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A STUDY ON FETAL CONGENITAL ANOMALIES AND ASSOCIATED MATERNAL RISK FACTORS

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ABSTRACT

Congenital anomalies are important contributors to perinatal morbidity, mortality, childhood disability, and long-term healthcare burden. Early antenatal detection and identification of associated maternal risk factors are essential for timely counseling, surveillance, and pregnancy management. In a tertiary-care context, this study evaluated the frequency and pattern of foetal congenital abnormalities as well as their correlation with specific maternal risk factors600 pregnant women between 11 and 24 weeks of gestation who were visiting Sree Balaji Medical College and Hospital in Chennai participated in an 18-month hospital-based cross-sectional study. Participants underwent structured interviews and routine antenatal ultrasonography. Maternal risk factors evaluated included consanguinity, previous anomalous pregnancy, positive family history of congenital anomalies, and maternal diabetes mellitus. SPSS version 22 was used to analyse the data, and $p<0.05$ was chosen as the statistical significance level. Fetal congenital anomalies were detected in 54 pregnancies, giving an overall prevalence of 9.0%. CNS anomalies were the most common, followed by cardiovascular and genitourinary anomalies. Most abnormalities were detected between 18 and 20 weeks of gestation. Congenital anomalies occurred more frequently among women with a previous inconsistent pregnancy, positive family history, maternal diabetes mellitus, and consanguinity, with statistically significant associations observed. Structured antenatal screening combined with systematic maternal risk assessment can facilitate early identification of fetal congenital anomalies. Early registration, targeted surveillance, appropriate counseling, and timely referral are important for improving maternal and fetal care.

KEYWORDS: Congenital anomalies; Antenatal screening; Maternal risk factors; Consanguinity; Maternal diabetes; Ultrasonography

1. INTRODUCTION

Congenital anomalies are structural or functional abnormalities that develop during pregnancy and can be detected before to, during, or after childbirth. They remain important contributors to perinatal morbidity and mortality, childhood disability, and long-term healthcare burden. They have a multifactorial and complex etiology that includes genetic susceptibility, maternal characteristics, metabolic disorders, nutritional deficiencies, infections, environmental exposure and teratogenic agents. Maternal and family factors have thus been the focus of much interest as a possible risk factor of fetal congenital abnormalities (Abebe et al., 2021). The systematic assessment of maternal risks during pregnancy has proven to be important, with epidemiological evidence indicating that a number of maternal exposures have been found to be associated with the occurrence of congenital anomalies (Taye et al., 2018). Hospital-based ANC studies have also established the significance of assessing the maternal risk profile in combination with the type of fetal anomalies detected during ANC (Abufraijeh et al., 2025).

Of particular concern is maternal age as the risk of congenital and chromosomal abnormalities increase with age (Goetzinger et al., 2017). The observational studies also provide evidence for a link between congenital anomaly risk and maternal age in various populations (Ahn et al., 2022). Maternal metabolic disorders are also important; diabetes before or during pregnancy has been linked to a higher incidence of congenital abnormalities in babies (Wu et al., 2020). In addition, maternal overweight and obesity might be associated with adverse fetal development, such as major congenital malformations (Persson et al., 2017). Given the ongoing prevalence of congenital anomalies, especially in low-resource settings, the need for antenatal screening, early detection of high-risk pregnancy, and awareness of potentially associated maternal factors highlights the importance of this issue (Mogess & Mihretie, 2024).

Congenital anomalies are acknowledged worldwide, but the incidence, distribution and risk factors are quite different depending on the characteristics of the populations, environmental factors, access to health care, and diagnostic methods. There is an interaction between environment and genetic background in the risk of congenital anomalies, and the evaluation of the risk is important for populations (Lee et al., 2021). Especially relevant metabolic factors are maternal obesity and diabetes, which have also been linked to congenital cardiac abnormalities (Helle & Priest, 2020). In addition,

the developmental and etiological pathways of different organ systems can be different, as seen in congenital anomalies of kidneys and urinary tract (Murugapoopathy & Gupta, 2020) and congenital abnormalities of the vertebrae (Raitio et al., 2023). Maternal processes during pregnancy can therefore impact a wide variety of fetal and childhood outcomes (Muglia et al., 2022).

However, there is little information available on the fetal congenital anomalies that are detected in antenatal period and selected maternal risk factors in South Indian tertiary care centres. Most of the evidence available is from postnatal evaluation or studies performed in various health care and geographic settings. The late registration of pregnancy and late referral may also contribute to late detection of fetal anomalies. Thus, local information about antenatal findings is necessary to describe the distribution of congenital defects and to determine maternal traits related to their incidence.

Early antenatal identification of fetal abnormalities gives an opportunity for appropriate diagnosis, counselling and pregnancy management. If screening suggests there is a risk of chromosomal or genetic abnormality, confirmation can be obtained via other procedures like chorionic villus sampling and amniocentesis, but there are associated risks with these procedures, which should be taken into account (Salomon et al., 2019). Maternal metabolic health is also pertinent to pregnancy outcomes, highlighting the need to recognise and optimise maternal risk factors during antenatal care (Chen et al., 2025). Good identification and documentation of congenital anomalies is critical to effective monitoring and comparison across health care facilities (Dolk et al., 2021); and effective screening processes are especially important in low- and lower-middle-income countries where access to diagnostic services may be restricted (Seyi-Olajide et al., 2023). Hence, consanguinity, previous anomalous pregnancy, positive family history of congenital anomalies and maternal diabetes mellitus/overt diabetes were given particular attention in the present study. The identification of these factors at routine antenatal check-ups can help with risk stratification, targeted screening, timely counselling and appropriate referral. To address this, the study was conducted in a tertiary care hospital to ascertain the prevalence and pattern of antenatally diagnosed fetal congenital anomaly and explore its relationship to selected maternal risk factors.

Aim and Objectives

Aim: To study the prevalence and pattern of fetal congenital anomalies detected during antenatal screening and to analyze the association of maternal risk factors with these anomalies in a tertiary care hospital setting.

Objectives:

1. To identify the distribution of various congenital anomalies among pregnant women attending Sree Balaji Medical College and Hospital.
2. To determine the maternal risk factors linked to foetal congenital abnormalities in the study population, with particular attention to the mother's history of diabetes mellitus or overt diabetes, her family history of congenital abnormalities, her history of consanguinity, and her history of congenital abnormalities in prior pregnancies.

2. METHODOLOGY

2.1. Study Design And Setting

The Department of Obstetrics & Gynaecology at Sree Balaji Medical College and Hospital in Chennai, Tamil Nadu, conducted this cross-sectional study. It is a tertiary care teaching and referral hospital, offering general and high-risk antenatal care. Obstetric ultrasonography, targeted anomaly assessment and specialist consultation was available making the setting appropriate for evaluating fetal congenital irregularities and association with selected maternal risk factors among antenatal women.

2.2. Study Period and Population

This study lasted for 18 months. All pregnant women in the period of 11-24 weeks of gestation regardless of their maternal age, gravidity or parity who were attending the antenatal outpatient service or admitted to the obstetric wards were included for study. The chosen gestational window included within it the gestational window of early fetal assessment and the routine mid-trimester anomaly screening window, enabling detection of major structural abnormalities in various stages of fetal assessment.

2.3. Sample Size and Sampling Technique

The sample size was calculated using a prevalence of congenital anomalies of 38% with P = 38, Q = 62, and an absolute precision of 4. Using this calculation, the sample size needed was calculated to be 600 participants. The purposive sampling method was used to recruit participants. The eligible antenatal women who met the pre-defined selection criteria were recruited during the period of the study until the desired sample size was reached.

2.4. Eligibility Criteria

All women of reproductive age, irrespective of gravidity and parity, between 11 and 24 weeks of pregnancy were eligible to be included in the study. Women presenting before 11 weeks or after 24 weeks of gestation were excluded. Women who did not want to participate and women who were not able to give reliable information of medical, obstetric or family history were also excluded.

2.5. Data Collection

A structured interview schedule and an ultrasound fetal assessment record were used to collect data. The interview schedule consisted of information on sociodemographic characteristics, medical and obstetric history, family history of congenital anomaly, consanguinity, previous history of abnormal pregnancy, diabetes mellitus in mother and other

possible risk factors. To improve participant comprehension, the questionnaire was first created in English and then translated into Tamil. A pilot assessment was carried out to evaluate the clarity and feasibility of the data-collection tool. All the participants gave written informed consent and were interviewed face-to-face with routine antenatal ultrasonography. Standard institutional techniques were used to perform ultrasonographic examinations by trained radiologists and obstetricians. Congenital anomalies detected were grouped by primarily involved system: central nervous system, cardiovascular, gastrointestinal, genitourinary, musculoskeletal, craniofacial, or multiple congenital anomalies. Women who had fetal abnormalities detected were counselled about the abnormalities and referred for further evaluation and management as indicated.

2.6. Maternal Risk Factors

The following maternal risk factors were assessed with respect to fetal congenital anomaly: consanguinity, positive family history of congenital anomaly, previous pregnancy complicated by a congenital anomaly, maternal diabetes mellitus and overt diabetes. The factors were chosen based on the main goal of the investigation. Consanguinity was considered to exist when partners were second cousins or closer.

2.7. Outcome Measures

The primary result of the investigation was the presence of a fetal congenital anomaly detected by antenatal ultrasonography. Secondary outcomes included the type and system-wise distribution of congenital anomalies, gestational age at first detection, and the relationship among selected maternal risk factors and fetal congenital irregularities. These outcomes were assessed using information obtained from the structured interview schedule and ultrasonographic evaluation.

2.8. Statistical Analysis

Collected data were all recorded in MS Excel and later analyzed by SPSS version 22. Frequencies and percentages were used to display data for categorical variables, while mean ± standard deviation was used for continuous variables. The number of fetal congenital anomalies were calculated based on total number of women who underwent Antenatal Screening. The The connections between specific maternal risk factors and foetal congenital abnormalities were assessed using the chi-square test or Fisher's exact test as applicable. The threshold for statistical significance was fixed at $p < 0.05$.

2.9. Ethical Considerations

Before the recruitment of participants, ethical clearance for the study was obtained from the Institutional Ethics Committee. Following an explanation of the study's objectives and methodology, each participant provided signed informed consent. No one was forced to participate and the information provided by the participants was kept confidential during the study. Women with fetal congenital anomaly diagnosis were given appropriate counseling and referred for further evaluation and clinical management as per institutional practice.

3. RESULTS

3.1. Baseline Features Of The Study Population

Total of 600 antenatal women included in the study. Most of these were in the 21–25 years age group (35.0%) and 26–30 years age group (33.0%). Of the women, 14.0% were in the age band of ≤20 years and 14.0% were between 31 and 35 years of age, with only 4.0% above the age of 35 years. The overall age group of the participants was 68.0% (21-30). As far as gravidity is concerned, 354 women (59.0%) were multigravida, 246 (41.0%) were primigravida, so there were more multigravida women than primigravida women in the study population. The maternal age and gravidity distribution for this population is given in Table 1.

Table 1. Baseline Features (n = 600)

Characteristic	Category	Number (n)	Percentage (%)
Maternal age (years)	≤20	84	14.0
	21–25	210	35.0
	26–30	198	33.0
	31–35	84	14.0
	>35	24	4.0
Gravidity	Primigravida	246	41.0
	Multigravida	354	59.0

The maternal age and gravidity distribution at the baseline are given in Table 1. These characteristics are summarized graphically in Figure 1 for easy comparison between categories.

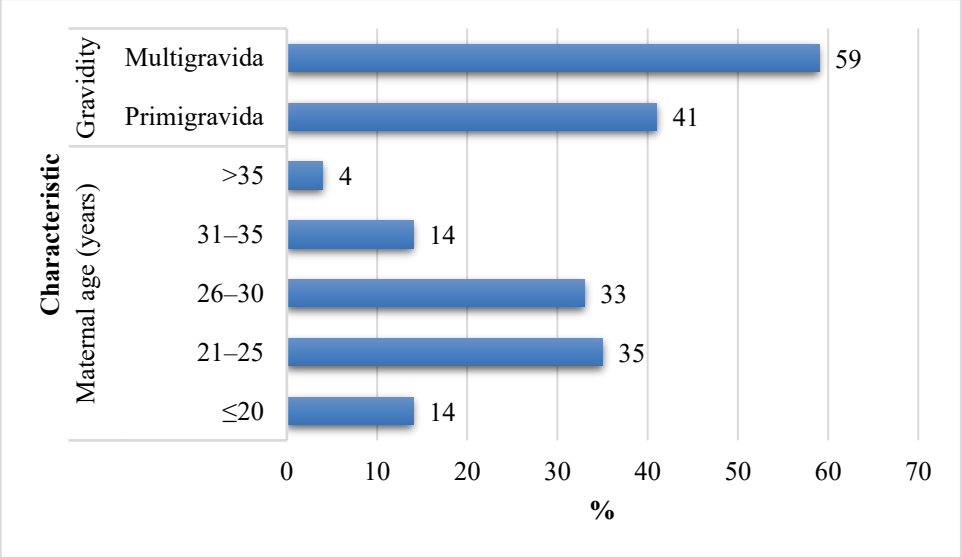

Figure 1. Baseline Maternal Characteristics

As presented in Figure 1, large proportions of the study population fell in the 21-30 age group which constituted the major reproductive-age group of the study population. The gravidity further revealed that there was higher numbers of multigravida women as compared to the primigravida women, showing that women with previous pregnancy experience were more represented in the study group.

3.2. Prevalence of Fetal Congenital Anomalies

Of the 600 antenatal women who underwent ultrasonography, 54 pregnancies (9.0%) had fetal congenital anomaly. A congenital anomaly was not detected in 546 fetuses (91.0%) on antenatal ultrasonographic examination. Therefore, around 9% of the total number of pregnancies in the study were identified with fetal congenital anomaly as a result of the antenatal screening. The distribution according to fetal anomaly status is presented in Table 2.

Table 2. Prevalence of fetal congenital anomalies among the study population (n = 600)

Fetal status	Number (n)	Percentage (%)
Normal fetus	546	91.0
Congenital anomaly present	54	9.0
Total	600	100.0

Table 2 shows the distribution of fetuses by numerical value of fetal status, with a strong differentiation between fetuses without fetal anomaly and fetuses with congenital anomaly. The proportional distribution of normal fetuses and fetuses with congenital anomalies is shown graphically in Figure 2 to supplement the tabulated findings and to give a visual comparison between the two groups at a glance.

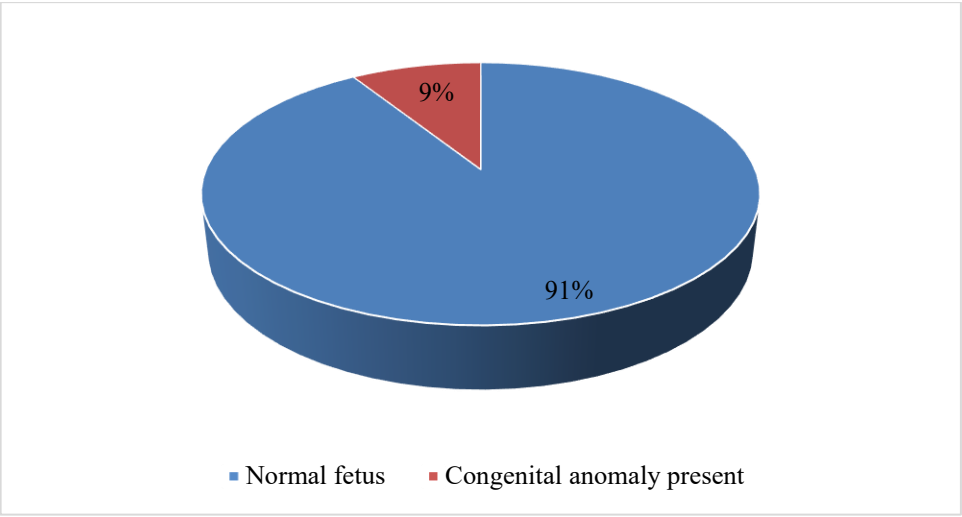

Figure 2. Prevalence of Fetal Congenital Anomalies

The overall fetal-status pattern of the study population is clearly depicted in Figure 2. The majority of pregnancies screened were found to be normal, with a small percentage of pregnancies found to be congenitally abnormal. This visual contrast emphasizes the fact that despite the relative low incidence of congenital anomalies, they represented a clinically important finding among women undergoing antenatal ultrasonographic screening.

3.3. System-Wise Distribution of Fetal Congenital Anomalies

Of the 54 fetuses with congenital anomalies, the most common were central nervous system anomalies (18, 33.3%), cardiovascular anomalies (12, 22.2%) and genitourinary anomalies (9, 16.7%). Six fetuses (11.1%) had gastrointestinal anomalies, and 5 (9.3%) had musculoskeletal anomalies. Two fetuses (3.7%) had craniofacial anomalies and two had multiple congenital anomalies. In summary, the most common categories of abnormalities detected in the course of the antenatal screening were CNS, cardiovascular and genitourinary anomalies (Table 3).

Table 3. System-wise distribution of fetal congenital anomalies (n = 54)

System involved	Number (n)	Percentage (%)
Central nervous system (CNS)	18	33.3
Cardiovascular system (CVS)	12	22.2
Genitourinary system	9	16.7
Gastrointestinal system	6	11.1
Musculoskeletal system	5	9.3
Craniofacial anomalies	2	3.7
Multiple congenital anomalies	2	3.7
Total	54	100.0

3.4. Gestational Age at Detection of Congenital Anomalies

If a fetal anomaly was detected, the gestational age of detection was evaluated in the 54 fetuses with congenital anomaly. The highest percentage was found in the 18 to 20 weeks of gestation with 24 cases (44.4%). Between 14 and 17 weeks, 12 anomalies (22.2%) were identified and between 21 and 24 weeks, 12 others (22.2%). A total of 6 (11.1%) cases were detected as early as 11–13 weeks. Thus, the 18-20 week gestation period was the most common time of diagnosis of congenital anomaly in the study population (Table 4).

Table 4. Gestational age at detection of fetal congenital anomalies (n = 54)

Gestational age at detection	Number (n)	Percentage (%)
11–13 weeks	6	11.1
14–17 weeks	12	22.2
18–20 weeks	24	44.4
21–24 weeks	12	22.2
Total	54	100.0

The distribution of congenital anomalies by gestational age indicated that all screening intervals were not the same in terms of congenital anomalies detected. Increased abnormality detection was found in the routine mid-trimester period, and this should be used as the period for detailed fetal structural assessment. The comparative distribution of anomaly detection is given for all four of the gestational-age groups in Figure 3.

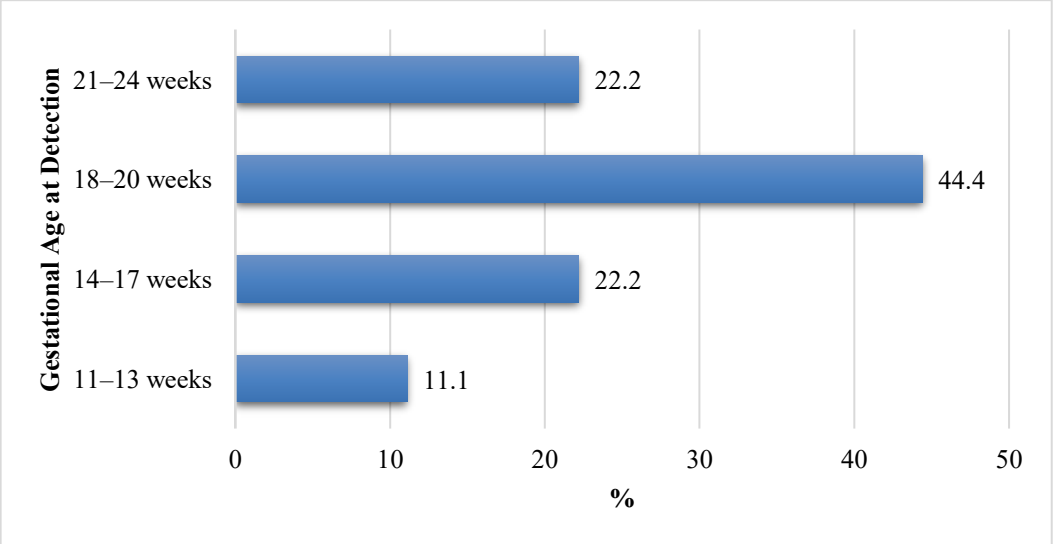

Figure 3. Gestational Age at Detection of Congenital Anomalies

The 18–20 week gestational interval was the primary interval for detection of fetal congenital anomalies (as shown in Figure 3); and abnormalities detected during the first-trimester interval were relatively less common. The distribution of observed results highlights the importance of a detailed and timely mid- trimester ultrasound scan as this is a crucial time for the detection of fetal structural abnormalities and for subsequent counseling, further evaluation and appropriate antenatal management.

3.5. Association Between Consanguinity and Fetal Congenital Anomalies

One hundred twenty-six (21.0%) of the study women had a history of consanguineous marriage. Of these women, 20 (15.9%) had pregnancies complicated with fetal congenital anomalies; 106 (84.1%) had no detected anomaly. Among the 474 women without a history of consanguinity, 34 pregnancies (7.2%) were found to have congenital anomalies and 440 (92.8%) had no congenital anomaly. The incidence of fetal congenital anomalies was hence distinctly high in the women with consanguineous marriages than in those who did not have such marriages. The difference above was statistically significant ($p < 0.05$) which showed an important association between consanguinity and fetal congenital anomalies in the studied population (Table 5).

Table 5. Association between consanguinity and fetal congenital anomalies (n = 600)

Consanguinity status	Anomaly present, n (%)	Anomaly absent, n (%)	Total, n
Present	20 (15.9)	106 (84.1)	126
Absent	34 (7.2)	440 (92.8)	474
Total	54 (9.0)	546 (91.0)	600

3.6. Association Between Family History and Fetal Congenital Anomalies

Forty-eight women (8.0%) had a family history of congenital abnormalities. Of these women, 12 pregnancies (25.0%) were complicated by fetal congenital anomalies and 36 women had no fetal congenital anomaly detected. Of the 552 women without a positive family history, congenital anomalies were detected in 42 pregnancies (7.6%) and 510 had no anomaly. Thus, women with a positive family history of congenital anomalies had significantly more congenital anomalies. The relationship between family history and occurrence of fetal congenital anomalies was statistically significant (Table 6).

Table 6. Association between family history of congenital anomalies and fetal congenital anomalies (n = 600)

Family history status	Anomaly present, n (%)	Anomaly absent, n (%)	Total, n
Present	12 (25.0)	36 (75.0)	48
Absent	42 (7.6)	510 (92.4)	552
Total	54 (9.0)	546 (91.0)	600

A distinct difference in the prevalence of fetal congenital anomalies was found between women with and without positive family history. The difference can be used to visualize the association between family history and the incidence of anomalies in the study population. A comparison of the distribution of congenital anomalies by family-history status is shown in Figure 4.

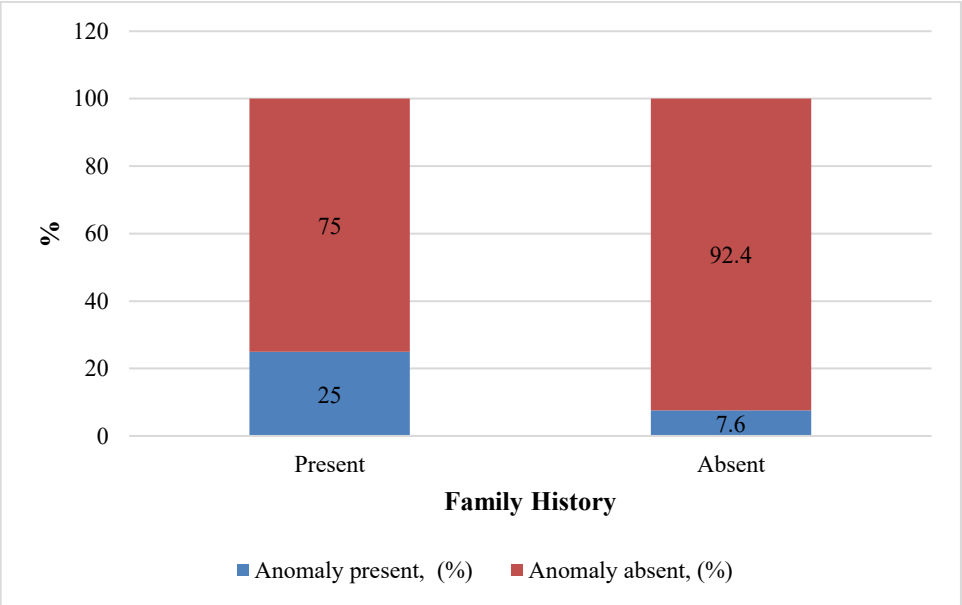

Figure 4. Family History and Fetal Congenital Anomalies

As noted in Figure 4, fetal congenital anomalies were more commonly seen among women with a positive family history of congenital anomalies, whereas most pregnancies among women with a negative family history were not associated with fetal congenital anomalies. This difference between the two groups shows even graphically the statistically important relationship of family history and the incidence of fetal congenital anomalies found in the study.

3.7. Association Between Previous Anomalous Pregnancy and Current Fetal Congenital Anomalies

Thirty-six women (6.0%) in the study population reported a previous pregnancy complicated by a congenital anomaly. Of all these women, 10 (27.8%) were determined to have a fetal congenital anomaly in the current pregnancy and 26 (72.2%) no fetal anomalies. Of the 564 women with no history of an anomalous pregnancy, however, 44 pregnancies (7.8%) were diagnosed with congenital anomaly and 520 (92.2%) were not. Thus, the rate of fetal congenital anomaly was significantly increased in women with a history of an abnormal pregnancy, versus women without such a history. This pattern suggests that a previous pregnancy affected by a congenital anomaly may serve as an important clinical marker for identifying women who require closer antenatal surveillance in subsequent pregnancies. The association between previous anomalous pregnancy and current fetal congenital anomalies was statistically significant in the present study (Table 7).

Table 7. Association between previous anomalous pregnancy and current fetal congenital anomalies (n = 600)

Previous anomalous pregnancy	Anomaly present, n (%)	Anomaly absent, n (%)	Total, n
Present	10 (27.8)	26 (72.2)	36
Absent	44 (7.8)	520 (92.2)	564
Total	54 (9.0)	546 (91.0)	600

3.8. Correlation Between Maternal Diabetes Mellitus and Fetal Congenital Anomalies

72 women (12.0%) had maternal diabetes mellitus/overt diabetes. Fetal congenital anomalies were identified in 14 pregnant women (19.4%) and in 58 pregnancies no congenital anomaly was detected among the diabetic women. Of the 528 non-diabetic women, 40 (7.6%) had congenital anomalies and 488 had no anomaly. As a result, the proportion of congenital abnormalities was considerably higher in women with diabetes than in women without the disease. The study discovered a statistically significant correlation between the incidence of foetal congenital anomalies and maternal diabetes mellitus (Table 8).

Table 8. Association between maternal diabetes mellitus and fetal congenital anomalies (n = 600)

Maternal diabetes status	Anomaly present, n (%)	Anomaly absent, n (%)	Total, n
Diabetic	14 (19.4)	58 (80.6)	72
Non-diabetic	40 (7.6)	488 (92.4)	528
Total	54 (9.0)	546 (91.0)	600

When the distribution was made by diabetic status, it was found that there was a significant difference in the rate of fetal congenital anomalies between the diabetic and non-diabetic women. Rates of congenital abnormalities were found to be higher in women with diabetes, while the rate of pregnancies was seen to be relatively normal in non-diabetic women. The relative trends by maternal diabetic status are illustrated in Figure 5.

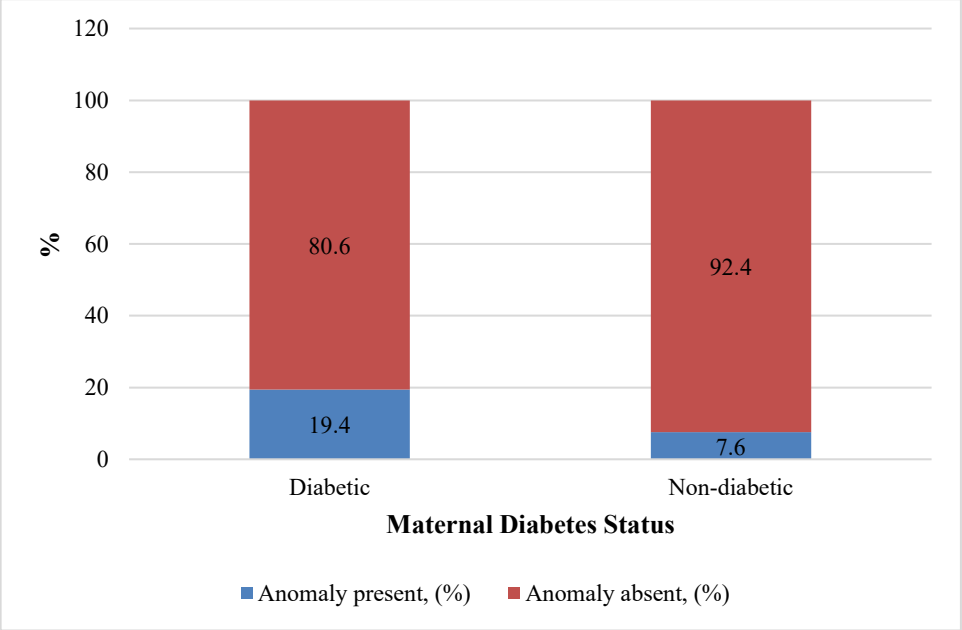

Figure 5. Maternal Diabetes and Fetal Congenital Anomalies

Figure 5 demonstrates a higher occurrence of fetal congenital anomalies among women with maternal diabetes compared with non-diabetic women. The difference between the two groups indicates a greater proportion of fetal abnormalities among diabetic women in the study population. This graphical pattern supports the statistically significant association observed between maternal diabetes mellitus and fetal congenital anomalies.

4. DISCUSSION

In the present study there were 600 antenatal pregnancies of which 54 (9.0%) had fetal congenital anomalies. This discovery suggests that there is a significant prevalence of congenital abnormalities detectable in the prenatal period in the tertiary-care population examined. The relatively high proportion must be seen in the context of the hospital setting, where not only routine ante-natal patients are referred for admission but also high-risk patients are referred. Of the fetuses that were affected, the most frequent anomalies were central nervous system (33.3%), cardiovascular (22.2%) and genitourinary anomalies (16.7%). This distribution underscores the need to perform systematic fetal central nervous system, cardiac and renal ultrasound on a routine anomaly scan.

The time of the diagnosis proved to be clinically relevant as well. The greatest number of anomalies (44.4%) were found at mid-trimester (18-20 weeks) which further emphasizes the importance of the mid-trimester anomaly scan. But 22.2% were found between 21 and 24 weeks, which means that a substantial number of abnormalities were picked up quite late. Early antenatal registration and screening might thus enhance the opportunity for diagnostic evaluation, counselling and adequate pregnancy management.

There was an increased rate of congenital anomalies for all four selected maternal risk factors. The highest was seen in women who had a previous history of anomalous pregnancy (27.8%) followed by family history of the anomaly (25.0%), women with diabetes (19.4%) and consanguinity (15.9%). The same ratios for women who lacked the above risk factors were significantly lower by comparison. These results are indicative that maternal and reproductive history is important in identifying those pregnancies that may need more targeted ante-natal surveillance. However, as the study was cross-sectional, these relationships should be considered associations and not cause-and-effect relationships.

The substantial proportion of cardiovascular anomalies observed in the present study is consistent with previous research emphasizing the importance of maternal and pregnancy-related risk factors in CHD. Li et al. (2017) showed the value of using several risk factors together to predict CHD in a hospital-based population, which is the focus of the present study, risk based antenatal assessment. Likewise, Lopes et al. (2018) pointed out the significant clinical implications of CHD, especially those that involve critical CHD, an even greater reason to recognize heart defects in utero.

The correlation between congenital anomalies and positive family history is also in line with studies indicating that family history is contributing to the development of structural anomalies. Jamilian et al. (2017) in their study on cleft lip and palate and associated anomalies found family history as one of the associated risk factors. Recent studies at the population level also show that the frequency and distribution of congenital anomalies vary significantly across population, according to the healthcare environment. The study results presented by Mezawa et al. (2019) in Japan Environment and Children's Study show the need for large-scale surveillance to establish patterns of congenital anomalies in populations. In general, however, and in KC et al. (2020) in the health facility setting, adverse perinatal outcomes often happen in the context of complex interactions between maternal and obstetric risk factors.

The results argue for the importance of screening for high risk pregnancy as a matter of course by considering family history, the outcomes of previous pregnancies, consanguinity and maternal diabetes. These women should be considered for timely first trimester evaluation, detailed mid trimester anomaly scan and targeted fetal imaging, if indicated, and counselling. Preconception care and proper nutrition also are highlighted by the higher percentage of CNS anomalies. Increasing the potential for timely antenatal care registration and referral can help minimise delays in the detection of anomalies and enhance opportunities for informed clinical decision making.

There are a number of limitations in the study. The results may not reflect the prevalence of congenital anomalies in the general population because it was hospital based and performed at a tertiary referral center. The cross sectional design allows identification of association, but not time or cause. Minor structural, functional, metabolic and some chromosomal abnormalities might not be detected with antenatal ultrasonography. Some risk factor data for the mothers was self-reported and confirmation of the genetic status of all affected fetuses was not routinely performed. Multivariable analyses to assess potential confounding variables also were not conducted.

The subjects of future studies should be multicentric and population-based to obtain more representative estimates of prevalence and to elucidate the regional variations. Longitudinal studies would be useful to assess what happens to the babies of affected pregnancies in the short and long-term. Genetic, chromosomal and molecular diagnostic tools might be useful to further define the etiology of congenital anomalies. Larger studies with multivariable statistical modelling may also assist in estimating the independent effect of each of the individual maternal risk factors and enhance the risk stratification strategies for antenatal care.

5. CONCLUSION

The current study illustrates that fetal congenital anomalies are a serious issue in prenatal care and can be detected successfully by prenatal screening using a structured approach. Central nervous system abnormalities were the most common category, followed by cardiovascular and genitourinary anomalies, highlighting the need for a thorough evaluation of the fetus by systems in routine anomaly scanning. The study also revealed that the majority of the abnormalities were identified at the mid-trimester period which highlights the importance of timely antenatal registration and timely ultrasonographic examination. Selected maternal risk factors were found to be significantly associated with

fetal congenital anomalies, namely, consanguinity, maternal diabetes mellitus, positive family history of congenital anomalies and previous history of abnormal pregnancy. This highlights the need to take a detailed maternal, obstetric and family history in the antenatal assessment to enable early identification of high-risk pregnancies. The study emphasizes the importance of preconception counseling, optimization of maternal health, genetic counseling, appropriate nutritional measures, and targeted antenatal surveillance for women with identifiable risk factors. Prompt referral to these appropriate tertiary-care resources and timely evaluation for diagnosis may further enhance clinical decision-making and pregnancy management. Overall, systematic risk assessment combined with structured antenatal screening can help to identify congenital abnormalities at an earlier stage and help to provide better care for mothers and fetuses.

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