

Prevalence and associated factors of congenital anomalies in a tertiary care centre in Tamilnadu

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Abstract

Background: A birth defect or congenital anomaly is an abnormality of structure, function or body metabolism that is present at birth and results in physical or mental disability. Evaluation and management of newborns with one or more malformations present a significant challenge to the healthcare providers and families. Despite major advances in understanding the etiology and pathogenesis, malformations remain a leading cause of infant mortality. This study brings about the prevalence of congenital anomalies among antenatal patients delivering beyond the period of viability, 22 weeks in a tertiary care centre in Tamilnadu and also the pattern of anomalies, along with the associated factors. **Materials and Methods:** A cross sectional study with nested case control design was conducted in a tertiary care centre in Taminadu for one year from July 2015 to June 2016. Those fetuses induced in second trimester following detection by ultrasound and those babies detected to have congenital anomalies by postnatal examination were included in the study. Data of 191 cases and 191 controls were collected by interviewing the mothers and reviewing the existing patient records. Relevant antenatal, natal, postnatal and past illnesses were recorded in a proforma and analysed. **Results:** In the study period, 191 babies out of 9877 were anomalous with a prevalence of 1.93%. Anomalies of the central nervous system were the commonest (35.6%). The ultrasound detection rate was 67.01%. Maternal age >25 years was seen in 55%. About 15.7% of the mothers had consanguineous marriage. The distribution among primigravida and multipara are almost similar. 16.2% of cases had a history of infertility in the mother. 8.4% of the cases had a family history. About 4.7% cases had a history of exposure to antiepileptic drugs. Maternal diabetes mellitus and epilepsy contributed 32.5% and 4.5% of cases respectively. Intrauterine growth restriction and amniotic fluid abnormalities were commonly associated. **Conclusion:** The study helps to know the pattern of congenital anomalies and the relationship of various gestational and familial factors and the importance of ultrasound in diagnosing anomalies. Surveillance of anomalies should be a must and all maternity hospitals should have their own anomaly register. Parents of any surviving anomalous child should receive emotional support and reassurance.

Key words: Congenital Anomaly, Consanguinity, Diabetes Mellitus, Neural Tube Defect

Introduction

Evaluation and management of newborns with one or more malformations present a significant challenge to healthcare providers and families. Despite major advances in understanding the etiology and pathogenesis, malformations remain a leading cause of infant mortality [1]. These children become an emotional burden to their families. A birth defect or a congenital anomaly is an abnormality of structure, function or body metabolism that is present at birth and results in physical or mental

disability or is fatal [2]. There are more than 4000 known birth defects. Major congenital abnormality is defined as those defects which cause serious structural, cosmetic and functional disability requiring surgical or medical management. Minor congenital abnormality may be defined as unusual morphologic features that are of no serious medical or cosmetic consequences [3].

Further classification of physical defects includes malformation, deformation, disruption, dysplasia, sequence, syndrome and association [3]. Any congenital anomaly must be described in terms of nomenclature. Considerable variation in frequency has been reported

Manuscript received: 8th December 2016

Reviewed: 16th December 2016

Author Corrected: 24th December 2016

Accepted for Publication: 31st December 2016

among different populations. Studies in India reveal an incidence of 3 to 4% [4]. In Japan the incidence has been reported to be 1.07% and in Taiwan it is 4.3%. In spite of high frequencies of congenital anomalies, the cause remains obscure. Around 15 to 20% are due to recognized genetic conditions, 8 to 10% are due to environmental factors (maternal related conditions, drugs or chemical exposure) and 20 to 25% are due to multi factorial inheritance [5]. The majority 40 to 60% of congenital anomalies have unexplained causes [5].

Although minor birth defects are often correctable, the emotional and economic burden on the family and society is considerable and invariably leaves families and healthcare providers with unanswered questions regarding the causes, recurrent risks and preventive measures. Musculoskeletal malformations are the commonest in most of the Indian studies [6].

Ultrasound is an accurate method to diagnose malformations prenatally in high risk group of pregnant women [7]. However most anomalies are found among newborns from pregnancies without risk factors. Therefore an ultrasound is offered to all pregnant women with the aim of screening for fatal anomalies. The modalities, the reliability and the value of such a screening are controversial. Usually an anomaly scan is done at 18 to 20 weeks [7]. When one anomaly is detected it is imperative that other anomalies are sought for and confirmed or ruled out.

Antenatal diagnosis of abnormality allows parents not only the option of termination but also time to plan care for the child. Prenatal diagnosis of congenital anomalies provides information for decisions during pregnancy and appropriate treatment perinatally and it is assumed to improve perinatal and long term outcome.

Congenital malformations have always been an attraction for researchers because of the high frequency with which they occur and the devastating effects they have on the individual and the family.

Congenital anomalies account for a large fraction of childhood mortality and morbidity. Around the world lot of importance is being focused on congenital anomalies with a decline in the mortality from other causes like infectious diseases.

This study brings out the prevalence of congenital anomalies of antenatal patients delivering beyond the period of viability 22 weeks in a tertiary care centre in Tamilnadu and also the pattern of anomalies along with the associated factors.

Materials and Methods

Study design: Cross sectional study with nested case control design

Study setting: A tertiary care centre in Tamilnadu for a period of one year from July 2015 to June 2016

Study population: Antenatal patients admitted to the labour room, either booked or referred, delivering an anomalous baby (live/stillborn) beyond the period of viability was taken as the case. Next patient in the parturition register was taken as the control.

To study the maternal and fetal risk factors, total number of cases and controls would be 191 each.

Inclusion criteria

1. Congenitally anomalous babies beyond 22 weeks of gestation (live/stillborn) delivered in our hospital were taken for the study
2. An infant with more than one anomaly was counted only once

Exclusion criteria

1. Babies delivered out of our hospital admitted due to anomalies
2. Gestational age less than 22 weeks.

Methodology: A study was conducted in a tertiary care centre in Tamilnadu for a period of one year. Those fetuses induced in second trimester following detection by ultrasound and those babies detected to have congenital anomalies by postnatal examination were included in the study. Data was collected by interviewing the mothers and reviewing the existing patient records.

Relevant antenatal, natal, postnatal and past illnesses were recorded in a preplanned proforma. Details like maternal age, parity, family history, consanguinity, history of infertility, exposure to teratogens, medical history and pregnancy losses in the past were noted.

Details of ultrasound were noted. The babies were examined in the labour room with help from labour room paediatrician and anomalies noted and recorded.

Statistical analysis: The data was entered into masterchart and necessary statistical tables were constructed. In order to test hypothesis, statistical tests like Chi square test and odds ratio were used.

Results

In the study period 191 babies out of 9877 were anomalous and this gives a prevalence of congenital anomalies in the antenatal patients delivering beyond the period of viability as 1.93%.

Table-1: Pattern of anomalies noted.

System	Count	Percentage
Central nervous system	68	35.6%
Musculoskeletal system	45	23.6%
Genitourinary system	36	18.8%
Cardiovascular system	10	5.2%
Gastrointestinal system	8	4.2%
Syndromes	8	4.2%
Miscellaneous	16	8.4%
Total	191	100

Anomalies of the central nervous system were the commonest (35.6%) followed by musculoskeletal system anomalies which was contributed by 23.6%. Anomalies of the gastrointestinal system was least commonly noted in the study.

Table-2: Ultrasound detection rate of anomalies.

System	Total cases	Cases detected by ultrasound	Percentage
Central nervous system	68	55	80.88%
Musculoskeletal	45	27	60%
Genitourinary	36	24	66.67%
Cardiovascular	10	6	60%
Gastrointestinal	8	4	50%
Syndromes	8	3	37.50%
Miscellaneous	16	9	56.25%

The ultrasound detection rate in total was 67.01%. A total of 128 cases were detected sonologically of the 191 cases. Detection rate was 80.88% for central nervous system anomalies.

Table-3: Period of gestation of first detection of anomalies by ultrasound

System	<18 Weeks	18-20 Weeks	>20 Weeks
Central nervous system	2	4	49
Musculoskeletal	12	0	15
Genitourinary	0	10	14
Cardiovascular	0	0	6
Gastrointestinal	0	0	4
Syndromes	0	0	3
Miscellaneous	0	0	9
Total	14(10.93%)	14(10.93%)	100(78.13%)

Although ultrasound picked up a fairly good number of anomalies, the period of gestation when it detected was beyond 20 weeks in majority of the cases. This rise is however spurious because the study included only cases delivered beyond the period of viability and probably lethal anomalies detected before 20 weeks had undergone termination of pregnancy earlier. Ultrasound detected 100 anomalous babies after 20 weeks and 63 cases were left undetected which could be minimized thus reducing perinatal morbidity.

Table-4: Distribution of subjects- family history of anomaly.

Family history of anomaly	Cases	Controls
Present	16(8.4%)	0(0%)
Absent	175(91.6%)	191(100%)
Total	191(100%)	191(100%)

Increasing maternal age >25 years was seen in 55% of the cases while it was 44.5% among the controls and this difference was statistically significant to state an association between the increasing maternal age and anomalies in the fetus. Of the 191 cases 68.1% were referred while it was only 12.6% among the controls. Consanguinity was present in the mothers in 15.7% of the cases while it was 3.1% in the controls and consanguinity was more prevalent among Muslims, most of them being third degree.

History of infertility in the mother bears a significant association with congenital anomaly in the fetus. 8.4% of the cases had a family history of anomalies (first degree relatives) while none of the controls had such a history.

Table-5: Distribution of subjects-history of previous anomalous pregnancy.

History of previous anomalous pregnancy	Cases	Controls
Present	12(6.3%)	4(2.1%)
Absent	179(93.7%)	187(97.9%)
Total	191(100%)	191(100%)

Previous history of adverse pregnancy outcome in the mother in the form of miscarriage, intra uterine fetal demise, still birth and neonatal death was found to be a significant risk factor for congenital anomaly and was present in 24.1% of the cases and 9.4% of the controls. 6.3% of the cases and 2.1% of the controls had a maternal history of previous anomalous pregnancy and this difference was not statistically significant.

Table-6: Distribution of subjects-periconceptual folic acid intake.

Periconceptual folic acid intake	Cases	Controls
Present	131(68.6%)	71(37.2%)
Absent	60(31.4%)	120(62.8%)
Total	191(100%)	191(100%)

Maternal periconceptual folic acid was present in 31.4% of the cases while 62.8% of controls took periconceptual folic acid and hence the intake of periconceptual folic acid has a preventive role in congenital anomalies and the association between the two is statistically significant.

Table-7: Maternal diabetes

Maternal diabetes	Cases	Controls
Present	62(32.5%)	10(5.2%)
Absent	129(67.5%)	181(94.8%)
Total	191(100%)	191(100%)

Maternal fever in the first trimester was found in 7.9% of cases and 4.7% of controls. Statistically significant difference has been found between the cases and controls with regard to maternal intake of teratogenic drugs in the first trimester. 4.7% of the cases and 0.5% of the controls had the history which was mainly antiepileptic drugs. 32.5% of the cases had maternal diabetes both gestational and overt when compared to 5.2% of the controls and the difference observed has been found to be statistically significant.

Table-8: Maternal epilepsy.

Maternal epilepsy	Cases	Controls
Present	9(4.7%)	1(0.5%)
Absent	182(95.3%)	190(99.5%)
Total	191(100%)	191(100%)

Maternal epilepsy complicated 4.7% of the cases and 0.5% of the controls and this difference when analysed was found to be statistically significant and thus epilepsy in the mother has a significant association with an anomalous fetus, in the study.

Table-9: Significant factors associated with congenital anomalies.

Factor	Cases	Percentage
Maternal age >25 yrs	105	55
Referred	130	68.1
Presence of consanguinity	30	15.7
Presence of maternal history of infertility	31	16.2
Presence of family history of anomaly	16	8.4
Presence of maternal history of previous adverse pregnancy outcome	46	24.1
Absence of periconceptional folic acid	131	68.6
Presence of drug intake in first trimester	9	4.7
Presence of maternal diabetes	62	32.5
Presence of maternal epilepsy	9	4.7
Presence of maternal spotting PV	52	27.2
Presence of IUGR	116	60.7
Presence of oligamnios	43	22.5
Presence of hydramnios	61	31.9
Male fetus	133	69.6

27.2% of the cases had a history of spotting or bleeding per vaginum in the early trimester in the mother as compared to 5.2% of the controls making it a significant associated factor. 60.7% of the cases as against of 20.4% of the controls showed intra uterine growth restriction making the difference statistically significant thus implicating IUGR as an associated factor. 22.5% of the cases had oligamnios as compared to 5.2% of the controls. 31.9% of the cases and 1% of the controls showed hydramnios and when analysed this difference was found to be significant in the study defining an association between hydramnios and fetal anomalies. Of the 191 cases, 69.6% were male babies, 25.1% females and 5.2% had ambiguous genitalia while in the controls 50.3% were males and 49.7% were females.

Discussion

This study reflects the results obtained from a tertiary care centre in Tamilnadu. This study has brought about the perinatal morbidity and mortality resulting from the birth of a viable anomalous baby.

Pattern of anomalies- Malformations of the central nervous system was the commonest in the present study accounting for about 35.6% of the total anomalies followed by musculoskeletal system (23.6%), the

genitourinary system, the cardiovascular system and the gastrointestinal system. In central nervous system anomalies, anencephaly was the commonest [7].

Central nervous and musculoskeletal system anomalies showed predominance over the rest in many of the studies conducted in india and abroad. Many studies show that central nervous system malformations were associated with very high perinatal mortality [8].

Original Research Article

Genitourinary anomalies ranked third with 18.8% of the total anomalies and hydronephrosis was the commonest genitourinary anomaly. This system was followed by the cardiovascular system and gastrointestinal system accounting for 5.2% and 4.2% of the total anomalies respectively.

A study conducted in the Banaras Hindu University, showed similar results. The central nervous system (39.5%) was most commonly involved followed by musculoskeletal system (14.5%) [9].

A hospital based study conducted in Jammu showed higher incidence of musculoskeletal anomalies. The pattern of congenital anomalies included musculoskeletal (30.6%), central nervous system (20.5%), gastrointestinal tract (18.5%), genitourinary (4.7%) and cardiovascular system (4%) [10].

There were 8 cases of identifiable syndromes of which 5 cases were Downs syndrome and this may be attributed to increasing maternal age.

Ultrasound picked up 67.01% of the 191 cases. The detection rates were higher when serial scans were done in the second trimester. Ultrasound picked up 80.88% of central nervous system malformations, 60% of the musculoskeletal anomalies, 66.67% of genitourinary anomalies, 50% of gastrointestinal tract anomalies, 60% of cardiovascular system anomalies and 37.50% of syndromes. Chitty et al evaluated the effectiveness of routine ultrasound in unselected general population [11,12]. He observed that early anomaly scan brought down the perinatal mortality and morbidity significantly. Besides it saves a lot of anxiety for the couple and their family. Helsinski trial found that early ultrasound detection led to an increased rate of elective abortions and therefore reduced perinatal death [12]. On the other hand radius trial found no statistically significant effect on the rate of induced abortions.

Risk factors associated with anomalies

Maternal age- In the present study 55% of the cases were associated with a maternal age of more than 25 years while it was 44.5% for the controls. The mean maternal age in the control population was 24.31 years while it was 25.31 years for the cases, yet this small difference was found to be statistically significant defining an association between increasing maternal age and anomalous fetus.

Many authors have shown higher incidence of malformations in the babies born to mothers aged over 35 years [12,13], while others have associated 20-35 years

maternal age group with higher incidence of congenital malformation [14,15].

Booking status- Majority of the cases 68.1% were referred while among the controls it was only 12.6%. This might be due to the fact that many cases of congenital anomalies being referred to a tertiary care centre for a better neonatal care. This difference has been found to be statistically significant.

Religion- The religionwise distribution of both cases and the controls are similar and this is in contrast to certain studies which showed a preponderance of anomalies among Muslims due to consanguineous marriage [15]

Consanguinity- Third degree consanguineous marriage was present in 30 cases and 6 controls and difference being a statistically significant one [14,15,16].

Kesavan P et al also found a similar relationship. He observed an increased incidence of congenital anomalies among the offsprings of consanguineous mating [16].

Parity- The distribution of study subjects according to parity was more or less similar in both the groups and was not statistically significant. Congenital anomalies were seen more frequently in mothers who had a parity of 4 and above. Chaturvedi et al recorded increase in frequency of central nervous system anomalies in primi and fourth gravida mothers [17].

Infertility- History of infertility was present in 16.2% of the cases and 4.2% of the controls the difference being statistically significant. This is accordance with Kovacs et al who found an increased predilection for multiple pregnancies and congenital anomalies with infertility and assisted reproductive techniques [18].

Family history of anomalies- 8.4% of the cases had a family history of anomalies in the first degree relatives when compared to none among the controls

Previous adverse pregnancy outcome- 24.1% of the cases had a maternal history of previous adverse pregnancy outcome while 9.4% of the controls had a similar history. A study by Bhat BV in India reported significant relationship between positive history of previous abortion [19,20,21].

Previous anomalous pregnancy- 6.3% of the cases and 2.1% of the controls had a maternal history of previous anomalous pregnancy and this was not found to be statistically significant.

Original Research Article

Periconceptional folic acid- 62.8% of the controls had a maternal periconceptional folic acid intake when compared to 31.4% of the cases. Several studies show that ensuring maternal folic acid supplementation during the periconceptional period can lower the incidence of these anomalies [20,21]

Teratogen exposure in the first trimester- Among teratogens, drug intake in the mother was the only significant risk factor found to be associated with fetal anomalies in the present study. Febrile illness and radiation exposure were distributed equally among the cases and controls drawing no significance.

Study conducted by Menon VK and Bharucha KE concluded that environmental influences like drug, radiation exposure, substance abuse and febrile illness were not found to be responsible for the genesis of congenital anomalies[22,23,24].

Maternal illness- Maternal diabetes and epilepsy were found to have statistically significant association with fetal congenital anomalies in the present study while maternal hypertension was distributed almost in a similar fashion among the cases and controls drawing no significant association. This is comparable with the result of various studies [25,26].

Ray et al found significant association between pregestational diabetes in the mother and congenital heart disease in the newborn[27]. Maternal hyperglycemia in the first trimester is associated with congenital anomaly in the newborn[28]. Farrell et al found that women with poorly controlled diabetes have a 2 to 3 fold increased risk of offspring with all congenital anomalies, including 1% risk for neural tube defects[29,30]. Jaaz D and Olaafsson and colleagues found a 2.7% fold increase in congenital malformations in epileptic mothers on antiepileptic drug treatment [31,32,33].

Antenatal complications- History of spotting or bleeding per vaginum, intrauterine growth restriction, oligamnios and hydramnios are all found to be significant factors associated with congenital anomalies in the present study. Rani R, Camero A and Munro have found that significant obstructive renal lesions are associated with a reduction in the amniotic fluid volume in their study [34,35,36]. Rddi Rani and Manjula found out an increased incidence of congenital anomalies with an abnormal increase in amniotic fluid volume [37].

Conclusion- The increasing proportion of fetal and infant morbidity due to anomalies have compelled us to study the associations and circumstances they occur.

The prevalence of congenital anomalies in the antenatal patients delivering beyond the period of viability in this tertiary care centre was 1.93%. The study definitely helps to know the pattern of congenital anomalies and the relationship of various gestational and familial factors in relation to congenital anomalies.

Considering the high frequency of central nervous system anomalies recorded in this study, it seems to be reasonable to pay more attention to the role of periconceptional folic acid supplementation for the primary prevention of congenital anomalies particularly neural tube defects.

Congenital malformations of the central nervous system like anencephaly, spina bifida, facial defects (cleft lip, cleft palate) can be detected in an early age by ultrasonography, amniocentesis. Various genetic or chromosomal abnormalities can be diagnosed by chorionic villous sampling and maternal serum screening. Certain risk factors can be modified like avoidance of consanguineous marriage, periconceptional folic acid intake, avoidance of teratogens and strict glycemic control in diabetics need to be addressed.

Sonography is a promising tool for the early detection of major malformation during pregnancy to reduce the high morbidity and mortality of the neonates due to congenital malformations. An increasing volume is accumulating on the use of 3D and 4D scans and the diagnosis of congenital anomalies could receive revived attention. Present evidence has already suggested that smaller defects such as spina bifida, cleft lip/palate and polydactyly can be more lucidly demonstrated. Other more subtle features such as low set ears, facial dysmorphism or clubbing of feet can be better assessed leading to more effective diagnosis of chromosomal abnormalities. The study of fetal cardiac malformations is also receiving attention. The ability to obtain a good 3D picture is nevertheless still very much dependent on operator skill, the amount of liquor around the fetus, its position and the degree of maternal obesity, so that a good image is not always obtainable.

Thus congenital malformations are emerging as important perinatal problem contributing sizeably to the perinatal morbidity and mortality with considerable repercussion on the mothers and the families affected. The life threatening congenital malformations must be identified by thorough clinical examination because early diagnosis and surgical correction or palliation of these infants offer the best chance for survival.

Funding: Nil, **Conflict of interest:** Nil

Permission from IRB: Yes

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How to cite this article?

Prema N, Sudhakaran R, Divya. B.V, Meerabai V, Maharani. Prevalence and associated factors of congenital anomalies in a tertiary care centre in Tamilnadu. *Obs Rev:J Obstet Gynecol* 2016;2(4):55-63.doi: 10.17511/joog.2016.i04.03.

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