenital anomalies in a tertiary health facility in Niger Delta region of Nigeria. This is a descriptive retrospective cross-sectional study. It involved data from the labor ward and neonatal birth registers of the facility on the total number of births and the babies that were delivered with major birth defects between January 2011 and December 2019. We also conducted a statistical comparison of the prevalence of congenital abnormalities in the Niger Delta with that in other regions of Nigeria. Out of the 21,738 births that was recorded, 837 maternities had babies with major congenital anomalies giving a prevalence of 38.5 cases per 1,000 births. This figure is far more than that which was obtained in other regions of Nigeria - 4.15: cases per 1,000 births in the South East (P,0.002), 15.84:1,000 in the South West (P,0.001), and 5.51:1,000 in the North East (P,0.003). The predominant anomalies were tetralogy of Fallot (10.5%), ventricular septal defect (9.4%), coarctation of aorta (9.1%), lower limb reduction (8.2%), hydrocephalus (7.6%), cleft palate (7.5%), upper limb reduction (6.5%), spinal bifida (6.2%), club foot (6.1%), microcephaly (6.0%) and hip dislocation (4.2%). Improved maternal health, preconception care, folic acid supplementation and routine fetal anomaly scan to reduce these anomalies was recommended.*

KEYWORDS: Congenital Anomalies, Prevalence, Birth Defects, Maternity, Niger Delta

INTRODUCTION

Congenital Anomalies (CA) are structural or functional defects including metabolism, which can be diagnosed during intrauterine fetal life, at birth, or later in life (Sadler, 2014). These comprise the various categories of disruptions, malformations, deformations and association syndromes and frequently result from genetic abnormalities and insults to the developing fetus (Wynshaw-Boris & Biesecker, 2017). Congenital anomalies may present as either single isolated defects or as multiple organ system anomalies in a single individual. These anomalies may result from disruptions of the normal chromosomal pattern, for example, Down's syndrome, interference with an originally normal developmental process by teratogens such as drugs, alcohol, viral and bacterial infections such as rubella, cytomegalovirus and by ionizing radiations (Sartorius & Nieschlag, 2010).

Birth defects are common causes of perinatal morbidity and mortality, and have become a global phenomenon. It is estimated that one out of every 3 babies that die in the world has a congenital anomaly (Tomatiret al., 2019). The World Health Organization (WHO) estimates that some 260,000 deaths worldwide (about 7% of all neonatal deaths) were caused by congenital anomalies in the year 2004 (WHO, 2012). The birth prevalence of Congenital anomalies varies from country to country. It is believed that between 2-4% of the live born infants and 15-20% of stillbirth has a significant birth defect (Adane, et. al., 2020). Congenital malformations are a significant component of the global burden of disease (GBD) among children accounting for 25 million disability-adjusted life years worldwide (Wu, Poenaru & Poley, 2013). The World Health Organization's recent GBD study reports that anomalies rank 17th in the causes of disease burden and are mainly responsible for hospital admission and prolonged stay in the special care baby unit (SCBU) (Murray, et. al., 2010).

The prevalence of these anomalies differs across the various races of the world. Reported prevalence of major congenital malformations in different population around the world has shown considerable variation and ranges from less than 1% to up to 8% (WHO, 2012). Dastgiri et al. (2012) in Glasgow in an 18-year review of congenital anomalies reported prevalence of 324/10,000 births. In Canada, 2-3% of the 350,000 babies born each year will be delivered with a serious congenital anomaly (Lowry, 2012). Tomatir et al. (2019) in Turkey reported prevalence of 2.9/1000 live births. In India, Sarka et al (2013) in their study reported a prevalence of 2.22% (286 had congenital malformations out of the 12,896 babies born during the study period). Contrary to the commonly held view that congenital disorders are not a public health issue in developing countries, in recent years, a number of developing countries are in fact experiencing an epidemiological transition, with significant declines in infant mortality rates, reduction of infections and malnutrition and a relative increase of morbidity and mortality due to congenital malformations (Taboo, 2012). Congenital anomalies contribute immensely to perinatal and neonatal mortality and disability, and may result in serious, adverse effect on the health, development, or functional ability of the child especially in resource-poor countries. Birth defects can be life threatening, result in long-term disability, and negatively affect individuals, families, health – care systems and societies (WHO, 2012).

In Nigeria, few studies have examined the prevalence of congenital anomalies in different settings. Bakare et al. (2019) in South Western Nigeria in a prospective study of external birth defects in neonates reported a prevalence of 6.9%. Akinmoladun, et al (2018) determined the epidemiologic pattern and outcome of major congenital anomalies detected prenatally at the University College Hospital, Ibadan, Nigeria, over a 4-year period on 989 fetuses for which 62 (6.3%) had CAs. Similarly, a 10-year retrospective study conducted in the Department of Obstetrics and Gynaecology and the Department of Paediatrics (Special Care Baby Unit) of Amino Kano Teaching Hospital, Kano, between April and March 2017 reported a prevalence of 4.4% (Takai et al 2019). Sunday-Adeoye et al. (2007) in Delta state, Nigeria in a retrospective study reported incidence of external congenital anomalies of 110.8/10,000 live births. Interestingly, it is believed that up to 60% of congenital anomalies are potentially preventable (Dastgiri, 2012). Data collected from a congenital anomaly registry may then be used for identifying prevalence trends, for conducting research on potential risk factors, for public health policy development, for planning and implementation of services needed by children with malformations and for evaluating the effects of preventive measures and treatment services. This study assessed the prevalence of congenital anomalies in University

of Port Harcourt Teaching Hospital, Rivers state Nigeria from 2010 – 2019 and compared it with the prevalence recorded in other parts of the country.

METHODOLOGY

This study adopted a retrospective cross-sectional research design to estimate the prevalence of congenital anomalies from January 2010 – December 2019 in University of Port Harcourt Teaching Hospital, Rivers state Nigeria. This hospital enjoys patronage from within and outside the state with patient turnover rate of well over 400,000 out-patients per annum, over 10,000 in-patients per annum and over 3000 surgeries per annum. The study sample of 837 included all babies both booked and un-booked pregnancies born with congenital anomalies out of a population of 21,738 births recorded during this stipulated time. Data collection was done using the direct retrieval approach from the patient case folders/notes, birth registers in the labour ward and admission/discharge registers in the intensive care baby unit. A purpose designed proforma/checklist was used to retrieve information on the socio-demographic characteristics of the neonates and mothers and the diagnosed congenital anomalies. The statistical package for social sciences (SPSS) software version 23 was used for data entry and analysis. Data collected was analyzed using descriptive and influential statistics. Research questions posed by the study objectives were answered using descriptive statistics of simple proportion, mean and percentages. Chi – square and Odd ratio was used to compare the prevalence of congenital anomalies across other regions in Nigeria. P-value of 0.05 and below were considered significant. Ethical approval was obtained from the Research Ethics Committees of the University of Port Harcourt and University of Port Harcourt Teaching Hospital after due process was completed. Permission for using patient's data was not necessary because patients gave their consent on booking with the hospital that their data can be used if necessary, for research. Information retrieved from the records were treated as confidential and was not divulged to anyone. Sorting of the required information from the records using the checklist was done in privacy outside from the reach of people.

RESULTS

Prevalence of Congenital Anomaly (CA)

Out of the 10 years of the study, the total number of women who delivered with the teaching hospital was 21,738 (Table 1). Eight hundred and thirty seven of the 21,738 had babies with major congenital anomalies thereby giving the combined prevalence rate (for the ten-year period) of 3.9% implying 38.5 cases per 1,000 live births (Table 1). With respect the total births, 2012 had the highest delivery of 4138 and thereafter number of deliveries declined and remained low as the years went by. The highest number of congenital anomalies was recorded in 2011 with about 136 cases followed by 2010 and 2012 which had 123 cases each. Interestingly, a sharp drop to 26 cases in 2013 was recorded and afterwards a gradual steady increase from year 2014 to 2019 standing at 79 cases (Figure 1). Overall, the prevalence rate per year shows that the lowest prevalence of 0.9% was noted in 2013 and the highest of 9.6% was recorded in 2014. In 2010, a prevalence rate of 4.5 was recorded which was followed by a steady decline from 2011 – 2013 with a peak rise in 2014. Thereafter, a steady decrease was recorded from 2015 – 2019 finishing at 4.8% (Figure 2).

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Table 1: Prevalence of Congenital Anomaly Relative to Number of Birth from 2010 – 2019

Year	Total birth per year	Total No of CA per year	Prevalence (%) per year
2010	2743	123	4.5
2011	3672	136	3.7
2012	4138	123	3.0
2013	3024	26	0.9
2014	691	66	9.6
2015	1478	68	4.6
2016	1332	69	5.2
2017	1485	68	4.6
2018	1532	79	5.2
2019	1643	79	4.8
Total	**21,738**	**837**	**3.9**

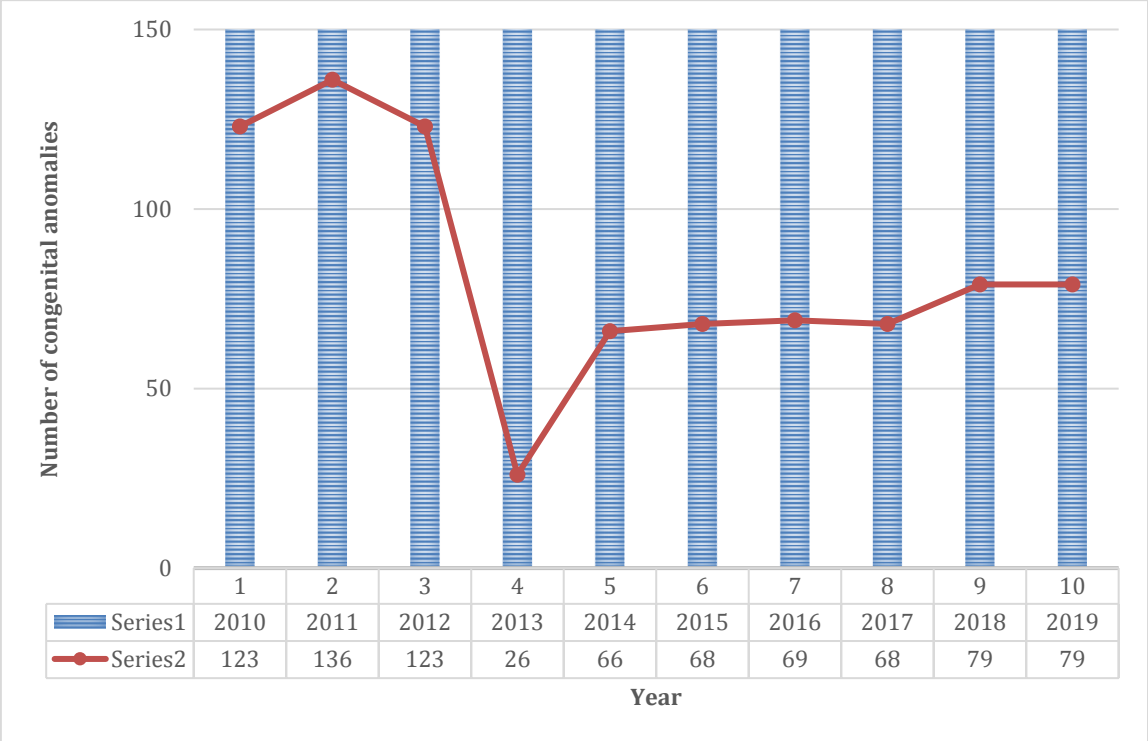

Figure 1: Number of Congenital Anomalies Diagnosed per Year

Figure 2: Prevalence of Congenital Anomaly from 2010 - 2019

In decreasing order of frequency, the prevalence of the 837 different congenital anomalies recorded during the ten-year study period as shown in Table 2 is as follows: tetralogy of Fallot (10.5; 88/837), ventricular septal defect (9.4; 79/837), coarctation of aorta (9.1; 76/837), lower limb reduction (8.2; 69/837), hydrocephalus (7.6; 64/837), cleft palate (7.5; 63/837), upper limb reduction (6.5; 54/837), spinal bifida (6.2; 52/837), club foot (6.1; 51/837), microcephaly (6.0; 50/837), hip dislocation (4.2; 35/837). The other congenital anomalies recorded were below the general prevalence rate of 3.9% (Table 2).

Furthermore, as shown in Table 3, the prevalence of congenital anomalies at the UPTH in the South Southern Nigeria from 2010 – 2019 is significantly higher than the figure recorded in the same facility from 2011 – 2014 as well as figures in other regions of Nigeria where the same study methodology was adopted. The only differences in the studies were the years when they were performed and the inclusion of birth anomalies in the data diagnosed at postmortem in the South Western region of Nigeria.

Table 2: Profile of Congenital Anomaly Recorded from 2010 – 2019 n = 837

Items	Frequency	Percentage
Lower limb reduction	69	8.2
Upper limb reduction	54	6.5
Hip dislocation	35	4.2
Club foot	51	6.1
Tetralogy of Fallot	88	10.5
Coarctation of aorta	76	9.1
Ventricular septal defect	79	9.4
Hypospadias	4	0.5
Undescended testis	5	0.6
Cleft lip with palate	29	3.5
Cleft lip without palate	26	3.1
Cleft palate	63	7.5
Gastroschisis	30	3.6
Omphalocele	22	2.6
Tongue tie	23	2.7
Spinal bifida	52	6.2
Hydrocephalus	64	7.6
Microcephaly	50	6.0
Down syndrome	17	2.0

Table 3: Comparison of the Prevalence of Congenital Anomalies in the Niger Delta, South Southern Nigeria (present study) with that in Different Regions of Nigeria

Regions	Study period, duration	Number of birth	Number of birth with defects	Prevalence per 1,000 birth	p-value	X^2	OR	Cl
SSN[a]	2010 – 2019 10 years	21,738	837	38.5				
SSN[b]	2011 – 2014 4 years	7670	159	20.73	0.000	128.43	3.15	2.53 – 4.67
SSE	2002 – 2012 10 years	14,446	60	4.15	0.002	102.14	4.04	3.11 – 5.45
SWN	1981 – 1990 10 years	22,288	353	15.84	0.001	15.12	1.12	0.98 – 2.16
NEN	1998 – 2004 7 years	13,619	75	5.51	0.003	87.83	2.78	1.54 – 4.02

Notes: *SSN[a] – present study, SSN[b] – University of Port Harcourt Teaching Hospital (Abbey, et. al., 2017), SEN – Federal Medical Centre Abakaliki, Ebonyi State (Onyearugha and Onyire, 2014), SWN – Lagos University Teaching Hospital (Iroha et al, 2001) and NEN – Aminu Kano Teaching Hospital, Kano (Mukhtar-Yola et al. 2005)*

Abbreviations: *CI, confdence interval; NEN, North Eastern Nigeria; OR, odds ratio; SEN, South Eastern Nigeria; SSN, South Southern Nigeria; SWN, South Western Nigeria.*

DISCUSSION

Our study demonstrates that the prevalence of major congenital anomalies at the University of Port Harcourt Teaching Hospital (UPTH), Rivers state during the period of 2010 – 2019 was 38.5 per 1,000 birth with cardiovascular anomalies such as tetralogy of Fallot, ventricular septal defect, coarctation of aorta predominating at 29%. These figures are extremely high and also statistically significant, when compared with the finding from previous study conducted in the same health facility which reported a prevalence of 20.73 per 1,000 births from 2011 – 2014 (Abbey, et. al., 2017) and 4.0 per 1,000 births from 1990 – 2003 (Ekanem, et. al., 2011). Prevalence studies in other tertiary institutions in Nigeria also showed significantly lower figures than the values obtained in our study (Table 4) (Iroha, et. al, 2001; Mukhtar-Yola, et. al., 2005; Onyearugha and Onyire, 2017). This study finding is quiet disturbing especially when considering the prevalence of the two studies conducted in our study setting in previous time hence posing a question of "why is the number of major congenital anomalies increasing in UPTH? This finding may represent a natural trend of events where the prevalence tends to increase with time or could it be that the facility is getting better at diagnosing these anomalies at or soon after birth. Tactfully speaking, the exposure to and number of environmental tetratogens which is peculiar to the Niger Delta region of Nigeria may be increasing with time. Much more perturbing is that from the figures in our study (Table 4), there are more major congenital anomalies in the Niger Delta region of Nigeria than was recorded in other parts of the country. The authors share a strong view that this may be due to the calamitous environmental degradation that has taken toll in the Niger Delta region of Nigeria. Port Harcourt, Rivers state where are our study setting is located is an epicenter of oil exploration activities in this region. There have been issues of oil pipeline vandalism and oil spillage, inappropriate discharge of waste waters, gas flaring, toxic leakage from underground petroleum storage tanks, dumping of dangerous chemical wastes, illegal refineries popularly known as 'bunkery' and black soot etc. (Obire and Amusan, 2003; UNEP, 2011). These sources of pollution have led to the contamination of soil, water, and air with heavy metals (arsenic, mercury, cobalt, manganese, etc), different gases (sulfur dioxide, nitrogen dioxide, ozone, and carbon monoxide), particulate matters, benzene, toluene, ethylbenzene, and xylene, and other volatile organic compounds (Lupo, et. al., 2011; Ghosh, et. al., 2012) which are thought to have serious effect on the fetus inutero. The abundant environmental teratogens that contaminate the Delta can cause congenital abnormalities through preconception mutagenic action (maternal or paternal) giving rise to chromosomal abnormalities and syndromes or through post-conception teratogenic action in pregnancy, depending on the nature of the teratogen and the precise timing of exposure – embryonic or fetal period. Therefore, it is not surprising that women who have lived in that environment for years should experience high prevalence of congenital abnormalities, then women who live in another region of Nigeria. Although, a further study to substantiate this claim is recommended.

RECOMMENDATION

The establishment of optimal birth outcome support group with emphasis on prevention of congenital anomalies should be established in the facility. There should be improved maternal health, preconception care, folic acid supplementation and routine fetal anomaly scan to reduce these anomalies. A study on environmental correlates of congenital anomalies was also recommended.

CONCLUSION

The prevalence of major congenital abnormalities at birth at the UPTH was 38.5 cases per 1,000 births. The predominant anomalies were tetralogy of Fallot, ventricular septal defect, coarctation of aorta, lower limb reduction, hydrocephalus, cleft palate, upper limb reduction, spinal bifida, club foot, microcephaly and hip dislocation.

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