

Maternal Age Associated Congenital Anomalies Among Newborns in North Central Nigeria.

ABSTRACT

Background: Congenital anomalies occur due to structural or functional anomalies of the body that present at birth. **Aim and objective:** To determine the association between neonatal characteristics, major systems and maternal age. **Materials and Methods:** This descriptive retrospective study was carried out at the neonatal unit of the Benue State University Teaching Hospital over a three-year period. Data was collected from the medical records of patients with congenital anomalies and analyzed using the Chi-square test (χ^2), significance level of 5% ($p < 0.05$). **Results:** A total of 843 neonates were admitted and 72 were documented to have congenital anomalies giving a prevalence of 8.5%. The major systems involved were the Central Nervous System, Gastrointestinal Tract and Musculoskeletal System. The age group distribution of these mothers with CA less than 20 years were 8(11.1%), 20-24 years 19(26.4%), 25-29 years 23(31.9%), 30-34 years 17(23.6%) and 35 years and above 5(7.0%) respectively. 52 (72.2 %) of the mothers attended Antenatal Care (ANC). 43(59.7%) of the neonates were males while 29(40.3%) were females. Most of the congenital anomalies occurred amongst the primiparous 24(33.3%). The newborns with birth weight above 2500g 50(69.4%) presented more with CA. Greater percentages 67(93.1%) were term. Among the systems involved the Central Nervous System (CNS) had the highest prevalence of 3.3 % and occurred in the maternal age group 25-29 years giving a prevalence rate of 1.3 %. Myelomeningocele was the leading cause of CNS manifestation with a prevalence rate of 2.5%. Anorectal malformation was the commonest GIT disorder with a prevalence rate of 1.7 % and Gastroschisis (MSS) with a prevalence of 0.9%. **Conclusion:** Neonates from mothers above 25 years are not more at risk of developing congenital anomalies than mothers below 24 years. The major systems involved were the CNS, GIT and MSS.

Key words: Congenital anomalies, newborns, maternal age, prevalence rate, diagnosis.

1. INTRODUCTION

Congenital anomalies are defined as structural or functional anomalies of the body that is present from birth. ^[1-3] Every year an estimated 7.9 million children are born with a birth defect. At least 3.3 million children under five years of age die from birth defects each year and an estimated 3.2 million of those who survive may be disabled for life. ^[1] Birth defects are a global problem, but their

42 impact is particularly severe in middle- and low- income countries where more
 43 than 94 percent of the births with serious birth defects and 95 percent of the
 44 deaths of these children occur. ^[1] In a hospital based study in Makurdi, North
 45 Central Nigeria the prevalence of Congenital anomalies was found to be 8.5%.
 46 ^[4] In Nigeria median age at first birth for women age 25-49 is 20.2 years.
 47 Women living in urban areas have their first birth three years later (22.0 years)
 48 than women living in rural areas (19.0 years). ^[5] Maternal age profile of the
 49 general population has changed remarkably in Europe, with advanced maternal
 50 age rising each year. Prior studies have described the effect of the maternal age
 51 on the outcome of pregnancy as well as its relationship with newborn's birth
 52 defects. Both younger and older maternal age may pose increased risks for birth
 53 defects. ^[6] It is well known that older mothers have a higher risk of
 54 chromosomal anomalies such as Down Syndrome, ^[7,8] but whether they are at
 55 excess risk of non-chromosomal anomalies is less clear. Hollier et al in a large
 56 prospective cohort study demonstrated an additional 1% age related risk of non-
 57 chromosomal abnormalities in women aged 35years or older. ^[8] However Baird
 58 et al found no association between the incidence of congenital malformations
 59 and advanced maternal age. ^[9] Recent studies suggest that young maternal age
 60 maybe a stronger risk factor for certain congenital anomalies compared with
 61 advanced age. ^[10-11] Many of this studies have been unable to get information on
 62 still births and terminations, thereby information on anomalous fetuses are
 63 lacking. The aim of this study was to determine the association between
 64 neonatal characteristics, major systems and maternal age.

65 2.MATERIALS AND METHODS

66 2.1 Study Site and Design

67 A descriptive retrospective study conducted at the Neonatal unit of the Benue
 68 State University Teaching hospital (BSUTH), Makurdi, Benue State over a
 69 three-year period from June 2013 to July, 2016. This 350 bed teaching hospital
 70 became fully operational in January 2012 and it provides both secondary and
 71 tertiary health care services to Benue State and the adjoining states, as well as
 72 involvement in both undergraduate and postgraduate trainings in the various sub
 73 specialties of medical practice. The Neonatal unit of the hospital is where
 74 children less than 28 days of age are admitted. The unit is further divided into
 75 an out born subunit equipped with 4 cots, 2 incubators, 1 resuscitaire and two
 76 phototherapy units and the in born unit which is equipped with 4 cots, 2
 77 incubators, 4 phototherapy units, 2 replaceable oxygen cylinders, 1 resuscitaire
 78 and 1 apnoea monitor. The manpower that is responsible for the effective
 79 running of the unit consists of a Paediatrician, Paediatric residents and Nursing
 80 staff. The hospital receives referral from different parts of the state and
 81 surrounding states.

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2.2 Data Collection and Definition of Variables

A self-designed structured questionnaire was used to collect data from participants. The diagnosis of congenital anomaly(CA) was based on clinical evaluation and ultrasound examination when required. Genetic screening and echocardiography could not be done due to lack of equipment and trained manpower. The different characteristics of mothers and newborns were analyzed by the maternal age groups. Mothers were categorized by age group into 5 groups: ≤ 19 years, 20 to 24 years, 25-29 years, 30-34 years and 35 years above. Other variables analyzed included the parity, data on antenatal care, congenital anomalies were classified using the International Statistical Classification of Diseases and Related Health Problems 10th Revision(ICD-10) version for congenital malformations, deformations and chromosomal abnormalities.^[12] For newborns sex, birth weight and gestational age were classified as term or preterm.

2.3 Data Analysis

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

3.RESULTS

3.1 Maternal and Neonatal General Characteristics

Table 1 summarizes maternal and neonatal general characteristics. A total of 843 neonates were admitted into the Special Care Baby Unit (SCBU) of Benue State University Teaching Hospital (BSUTH) over a three-year period from June 2013 to July 2016. Among them 72 neonates were documented to have congenital anomalies, giving a prevalence rate of 8.5%. The age group distribution of the mothers of these babies with CA was less than 20 years 8(11.1%), 20-24 years 19(26.4%), 25-29 years 23(31.9%), 30-34 years 17(23.6%) and 35 years and above 5(7.0%) respectively. Of the 72 mothers, 52 (72.2 %) attended Antenatal Care (ANC). In all 43(59.7%) of the neonates were males while 29(40.3%) were females. Majority of the congenital anomalies occurred amongst the primiparous mothers 24(33.3%). The newborns with birth weight above 2500g 50(69.4%) presented more with CA. A greater percentage 67(93.1%) were term.

123 Table 1. Univariate Analysis of Maternal and Neonatal Characteristics

	Maternal Age Group	N (%)
	≤ 19	8 (11.1)
	20-24	19 (26.4)
	25-29	23 (31.9)
	30-34	17 (23.6)
	≥ 35	5 (7.0)
	Parity	
	1	24 (33.3)
	2	17(23.6)
	3	12 (16.7)
	≥4	19(26.4)
	ANC	
	Yes	52 (72.2)
	No	20 (27.8)
	Sex	
	Male	43(59.7%)
124	Female	29(40.3)
125	Birth weight	
126	<2500g	22(30.6%)
127	≥2500g	50(69.4%)
128	Nature of gestation	
129	Singleton of gestation	72 (100.0)
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131 3.2 Prevalence Rates of Major Systems and Diagnoses Stratified By Maternal
132 Age

133 Table 2:The distribution of CA based on body system involved showed that the
134 Central Nervous System (CNS) had the highest prevalence of 3.3 %. The
135 maternal age group of 25-29 years had the highest prevalence rate of 1.3 %.
136 Myelomeningocele was the leading cause of CNS manifestation with a
137 prevalence rate of 2.5%. Gastrointestinal Tract(GIT) and Musculoskeletal
138 System(MSS) both had a prevalence rate of 2.5 % respectively. Anorectal
139 malformation was the commonest GIT disorder with a prevalence rate of 1.7 %
140 and Gastroschisis (MSS) with a prevalence of 0.9%.

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Systems/Diagnosis	N	Prevalence	Age Group and Prevalence Rates					Total
			15-19	20-24	25-29	30-34	≥35	
Systems			N(prev)	N(prev)	N(prev)	N(prve)	N(prev)	

CNS	28	3.3	3 (0.4)	4 (0.5)	11(1.3)	9 (1.0)	1(0.1)	3.3
GIT	21	2.5	0(0)	07(0.8)	6(0.7)	5(0.6)	3(0.4)	2.5
MSS	21	2.5	3(04)	07(0.8)	6(0.7)	3(0.4)	2(0.2)	2.5
Total	70	8.3	0.8	2.1	2.7	2	0.7	8.3
Diagnosis								
Myelomeningocele	21	2.5	3(0.4)	2(0.2)	8(0.9)	7(0.8)	1(0.1)	2.5
Anorectal Malformation	14	1.7	0(0)	5(0.6)	3(0.4)	2(0.2)	1(0.1)	1.7
Gastroschisis	8	0.9	0(0)	2(0.2)	3(0.4)	3(0.4)	0(0)	1
Omphalocele	7	0.8	3(0.35)	3(0.35)	0(0)	0(0)	1(0.1)	0.8
Total	50	5.9	0.75	1.35	1.9	1.6	0.3	6

Total prevalence is 8.5%; 72 congenital anomalies and 843 total neonates in this study.

Omphalocele major and minor combined to give the total and maternal age related prevalence rates.

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145 3.3 Birth Order Stratified by Maternal Age Group and Prevalence rates of CA.

146 Table 3 showed the distribution of cases amongst the various maternal age
147 groups with the highest proportion of 31.9 % of CA occurring in the age group
148 of 25-29 years. This is followed by 26.4 % and 23.6% in 20-24 and 30-34 age
149 groups respectively. The distribution of birth order showed that the lower birth
150 order had higher number of cases of CA corresponding to, 24(33.3%),
151 17(23.6%) and 12(16.7%) for birth order of 1,2 and 3 respectively. Similarly the
152 prevalence rate of CA was 2.83%, 2.01% and 1.42% for birth order of 1,2,3
153 respectively. The higher birth order ≥ 4 has much lower prevalence rate of
154 2.24% than a combined prevalence rate of 6.26% in the lower birth order, < 4 .

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163 Table 3 Birth Order Stratified by Maternal Age Group and Prevalence Rates of
164 CA

Parity/Birth order	Maternal Age Group					Total	Prevalence
	15-19	20-24	25-29	30-34	≥ 35		
1	6 (25)	10 (41.6)	4 (16.7)	4 (16.7)	0	24	2.83
2	2 (11.8)	7 (41.2)	4 (23.5)	4 (23.5)	0	17	2.01
3	0	2	7 (30)	1 (60)	2 (10)	12	1.42
≥4	0	0	8 (42.1)	8 (42.1)	3 (5.8)	19	2.24
Total	8	19	23	17	57	72	

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167 3.4 Bivariate Analysis on Characteristics and Systems involved on Maternal 168 Age and CA

169 Table 4 ANC attendance, birthweight and gestational age had a reduced risk of
170 association with maternal age group of 25 years and above with odds ratios of
171 (OR) 0.4,0.6 and 0.1 respectively. However, only birth weight was weakly
172 associated with maternal age, ≥25 years, P-value = 0.05. ANC attendance and
173 gestational age at birth was not statistically associated with maternal age, ≥ 25
174 years as shown by P-value = 0.41 and 0.06 respectively. The latter two
175 insignificant P-values were associated with overlap of confidence intervals of
176 reduced and increased risk (OR < 1 and OR > 1) of 0.003 and 1.5 for gestational
177 age at birth. Similarly, the CNS, GIT and MSS that were the major systems
178 involved showed that maternal age 25 years and above was a risk factor for all
179 of them to develop, OR of 2.5,1.3 and 1.8 respectively but with insignificant P-
180 values of 0.08,0.6 and 0.3. The confidence interval for each of them overlapped.

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182 Table 4 Bivariate Analysis for effect of Maternal Age on Neonatal
183 Characteristics

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Maternal age	Characteristics		OR	95% CI	χ^2	p-value
	Yes	No				
	Birth Weight					
	< 2500g	≥ 2500g				
≥ 25	10	35	0.4	0.1, 1.0	3.93	0.05
≤ 24	12	15				

ANC						
≥ 25	31	14	0.6	0.2, 1.9	0.66	0.41
≤ 24	21	6				
Gestational age						
	Preterm	Term				
≥ 25	1	44	0.1	0.003, 1.5	4.14	0.06**
≤ 24	4	23				
CNS						
≥ 25	21	24	2.5	0.9, 7.1	3.05	0.08
≤ 24	7	20				
GIT						
≥ 25	14	31	1.3	0.4, 3.8	0.22	0.6
≤ 24	7	20				
MSS						
≥ 25	11	34	1.8	0.2, 1.5	1.3	0.3
≥ 24	10	17				

** Fisher's exact

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186 4.DISCUSSION

187 In this study, the highest prevalence rate of congenital anomalies occurred in the
 188 age group of 25-29 years for major systems as well as their corresponding major
 189 diagnosis. The lower birth order has much higher prevalence of CA than the
 190 higher birth order, meaning that, lower parity was more affected. Maternal age,
 191 25 years and above were at higher risk of giving birth to cases of CA but not
 192 statistically associated with the major systems involved as shown in the
 193 bivariate analysis where CNS, GIT and MSS where the major systems involved
 194 and are implicated by odds ratios greater than 1. However, the P-values (> 0.05)
 195 in the analysis showed that none of them was statistically significantly
 196 associated with maternal age 25 years and above. The mean maternal age in our
 197 study was 26.5 years SD(± 5.3)95% CI 25.3-27.7. Our findings suggest that
 198 women between the ages of 24-29 years at delivery had a significant risk of
 199 having babies with non-chromosomal anomalies when compared with women

aged less than 24 years this is similar to what has been reported by other researchers.^[8,13] Women giving birth at an early age have increased risk of adverse pregnancy outcomes. Early prenatal care less likely in teenage mothers and these mothers are less likely to be educated and come from lower socioeconomic group.^[14] 72.2 % of the mothers in our study attended ANC which is a predictor of a favorable outcome of childbirth, including a reduced risk of premature births, low birth weight and infant mortality as described in literature.^[15-17] Association of low birth weight (LBW) with increased risk of congenital malformations is very well documented^[18] our findings is at variance with this because we found more babies with CA at birth weight above 2500g. There was no significant association of the birth weight with CA. In this study a significantly higher prevalence of malformation were seen among babies of primiparous mothers in contrast with what had been reported from other studies which found out that higher incidences of CA occurred in babies of the multiparas.^[18]

In the present study the malformations of the central nervous system (CNS), gastrointestinal tract (GIT) and musculoskeletal system (MSS) were the major systems involved and occurred in maternal age 25 years and above with OR of 2.5, 1.3 and 1.8 respectively but with insignificant p-values of 0.08, 0.6 and 0.3 respectively. The confidence interval for each of them overlapped. Fontoura and colleague documented similar findings.^[19] While Neelu Desai^[20] found MSS as ranking first and Shamim et al^[21] have shown GIT anomalies topping the list.

Our study is not without limitations, the small size maybe associated with power to infer significant association between maternal age and the various systems involved. This is a secondary data that lacked other descriptive information about the mothers like socioeconomic and environmental factors. This is a retrospective design with its potential for misclassification bias.

5. CONCLUSION

The present study gave us an idea regarding the frequency of distribution of congenital anomalies and its relation with associated maternal age. Neonates from older mothers are not more at risk of developing congenital anomalies than young mothers. The major systems involved were the CNS, GIT and MSS.

Recommendation

Emphasis should be laid on prevention by regular ANC, maternal education, prenatal ultrasonography, and supplementation of folic acid prior to conception. A Statewide or population based study of CA to increase sample size and power to draw inference. More diagnostic facilities and specialists to diagnose chromosomal and other in-utero anomalies, not just physical malformations.

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.

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