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Retrospective Study of Major Birth Defects in Neonates Presenting at a Tertiary Health Facility in Orlu, South-east Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors CJO and ENO designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors ENO, CJO, OEG and CO managed the literature searches, analyses of the study and authors CJO, CO and OEG managed the experimental process all authors read and approved the final manuscript.

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ABSTRACT

Background: A growing body of data suggests that birth defect is a significant contributor to infant and neonatal mortality because most of these will die early. Although individually rare, birth defect taken together accounts for a significant proportion of mortality and morbidity among infants and children. This is most apparent in populations where infections and malnutrition have been controlled. This study is designed to study the pattern of birth defect amongst neonates seen at Imo State University Teaching Hospital (IMSUTH).
Methods: This was a descriptive retrospective study. The data was collected from admission

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register in NBSCU, delivery record in labour room and the central medical records of IMSUTH. Data were represented in frequency tables and bar charts. Yates corrected Chi Square was used to calculate for significance.

Results: The prevalence of birth defect amongst newborns seen at IMSUTH was 5.10% with congenital anomalies of the Gastrointestinal tract observed to be the commonest followed by those of the Central nervous system. Maternal education w/as observed to have significant relationship between occurrence of birth defect and maternal native medication intake during pregnancy.

Conclusion: Five out of every 100 pregnancy in these environments may end with the birth of a child with congenital defect especially with women who took native medication during pregnancy and those with low educational status who may likely have taken native medication during antenatal care supervised by the traditional birth attendants (TBA).

Keywords: Birth defects; millennium development goals; infant mortality rate; neonatal mortality rates; under 5 mortality rates; traditional birth attendants.

1. BACKGROUND

In the year 2000, the United Nations (UN) resolved to reduce child mortality by two thirds from its 1990 base as part of its Millennium Developmental Goals (MDG4) [1]. It is obvious from current child mortality rates worldwide (Infant and Neonatal mortality rates) that the UN had fallen behind its projections especially in developing countries despite giant strides in the areas of industrialization and gradual improvement in the health sector in the last 40 years [1,2,3]. This positive health transition is marked by the decreasing occurrence of infectious disease and malnutrition which is reflected in the decreasing trends in child mortality rates [4]. A growing body of data suggests that birth defects are becoming a significant contributor to Infant and neonatal mortality because most die early [5]. Although individually rare, birth defects taken together accounts for a significant proportion of mortality and morbidity among infants and children especially in populations where infections are largely under control and nutritional deficiencies have been controlled as in developed countries like the United States of America [5]. Interestingly, the contribution of birth defects to infant mortality becomes obvious in countries with progressively decreasing Infant mortality rates [3]. It is important that health care workers in developing countries such as Nigeria, realizes the enormous implications of the increasing role of birth defects in U5 MR taking into consideration the fact that a large proportion of pregnant women in developing countries are exposed to teratogens, indiscriminate ingestion of drugs not prescribed by the doctor and intake of traditional medications [6]. Unfortunately health policy makers in developing countries are generally unaware of the global toll of birth defects and associated disabilities because data documenting the extent of these problems are lacking.

This study seeks to find the pattern of birth defect amongst newborns seen at IMSUTH. The focus is commonly on major structurally anomalies. These are structural changes that have significant medical, social or cosmetic consequences for the affected individual and typically require medical intervention [7]. Major structural anomalies are the condition that account for most of the death, morbidity and disability related to congenital anomalies. According to ICD-10 major congenital anomalies are anencephaly, cleft lip and palate, exomphalos/omphalocele, Gastrochisis, Hypospadias, Reduction defects, spinal bifida and Clubfoot.

2. STUDY DESIGN AND SETTING

This was a descriptive retrospective. Study of newborns, admitted into Newborn Special Care Unit (NBSU), and those delivered in our delivery room over a period of 8 years (2005-2013). The study population consisted of newborns with structural congenital anomalies diagnosed at birth and newborns without structural birth defects. Newborns with functional birth defects, chromosomal anomalies and older children were excluded from the study. The data was collected from admission register in NBSCU, delivery records at the delivery room of IMSUTH and folders of these patients obtained from the Hospital medical records. Important information obtained includes: Biodata, gestational age at delivery, parity, diagnosis, ante natal care (drug intake), and family, social and medical history. Ethical clearance for the study was applied and obtained. IMSUTH serves as a referral hospital in

the South Eastern part of Nigeria. Orlu is an urban town situated in the south eastern part of Nigeria located in the Tropical rainforest.

2.1 Data Analysis

Data were represented in frequency tables, Bar charts. Yates corrected Chi Square was used to calculate for significance.

3. RESULTS

Two thousand three hundred and Eighty six (2386) newborns records were screened for birth defects (Table 1). One hundred and twenty two (5.10%) of these newborns had major birth defects. Seventy (57.38%) of these neonates were males and 52 (42.62%) were females. Male to female ratio of children with birth defect is 1.4:1.Three hundred and seven of these children were delivered prematurely while the rest were delivered at term.

Table 1. New born characteristics

Gestational age at delivery	n%
Prematurity	307
Terms	2079
Gender	
Male	1248
Female	1138
Total	**2386**

Maternal age ranged from 20 years to 47 years with a mean age of 29.81years. Five hundred and fifty six of these newborns were delivered by primiparous mothers, while 1,208 newborns were delivered to mothers whose gravidity ranged from 2 to 4. Of the 2,386 newborns screened, majority of them (1011, 42.37%) were delivered to mothers with primary education, followed by those (700, 29.34%) delivered to mothers without any formal education. A review of the antenatal records of the mothers of all the newborns screened showed that majority (1316, 55.16%) of these mothers took both routinely prescribed drugs by doctors and native herbal medication prescribed by traditional birth attendants.

On Table 3, out of 122 birth defects observed in this study , congenital anomalies of the Musculoskeletal system was the commonest 34 (27.90%), followed by Central nervous system anomalies 30 (24.59%), gastrointestinal tract anomalies 28 (23.00%). Of the 34 recorded congenital anomalies of the musculoskeletal system, Omphalocoel 14(11.48%) was the commonest, while spinal bifida (22), a central nervous system anomalies constitutes 18.03% of all congenital anomalies recorded.

Table 2. Maternal characteristics of the children studied

Maternal age	n%
20 – 24	187(7.84)
25 – 29	1113(46.65)
30 – 34	764(32.02)
35 – 39	218(9.14)
+ 40	104(4.36)
Maternal parity	
Primiparity	556(23.30)
$G_2 – G_{4^+}$	1208(50.63)
Multiparity	622(26.07)
Maternal education	
Primary	1011(42.37)
Secondary	360(15.09)
Tertiary	315(13.20)
No formal education	700(29.34)
Maternal drug intake	
Native (Herbal) Med.	160(6.71)
Routine drugs	855(35.83)
Native (herbal) +Routine dosage	1316(55.16)
Other dosage	55(2.31)
Total	**2386**

Table 4 shows relationship between maternal educational status and drug ingestion during pregnancy. Majority of mothers who took native medication together with routine Ante Natal Care (ANC) drugs had primary education 578(43.92%) and no formal education 452(34.35%) respectively. Majority of those who took only native medication during pregnancy 68(42.50%) had no formal education. While a minority of mothers who took only the prescribed routine drugs had no formal education. These differences are statistically significant (χ2= 115.5847, P-value <0.05).

Table 5 shows relationship between maternal education and birth defects. Fifty four (44.26%) out of 122 mothers who gave birth to children had no formal education, while 12(9.84%) of these mothers had tertiary or university education. These differences were statistically significant χ^2 =14.2636, P <0.05 and the variables are dependant.

Table 6 shows the relationship between maternal parity and birth defect. Review of the 622 newborns delivered by multigravid (multiparous) mothers showed that only 35(5.63%) of them had birth defects, while 21(3.8%) out of the 556

newborns delivered by primigravida or primiparous mothers (women pregnant for the first time and who has not given birth to a child before.) had birth defects. However these differences were not statistically significant ($\chi 2$=2.6903, p-value=0.2605).

Table 7 shows drug intake amongst mothers of children with birth defect during pregnancy. Out of 1316 mothers who took native medication together with their usual routine drugs during pregnancy, 73 constituting 5.55% gave birth to children with birth defect. Thirty four (21.25%) out of 160 mothers who took only native medication during pregnancy gave birth to children with birth defect as against 10 (1.82%) out of 550 who took only routine drugs during pregnancy. These differences were statistically significant ($\chi 2$ =115.5847 P-value < 0.0001).

Table 8 shows the relationship between maternal age and birth defect. Though majority of newborn with birth, were delivered by mothers aged 25-29 years (n=70), this constituted 6.29% of all newborns delivered by this group of mothers. For mothers above the age of 40, only 7(8.05%) out of 87 newborns delivered by this group of mothers had birth defect. However, these differences were not statistically significant.

Comparatively, 36 (11.73%) of the 307 newborns delivered prematurely had birth defects as against 86 (4.14%) of the 2,079 newborns delivered a term. These observed differences in Table 9 were statistically significant.

Table 10, shows the outcome of children with birth defect. Twenty eight (22.95%) children with birth defect died. Majority 64(52.46%) of these children were referred out. Eight babies (6.56%) with anomalies of the musculoskeletal system namely cleft palate/lip were discharged home. Unfortunately, 22 mothers of these children consisting of 18.03% signed against medical advice and left the hospital.

Table 3. Pattern of birth defect seen children studied (n=122)

Nature of birth defect	n	n%
Central nervous system	**30**	24.60
- Microcephaly	-2	
- Spinal bifida	-22	
- Encephalocoel	-2	
- Hydrocephalus in newborn	-4	
Genito urinary tract	**6**	4.90%
- Posterior Urethral Valve	-4	
- Hypospadias	-2	
Gastro intestinal tract	**28**	23.0%
- Congenital Intestinal Obstructions*	-4	
- Hirshprung	-10	
- Oesophageal atresia with TOF	-10	
- Imperforate anus	-4	
Musculo skeletal system	**34**	27.90%
- Omphalocoel	14	
- Gastrohisis	4	
- cleft palate	6	
- LymphangiomaNeck(Cystic hygroma)	2	
- Congenital dislocation of hip bilateral	5	
- Saccro coccygeal teratoma	3	
Respiratory system	**2**	1.60%
- Bilateral choanal atresia posterior	2	
Cardiovascular system	**2**	1 .60%
- Cyanotic CHD	2	
***multiple Congenital anomalies**	**20**	16.40%
- Unclassified		
Total	122	100.0%

**multiple congenital anomalies (congenital anomalies involving more than one systems and unclassified)*

Table 4. Relationship between maternal education and drug intake during pregnancy

Drug intake	Tertiary 3º	Secondary 2º	Primary 1º	No formal education	Total
Native Medical + RD	1 58	128	578	452	1316
Native Medication only	17	23	52	68	160
Routine drugs only	85	158	229	78	550
Other drugs	55	51	152	102	360
Total	**315**	**360**	**1011**	**700**	**2386**

df =9 , $\chi 2$ = 115.5847, P-value <0.05

RD (Routine drugs folic acid, fesolate, vitamine B complex.)

Table 5. Relationship between maternal education and birth defects

Drug intake	3º (Tertiary)	2º (Secondary)	1º (Primary)	No formal education	Total
With birth defect	12	17	39	54	122
Without birth defect	303	343	972	646	2264
Total	**315**	**360**	**1011**	**700**	**2386**

df=3 $\chi 2$ =14.2636, The result is significant at Pvalue <0.05

Table 6. Relationship between maternal parity and birth defect

Maternal gravidity	New born with defect	Newborn without	
		Defect	Total
Primiparity	21	535	556
G_2 - G4	66	1142	1208
Multiparity	35	587	622
Total	**122**	**2264**	**2386**

Df =2, $\chi 2$ = 2.6903, P = 0.26050

Table 7. Relationship between maternal drug intake and birth defect

Maternal drug intake	New born with defect	Newborn without	
		Defect	Total
Native (herbal) dosage	34	126	160
Routine drugs only	10	845	855
Native +Routine drugs*	73	1243	1316
Others	5	50	55
Total	**122**	**2264**	**2386**

Df = 3, $\chi 2$ = 115.5847, P <0.0001

Table 8. Relationship between maternal age and birth defect

Maternal age	New born with defect	Newborn without defect	Total
20 – 24	9	178	187
25 – 29	70	1043	1113
30 – 34	28	736	764
35 – 39	8	210	218
> 40	7	97	104
Total	**122**	**2264**	**2386**

Df = 4, $\chi 2$ = 8.008, P value = 091286

Table 9. Relationship between gestational age at birth and birth defect

Gestational age at birth	New born with defect	Newborn without	
		Defect	Total
Premature babies(<37wk)	36	271	307
Term babies(>37wks)	86	1993	2079
Total	**122**	**2264**	**2386**

Df = 1, $\chi 2$ = 3.7604, P < 00001

The bar chart in (Fig. 1) shows the pattern of mortality amongst children with birth defect over the period of eight years (2005 to 2013). A total of 414(17.35%) deaths were recorded out of 2386 children screened for birth defect. Twenty eight of these deaths consisting of 6.76% occurred in children with birth defect. Majority of these deaths 7(25.00%) occurred amongst children with birth defects of the musculoskeletal system, followed by those of the genitourinary system 6(21.43%) and those with multiple congenital disorders 6(21.43%).

4. DISCUSSION

Birth defects are becoming significant contributors to childhood mortality in an era when giant strides have been made in the control of infectious diseases and nutritional deficiencies. This has aroused considerable interest amongst researchers. Incidence rates obtained by various workers working in different parts of Nigeria varied from 16.0% to 4.0%. Airede AI and Bello M [8], working in Maiduguri in the northern part of Nigeria reported an incidence rate of 16.0%. Bakere et al. [9], in Ile ife located in the south western part of Nigeria, overall prevalence rate of external congenital anomalies in ife ijesa as 6.9%, while Ekanem et al. [10], in Portharcourt located in the south southern part of Nigeria obtained an incidence rate of 4.0%. In South Africa, Kromberg et al. [11], recorded an incidence rate of 29.57%. Globally, the WHO states the incidence rate as 1 in 33. The present study located in Orlu in the south eastern part of Nigeria reports a prevalence rate of external major birth defects as 5.1% which is similar to what is obtainable in most part of Nigeria.

The gender distribution of children with birth defect showed a relative male preponderance with a male: female ratio of 1.4: 1. This pattern agrees with results from other workers such as Bakere et al. [9], Kromberg and Jenkins [11] and Uba et al. [12], 1:1.

Table 10. Outcome of children with birth defect as seen at IMSUTH

Outcome	M	F	Total n%
Death	20	8	28(22.95)
Referred out	34	30	64(52.45)
Discharged home	6	2	8(6.50)
Discharge against Med advise	10	12	22(18.0)
Total	70	52	122(100)

df =2, $\chi 2$ =1.33, P-value =0.16973

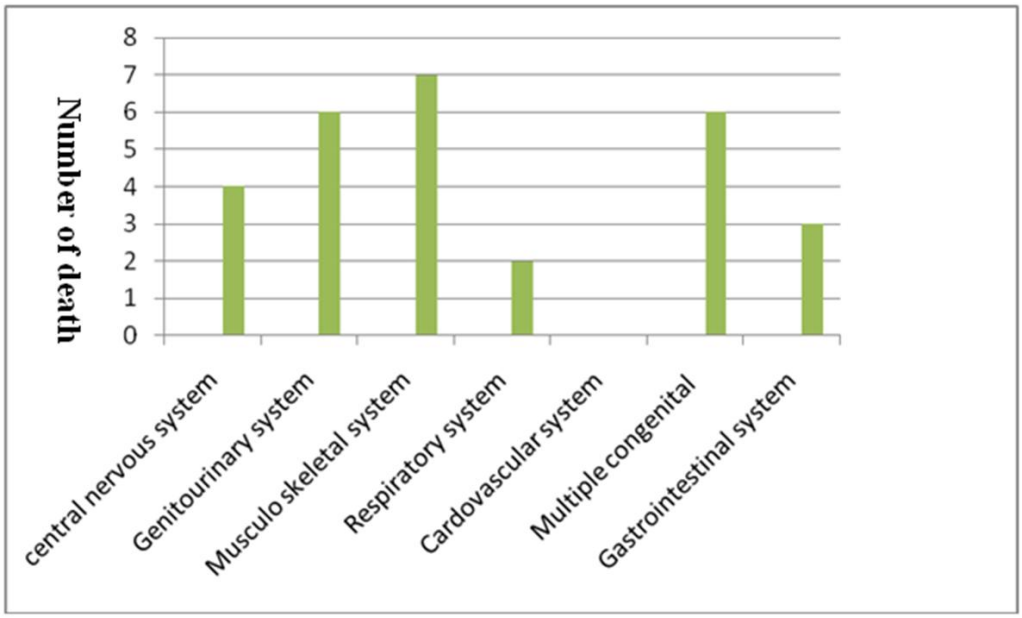

Fig. 1. Pattern of mortality amongst children with birth defect

In this study, the Musculoskeletal system 34 (27.90%), followed by CNS anomalies 30 (24.59%) were the commonest congenital anomalies. This was similar to studies by Bakare et al. [9], working in the south western part of Nigerian noted anomalies of the musculoskeletal system as the commonest. Ekwere et al. [13] working in the north central part of Nigeria who described gastrointestinal tract as the commonest, followed by CNS and musculoskeletal system anomalies. Ekanem [10] working in the south southern part of Nigeria noted congenital anomalies of the CNS and Musculoskeletal system as the commonest. Amongst the congenital anomalies observed in this study spinal bifida (18.03%) and omphalocoel (11.48%) were the commonest.

In this study maternal education had a significant relationship with both intake of native medication (pvalue <0.05) and birth of children with birth defects (pvalue<0.05). A large proportion of mothers who took native medication during pregnancy had primary or no formal education, while a significant number of children with birth defect have mothers with primary education. Maternal education is known to have very strong impact on child health; it is the single most important factor in explaining differentials in child health outcomes [14]. Although it may be an indirect determinant, maternal education directly or indirectly is related to resource availability in families in this environment and birth defects are more common among resource restricted families.

Studies [15,], have shown that a large percentage of pregnant women use native medications without the knowledge of their doctors. The constituents of these medications are hardly known and may interfere with the growth of the fetuses, causing birth defects. Lack of good and affordable health care encourages pregnant women to resort to Traditional birth attendants. Out of a total of 1476 mothers who took native medications, 107(7.25%) of these mothers gave birth to children with birth defects. While 15(1.65%) out of 910 mothers who did not take native medications gave birth to children with birth defects. Although this study was not designed to identify causative factors for birth defects, a significant proportion (p =< 0.05) of these mothers who took native medications gave birth to children with birth defect. Other possible causes of birth defect will include maternal and fetal disorders such as single gene defect, chromosomal defects and a large spectrum of environmental factors.

Several works have shown an association between parity and birth defects. Hoyt AT et al. [16] showed that primiparous women were likely to have babies with external birth defects such as hypospadias, omphalocoel and Gastrochisis while multiparous women significantly have increased risk of omphalocoel. Parity was shown to have positive associations with congenital heart defects according to the work of Yu feng et al. [17]. In contrast, this review did not demonstrate any significant difference amongst the different levels of parity. Our study is a hospital based retrospective study which may tend to exaggerate the incidences and prevalence. The sample size may be a limiting factor.

Various studies have shown clearly various associations between maternal age and birth defect. Gill SK et al. [18] showed that maternal age less than 20 years is associated with external birth defects such as Gastrochisis, while maternal age greater than 40 years is associated with hypospadias and craniosynostosis. In contrast Baird PA et al. [19] found no association between maternal age and external birth defects except with chromosomal abnormalities. This agrees with our study whereby maternal age did not significantly affect external birth defects. Children with chromosomal abnormalities were exempted from the studies.

The outcome of these children with birth defect in this study shows how unprepared our health institutions are in handling these groups of children. Of the 122 children, we could only help 8 (6.56%), 28(22.95%) died, 64(52.46%) were referred out because the facilities, manpower and expertise to handle them were not available and 22(18.03%) mothers of these children signed against medical advice and took their children away from the health facility.

The proportion of newborns with birth defects were significantly increased in those delivered prematurely (p-value < 0.00001). The findings in this review tend to agree with findings in other studies [20]. The risk of birth defect is increased in infants delivered prematurely and may have contributed to these children been delivered prematurely.

To realistically meet the Millennium Develop-mental goals we must recognize both the global

and national contribution of birth defect to childhood mortality rates. Presently, enormous resources are directed towards programmes aimed at preventing or treatment of infections and nutritional disorder with very little resources directed towards prevention or treatment of birth defects. Misconceptions that are believed to have contributed to lack of development of appropriate programmes for birth defects are the belief that effective care and prevention of birth defects require costly high technological interventions and attention to birth defects will draw funds away from other high priority maternal and child health care efforts. The bulk of care and prevention of birth defect is achieved at the primary and secondary level of care. Examples include family planning, optimizing women's diet and avoiding maternal infections to prevent birth defect. These are feasible and affordable in resource poor countries, together with development and strengthening of medical genetic services. Adequate development of manpower such as physicians, surgeons, nurses and physiotherapist would to a large extent reduce the incidence of birth defect and disability resulting from birth defect.

5. CONCLUSION

Five out of every 100 pregnancy in this environment may end with the birth of a child with congenital defect especially with newborn babies delivered prematurely and to women who took native medication during pregnancy and those with low educational status who may likely have taken native medication. In this study maternal age and parity did not significantly influence the birth of children with birth defect. We strongly recommend that a national survey be carried out on birth defect to answer questions on national prevalence rates, sociodemographic characteristics and possibly aetiological factors. Traditional birth attendants should undergo periodic evaluation and retraining, emphasizing on aetiological basis and prevention of birth defect.

CONSENT AND ETHICAL APPROVAL

All authors declare that 'written informed consent was obtained from the Ethical committee of the institution (IMSUTH) for publication of this paper and accompanying images".

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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