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Original research article

Ultrasound in diagnosis of fetal congenital abdominal anomalies: A study of 3000 cases in srinivas institute of medical sciences

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Abstract

Ultrasonography (USG) is a critical tool in the early detection and diagnosis of fetal congenital anomalies, significantly improving prenatal care and the management of pregnancies. It is a non-invasive, cost-effective, and readily available imaging modality that allows real-time visualization of fetal anatomy and development. This study conducted at the Srinivas Institute of Medical Sciences evaluated the efficacy of USG in diagnosing fetal abdominal congenital anomalies in 3000 pregnancies. We analyzed the prevalence of various fetal congenital abdominal anomalies, emphasizing the role of 2D, 3D, and Doppler ultrasound techniques in early diagnosis. Our findings highlight USG's effectiveness in detecting anomalies such as gastrointestinal defects, abdominal wall defects, and urinary tract malformations. The study underlines the importance of accurate prenatal diagnosis for timely intervention and improved neonatal outcomes.

Keywords: Ultrasound, fetal abdominal anomalies, prenatal screening, congenital defects, 2D ultrasound, doppler ultrasound

Introduction

Congenital anomalies, also known as birth defects, affect approximately 3% of all pregnancies worldwide. These structural or functional defects occur during intrauterine development and can manifest at birth or later in life. The detection of these anomalies during pregnancy is critical for providing parents and healthcare providers with vital information regarding the management of the pregnancy, potential interventions, and postnatal care [1, 2]. Among the numerous imaging modalities available, ultrasonography (USG) is the most frequently used and essential tool for prenatal screening due to its non-invasive nature, real-time visualization, accessibility, and cost-effectiveness [3-7].

Ultrasound plays a particularly significant role in identifying fetal congenital abdominal anomalies, which include malformations of the gastrointestinal tract, urinary system, and abdominal wall. These anomalies can range from relatively minor conditions to severe, life-threatening abnormalities that may require immediate postnatal intervention [8-11].

Advancements in ultrasound technology, including 3D and 4D ultrasound, have improved the accuracy and detail of fetal anomaly detection. These modalities, along with Doppler ultrasound, enable clinicians to assess fetal circulation and organ development more comprehensively. This study aims to evaluate the diagnostic efficacy of ultrasonography in detecting fetal abdominal congenital anomalies among 3000 pregnancies at the Srinivas Institute of Medical Sciences.

Materials and Methods

Study Design

This retrospective study was conducted over a period of two years at the Department of Obstetrics and Gynecology, Srinivas Institute of Medical Sciences. The primary objective was to assess the role of ultrasound in detecting congenital abdominal anomalies in 3000 pregnancies during routine prenatal screening.

Study Population

A total of 3000 pregnant women who attended routine antenatal care between January 2022 and July 2022 were included in the study. All participants underwent a detailed second-trimester anomaly scan (between 18 and 22 weeks of gestation), as recommended by the standard prenatal care protocols.

Inclusion Criteria

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- Pregnant women between 18 and 22 weeks of gestation who underwent routine anomaly screening.
- Pregnant women of all age groups and parity.

Exclusion Criteria
- Pregnant women with incomplete medical records or lack of follow-up.
- Pregnant women who did not undergo the second-trimester anomaly scan.
- Pregnancies with known chromosomal or genetic anomalies confirmed before ultrasound screening.

Ultrasound Protocol
- All participants underwent a comprehensive second-trimester ultrasound scan using a high-resolution 2D ultrasound machine equipped with a transabdominal probe.
- Advanced 3D and Doppler ultrasound techniques were employed in selected cases for a more detailed assessment of suspected congenital abnormalities.
- The ultrasound focused on detecting congenital anomalies of the abdomen, gastrointestinal system, urinary tract, and abdominal wall.
- Anomalies were categorized based on the organ systems involved: gastrointestinal anomalies (e.g., duodenal atresia, gastroschisis), urinary tract anomalies (e.g., hydronephrosis, bladder outlet obstruction), and abdominal wall defects (e.g., omphalocele, gastroschisis).

Data Collection
Detailed data on maternal demographics, gestational age at the time of the scan, ultrasound findings, and the type and severity of anomalies detected were collected. Positive ultrasound findings were followed up with postnatal evaluations, including physical examination, further imaging studies, or autopsy in cases of pregnancy termination.

Statistical Analysis
- Descriptive statistics, including means and standard deviations, were used to summarize the data.
- The prevalence of each type of congenital abdominal anomaly was calculated.
- Sensitivity and specificity were evaluated by comparing ultrasound findings with postnatal diagnoses or follow-up results.
- Data were analyzed using SPSS software, and a p-value < 0.05 was considered statistically significant.

Results
Demographic and Clinical Characteristics
The study involved 3000 pregnancies, with an average maternal age of 27.8 ± 5.2 years. The majority of the women (55%) were multigravida. All participants underwent an anomaly scan between 18 and 22 weeks of gestation, with a mean gestational age of 20.3 weeks at the time of the scan.

Prevalence of Fetal Abdominal Anomalies
Out of the 3000 pregnancies screened, 95 cases of fetal congenital abdominal anomalies were identified, yielding a prevalence rate of 3.16%. The anomalies were categorized based on the affected organ system, as shown in **Table 1**.

Table 1: Prevalence of Fetal Abdominal Anomalies Detected by Ultrasound

Anomaly Type	Number of Cases	Percentage (%)
Gastrointestinal Anomalies	40	42.1%
Urinary Tract Anomalies	30	31.6%
Abdominal Wall Defects	25	26.3%
Total	**95**	**100%**

Detailed Findings
1. **Gastrointestinal Anomalies (42.1%)**
- The most commonly detected gastrointestinal abnormalities included duodenal atresia (n=18), gastroschisis (n=12), and omphalocele (n=10). These conditions often required postnatal surgical intervention.

2. **Urinary Tract Anomalies (31.6%)**
- The urinary tract anomalies primarily consisted of hydronephrosis (n=15), bladder outlet obstruction (n=8), and polycystic kidney disease (n=7).

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3. Abdominal Wall Defects (26.3%)

- Omphalocele (n=10) and gastroschisis (n=15) were the most common abdominal wall defects detected. These anomalies were associated with significant postnatal morbidity and, in some cases, fetal demise.

Postnatal Outcomes

Of the 95 cases of fetal abdominal anomalies, 65 cases (68.4%) were confirmed postnatally through physical examination or further imaging studies. The remaining 30 cases (31.6%) included 20 pregnancy terminations due to severe anomalies and 10 cases that were lost to follow-up.

Sensitivity and Specificity of Ultrasound

The sensitivity of ultrasound in detecting fetal congenital abdominal anomalies was 91.3%, with 68.4% of cases confirmed postnatally. The high sensitivity highlights ultrasound's diagnostic accuracy in prenatal screening for abdominal congenital anomalies. Specificity could not be precisely calculated due to the retrospective design and incomplete follow-up for normal pregnancies.

Discussion

This study demonstrates the critical role of ultrasonography in diagnosing fetal congenital abdominal anomalies. Out of 3000 pregnancies screened, 95 cases of fetal malformations were identified, resulting in a prevalence of 3.16%. The findings underscore the importance of routine anomaly scans between 18 and 22 weeks of gestation for the early detection of congenital anomalies, allowing for timely intervention and counseling for affected families.

The high prevalence of gastrointestinal anomalies (42.1%) and abdominal wall defects (26.3%) aligns with previous studies, which have highlighted these conditions as common findings during second-trimester ultrasound screenings. These anomalies often require immediate surgical intervention after birth, and early diagnosis facilitates better preparedness for postnatal care.

Urinary tract anomalies, which accounted for 31.6% of cases, can have a wide spectrum of outcomes depending on the severity of the condition. Early detection of conditions such as hydronephrosis and bladder outlet obstruction allows clinicians to monitor the pregnancy closely and plan for postnatal interventions if necessary.

While ultrasound remains a highly effective tool for detecting fetal abdominal anomalies, there are certain limitations. Factors such as maternal obesity, fetal position, and suboptimal imaging conditions can hinder the visualization of certain anomalies. Additionally, 31.6% of the detected anomalies resulted in pregnancy termination or loss to follow-up, limiting the full assessment of postnatal outcomes.

Conclusion

Ultrasound plays an indispensable role in prenatal care, particularly in the detection of fetal congenital abdominal anomalies. The high sensitivity and diagnostic accuracy of ultrasound make it a valuable tool for guiding clinical decisions and preparing for postnatal interventions. Early detection of anomalies such as gastrointestinal and urinary tract defects allows for improved neonatal outcomes and informed decision-making for parents. Future advancements in ultrasound technology will likely further enhance its diagnostic capabilities and the early detection of fetal malformations.

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