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Association Of Congenital Anomalies in Newborns with Maternal and Fetal Factors in North Gujarat Region, India: A Cross-Sectional Analytical Study

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ABSTRACT

Background: Approximately 8 to 15% of perinatal deaths and 13 to 16% of neonatal deaths in India are a result of congenital anomalies. The objective of the research was to study incidence of clinically detectable congenital malformations in newborns delivered at secondary and tertiary hospitals and their association with maternal and fetal factors.

Material and methods: This study include all new-borns delivered at secondary and tertiary care hospitals in the Mehsana districts of Gujarat, India from January 1st, 2021 to December 31st, 2021. A total of 6900 consecutive births were examined for visible structural anomalies to determine the overall incidence and distribution of congenital malformations and their association with feto-maternal factors.

Results: Total numbers of malformed babies were 90 with incidence of 1.30%. Incidence of malformed babies was 1.54% among mother in the age group of 21-35 years, 3.57% among mother with consanguineous marriage, and 6.67.% among mothers with severe anemia. The incidence was 0.97% in babies <1500 birth weight, 0.97% among live births and 12.5% among preterm babies.

Conclusion: Congenital anomalies in newborns are significantly associated with maternal factors like maternal age, consanguinity, previous child with malformation, history of previous abortion and severe anemia and fetal factors such as stillbirth, premature babies, and low birth weight.

Key words: congenital anomalies, malformations, still births, birth defects, feto-maternal factors

INTRODUCTION

In addition to structural defects, chromosomal abnormalities, metabolic defects, and hereditary diseases, there are a variety of congenital anomalies that can be diagnosed before, during, or after birth.[1] Congenital anomalies are diagnosed during or shortly after birth in about 2-3% of births. A congenital anomaly arises from defective morphogenesis during early fetal development. The term encompasses metabolic or microscopic defects at the cellular level. There are serious medical, surgical, and cosmetic consequences associated with major anomalies. In poorer countries, malnutrition and infections are the leading causes of infant mortality and morbidity, while in developed countries, cancer, accidents, and congenital malformations are the leading causes. Approximately 8 to 15% of perinatal deaths and 13 to 16% of neonatal deaths in India are a result of congenital anomalies.[2,3]

A recognizable malformation or malformation is estimated to occur in one out of every 40 newborns.[4] With decreasing mortality due to infection and nutritional disorders, congenital malformation-related deaths are increasing.[5]

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It is possible for congenital malformations to present as primary defects in development or as multiple malformation syndromes. The cause of approximately 66% of major malformations is unknown. Most of them are of multi-factorial inheritance.[6,7,8] Congenital malformations are caused by a wide range of factors, including genetic factor, environmental factor, teratogenic agents, infections, medical problems, chemical agents, drugs, and radiation. There are also some maternal conditions that should be taken into consideration, including alcoholism, diabetes, endocrinopathies and nutritional deficiencies.[9]

Congenital malformations may be prevented and managed better through research programs that alert us to new teratogens, understand their epidemiological implications, and thus help us prevent their occurrence. The purpose of this study was to investigate the association of maternal and fetal factors with clinically detectable congenital malformations in newborns presented at secondary and tertiary care hospitals of North Gujarat region of India.

MATERIAL AND METHODOLOGY

The present study is a cross sectional analytical study of all the new-borns delivered at Obstetrics and Gynecology Department secondary and tertiary care hospitals of Mehsana district of North Gujarat region of India for a period of 1 year from 1st January 2021 to 31st December 2021. The study was approved by the institutional ethical council for human research prior to its execution. Data security and confidentiality were also taken into account. The file holding identity-related information was password-protected, and the completed Performa were kept in a lock with a key only the researcher had access to. To determine the overall incidence of congenital malformations and establish various etiological factors which appear to be causally related, 6900 consecutive births, including both live and still born babies, were examined for structural anomalies after written and verbal consent from their mothers. To cover all the findings of relevant history and of examination, a Performa was predesigned. It included information about the mother's age, consanguinity, parity, and family history for any congenital malformation, as well as antenatal history for exposure to infection, drugs, and irradiation.

High risk neonates were examined in detail by a neonatologist. All the babies were examined within 12 hours of birth. Thorough physical examination of new born babies was done. The immediate outcome of all the malformed babies was recorded during the period of the mother's hospital stay and an attempt was made to find out any history of congenital malformations in other family members. Investigations, such as ultrasonography, x-ray, and echo, as well as professional opinions from paediatricians, were used to confirm any malformed new born suspected of having syndromic congenital malformation. Data were statistically analyzed using SPSS software (trial version).

RESULTS

A total of 6900 babies were born out of which 95 were twins. Total numbers of malformed babies were 90, so total point incidence of congenital anomalies turned out to be 1.30%. (Table 1)

Out of total 6805 mothers 4535 (66.6%) were in the age group of 21-35 years and out of them 70 (1.54%) had malformed babies. Out of total 6805 fathers, 1085 (15.9%) fathers were above the age of forty and out of them 20 (1.84%) had malformed babies. Out of total 6805 mothers, 420 (6.2%) had consanguineous marriage and out of them 15 (3.57%) had malformed babies. Out of total 6805 mothers, 25(0.4%) had previous malformed child and out of them gave birth of 15 (60%) malformed babies. Out of total 6805 mothers, 990 (14.5%) mothers had history of previous abortion and out of them 25 (2.53%) had malformed babies. Out of total 6805 mothers, 375 (5.5%) mothers had severe anemia and out of them 25 (6.67%) had malformed babies. Statistically significant association was found between congenital malformation and maternal factors like maternal age, consanguinity, previous child with malformation, history of previous abortion and severe anemia. No statistically significant association was found between congenital malformation and paternal age. Mothers with previous child with malformation had 134 times higher risk of having malformed child in subsequent pregnancy. (Table: 2)

Out of 6900 newborns 1550 (22.5%) had birth weight less than 1500 grams and out of them 15 (0.97%) babies were congenitally malformed. Out of total 6900 newborns 6700 were live births and 200 were still births and out of 6700 live births 65 (0.97%) babies were malformed and out of 200 still births 25 (12.5%) babies were malformed. There were 3750 (54.3%) male newborns, out of that 50 (1.33%) were congenitally malformed and out of 3150 (45.7%) female newborns 40 (1.27%) were congenitally malformed. Out of 6900 newborns 280 (4.1%) were preterm babies and out of them 35 (12.5%) babies were congenitally malformed. Statistically significant association was found between congenital malformation and fetal factors such as stillbirth, premature babies, and low birth weight and prematurity.

Table 1: Incidence of congenital anomalies

Indicator	Value
Total No. of deliveries	6805
Total No. of twin deliveries	95
Total No. of newborns	6900
Total No. of malformed newborns	90
Incidence of congenital anomalies	1.30%
Incidence of congenital anomalies/1000 births	13.04

Table 2: Association of maternal factors with congenital malformation

Specific Character	Subjects (n=6805)	Malformed Cases (n=90)	χ^2 Value	P Value	Odds Ratio (95% CI)
Maternal Age					
<20 years	1490	10 (0.67%)	6.408	p=0.04	0.431(0.22 to 0.83)
21-35 Years	4535	70 (1.54%)			0.82 (0.42 to 1.61)
>35 Years	780	10 (1.28%)			
Paternal Age					
<40 Years	5720	70 (1.22%)	2.601	p=0.10	1.51 (0.92 to 2.50)
>40 Years	1085	20 (1.84%)			
Consanguinity					
Yes	420	15 (3.57%)	16.551	p<0.0001	3.116 1.77 to 5.47
No	6385	75 (1.17%)			
Previous child with malformation					
Yes	25	15 (60%)	409.14	p<0.0001	134.10 (58.36 to 308.12)
No	6780	75 (1.11%)			
H/o Previous abortion					
Yes	990	25 (2.53%)	12.384	p<0.001	2.292 (1.44 to 3.65)
No	5815	65 (1.12%)			
Severe anemia (Hb </= 7gm %)					
Present	375	25 (6.67%)	80.592	p<0.0001	6.995 (4.36 to 11.23)
Absent	6430	65 (1.01%)			

(Figures in the parenthesis are percentages)

Table 3: Association of fetal factors with congenital malformation

Specific Character	Babies born (n=6900)	Malformed Cases (n=90)	χ^2 Value	P Value	Odds ratio
Birth Weight					
<1500	1550	15 (0.97%)	8.389	p=0.03	0.99 (0.49 to 2.04)
1500-1999	2110	40 (1.9%)			1.97 (1.08 to 3.58)
2000-2499	1695	20 (1.18%)			1.21 (0.62 to 2.38)
>/= 2500	1545	15 (0.97%)			
Type of birth					
Live births	6700	65 (0.97%)	176.52	p<0.0001	14.58 (8.98 to 23.68)
Still births	200	25 (12.5%)			
Gender of Baby					
Male	3750	50 (1.33%)	0.052	p =0.81	0.95 (0.63 to 1.44)
Female	3150	40 (1.27%)			
Maturity of the baby					
preterm	280	35 (12.5%)	250.46	p<0.0001	17.052 (10.95 to 26.54)
full term	6620	55 (0.83%)			

No significant association was found between congenital malformation and gender of the child. Preterm babies have 17 times higher chances of malformations than term babies. (Table: 3)

DISCUSSION

In our study incidence of congenital anomalies was 1.30%. Studies like Desai N et al[10] and Saifullah et al[11] showed slightly higher incidence (3.6%) than our study. other studies like Taksande A. et al[12], Anand et al[13] and Karla et al[14] showed incidence of congenital anomalies were 1.91%, 2% and 1.98% respectively. The true incidence of congenital abnormalities is determined by a variety of circumstances, and no two studies are identical. It varies on ethnicity, population sample (hospital or community-based, live birth or total birth), study design (prospective or retrospective), age at diagnosis, follow-up period, autopsy rate, diagnostic facility available, and physician excitement and acuteness. The decreased incidence in present study compared to other studies could be due to the inclusion of abnormalities that were only present at birth. All abnormalities discovered during an autopsy or later identified were ruled out.

In our study statistically significant association was found between congenital malformation and maternal age. Other studies, such as Swain et al [5], Desai N et al[10], Taksande A. et al[12], and Sagunabai et al[15], have found statistically significant association of increased maternal age and congenital anomalies. Other studies such as Datta. et al[3], Khanna M. et al[4] and Karla et al[14] have found no statistically significant association between congenital malformation and maternal age. In our study no statistically, significant association was found between congenital malformation and paternal age. Yang et al.[16] also observed a correlation between increasing paternal age and offspring with esophageal atresia.

Our study found a statistically significant association between congenital malformations and low birth

weight. Low birth weight was associated with an increased risk of congenital malformations. This emphasizes the fact that the presence of congenital anomalies themselves impedes the growth of the developing fetus. Our study found a statistically significant relationship between congenital malformations and preterm birth. This is of particular concern as preterm birth and stillbirth are the leading causes of perinatal mortality. This fact is also reflected in other studies such as Desai N et al. [10] and Saifullah et al.[11], Takasande A. et al[12], Karla et al.[14].

In our study, statistically significant association was found between congenital malformation and still birth. other studies such as Datta. et al[3], Swain et al[5] and Taksande A. et al[12] also found a higher rate of birth defects in stillbirths. Often, major malformations are incompatible with life, which may explain the high incidence of birth defects in infants. In our study, no significant association was found between birth defects and child sex. Similar results were obtained in studies such as Datta. et al[3], Swain et al[4], Saifullah et al.[11]Taksande A. et al[12].

Present study was conducted at secondary and tertiary care hospitals with specialized maternal and neonatal care. Therefore, the number of complications mothers and babies can be higher than in the community. Therefore, the incidence of malformations in newborns may also be higher than in the general population.

CONCLUSION

The study concludes that congenital anomalies in newborns are significantly associated with maternal factors like maternal age, consanguinity, previous child with malformation, history of previous abortion and severe anemia and fetal factors such as stillbirth, premature babies, and low birth weight. More attention should be paid to prevention with regular antenatal care and to avoid known teratogenic and potential teratogenic substances. Outcomes need to be improved by providing antenatal testing, genetic counseling, better diagnostic and therapeutic facilities.

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