

The Role of Prenatal Ultrasound in Fetal Health

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Abstract: Background: Pregnancy ultrasound scans are beneficial in assessing and monitoring changes in the developing baby, solving issues, and guaranteeing the health of the mother and unborn child during pregnancy.

Aim: This study aims to assess and determine of fetal and maternal health findings of those who underwent to prenatal ultrasound.

Methodology: The data set comprised 81 pregnant women aged 25-40 years. All women underwent ultrasound examinations: one at 14-23 weeks of pregnancy and the other at 30-36 weeks. The examinations were conducted in different hospitals in Iraq over a period of one year between March 2023 and March 2024. The medical indicators and obstetric outcomes of mothers and fetuses were recorded.

Results: A total of 81 pregnant women have a Prenatal Ultrasound. Current findings shown maternal with ages (31 – 35) years were the most common, which include 53.09% of total cases, where almost of maternal had a BMI (> 28.9 kg/m²) with 60 cases, smokers were 17 cases, Gestational age (37.0 – 40) weeks had 56.79% of pregnant women, fetuses death were 6.17%, severe morbidity was 3.70%.

Limb abnormalities were found in 4.94% of total fetuses.

Conclusion: The present article demonstrates that ultrasound is an effective technique in improving clinical outcomes for both maternal and fetal health.

Keywords: Ultrasound Scan; Prenatal period; Complications; and Fetal and Maternal Health.

INTRODUCTION

In the last few decades, there have been significant changes and improvements in prenatal diagnosis, and this is greatly influenced by the increase in the use of ultrasound [1]. Introduction of ultrasonography in prenatal diagnosis has been a wonderful step forward in preventive healthcare by detecting impairments early and assisting in the management of such conditions in a timely manner, improving antenatal care as well as the health of both mother and child [2,3,4]. Ultrasound imaging for prenatal assessment provides an internal landscape of the woman's belly, therefore focusing on the growth and development of the fetal structures. From the early pregnancy period and throughout [5], ultrasound scans help to diagnose and verify the occurrence of multiple pregnancies, assess the parameters of the developing fetus, determine the existence of the fetus, and place the pregnancy [6,7]. As gestation progresses, it is possible, with the help of advanced imaging techniques, to show the growth of particular organs and bones as well as the vascular supply of the fetus [8]. In recent years, significant leaps have been made in the field of prenatal diagnosis, especially with respect to the congenital structural and functional defects owing to ultrasound [9,10,11]. A complete study, including particularly the 3D US, allows the diagnosing of several conditions in the fetus like spina bifida, heart anomalies, omphalocele, and limb deformities [12]. This initiative-taking approach improves the effectiveness of treatment strategies, reduces possible complications in the postnatal period, and helps the parents understand and prepare for the medical attention the infant may require [13]. Apart from detecting the abnormality, ultrasound prenatal diagnosis is also important in the assessment of fetal condition during the period of gestation [14,15]. The method evaluates several criteria, such as the amount of amniotic fluid, the condition of the placenta, and the growth patterns of the fetus. It is achieved by making use of ultrasound imaging, which aids in alleviating the anxiety of expectant parents by dealing with any issues promptly before they escalate [16]. Its transferable risk strategies are restorative measures, integrating for instance, prenatal ultrasound diagnosis, in case more assessments or interventions are required [17]. Accordingly, most investigative procedures designed for the fetus, such as Chorionic villus sampling (CVS), amniocentesis, fetoscopy as well as plain ultrasound examination, can also be performed in a dynamic mode using ultrasound imaging, thus decreasing the complications that are most likely to occur during the process and increasing the accuracy of the procedure. [18]

PATIENTS AND METHODS

We conducted a cross-sectional study of pregnant women participating in ultrasound screening, which included 81 samples. All pregnant women participated in ultrasound screening during pregnancy, as all women underwent delivery in different hospitals in Iraq, except for the period between March 2023 and March 2024. Pregnant women underwent ultrasound assessment before delivery at 15 to 22 weeks of gestation and another between 30 to 35 weeks of gestation. Obstetric ultrasound was performed for a series of medical examinations on pregnant women to assess the effects of fetal death risk, pregnancy status, heart rate, and the rate of various adverse events of the fetus. Patient data included age, obesity, comorbidities, smoking history, educational and economic level.

Furthermore, this study recorded the clinical and diagnostic data and characteristics of both pregnant women who underwent ultrasound, which included gestational age (<37.0, 37.0–40, >40), pregnancy history, birth weight in kg, and previous miscarriage or induced abortion. Also, we recorded obstetric and fetal outcomes, which included mortality, morbidity, mode of delivery, and adverse maternal and fetal outcomes. A biophysical profile (BPP) was performed in the postpartum time frame to specifically measure fetal movements, divided into three-time

frames (less than 10 minutes, 10 minutes to 30 minutes, and more than 30 minutes), muscle tone (which includes hypotonia, normotonic, and hypertonia), fetal heart rate patterns (bradycardia defined as less than 110 beats per minute, normal heart rate 110 to 160 beats per minute, and tachycardia greater than 160 beats per minute) and fetal amniotic fluid distribution (oligohydramnios, oligohydramnios, and polyhydramnios). Univariate analysis was performed to identify risk factors that adversely affect maternal and fetal health. SPSS version 22.0 was used to capture clinical outcomes and features related to pregnant women and fetuses.

RESULTS

Table 1. Baseline findings of pregnant women.

| Items | Parameters | No. of patients, [81] | Percentage [%] |
|---|---------------------------|-----------------------|----------------|
| Maternal age | | | |
| | 25 – 30 | 28 | 34.57% |
| | 31 – 35 | 43 | 53.09% |
| | 36 - 40 | 10 | 12.35% |
| BMI of pregnancy, kg/m² | | | |
| | < 24.6 | 6 | 7.41% |
| | 24.6 – 28.9 | 15 | 18.52% |
| | > 28.9 | 60 | 74.07% |
| Comorbidities | | 43 | 53.09% |
| | Hypertension | 23 | 28.4% |
| | Diabetes | 10 | 12.35% |
| | Asthma | 6 | 7.41% |
| | Anemia | 4 | 4.94% |
| Smoking use | | | |
| | Yes | 17 | 20.99% |
| | No | 64 | 79.01% |
| Education status of maternal | | | |
| | Primary | 9 | 11.11% |
| | Secondary | 22 | 27.16% |
| | Post-graduated university | 50 | 61.73% |
| Income status, \$ | | | |
| | < 420 | 26 | 32.10% |
| | 420 - 650 | 43 | 53.09% |
| | > 650 | 12 | 14.81% |

Table 2. Clinical characteristics of pregnant women.

| Characteristics | Parameters | No. of participants: 81 | Percentage, % |
|-------------------------------|------------|-------------------------|---------------|
| Gestational age, weeks | | | |
| | < 37.0 | 25 | 30.86% |
| | 37.0 – 40 | 46 | 56.79% |
| | > 40 | 10 | 12.35% |
| History of pregnancy | | | |
| | 0 | 29 | 35.80% |
| | 1 | 35 | 43.21% |
| | 2 | 12 | 14.81% |
| | > 2 | 5 | 6.17% |
| Brith weight, kg | | | |

| | | | |
|-------------------------|--------------|----|--------|
| | ≤ 2.26 | 5 | 6.17% |
| | $2.27 - 4.0$ | 63 | 77.78% |
| | > 4.0 | 13 | 16.05% |
| Miscarriage | | | |
| | 0 | 66 | 81.48% |
| | 1 | 13 | 16.05% |
| | ≥ 2 | 2 | 2.47% |
| Induced abortion | | | |
| | 0 | 67 | 82.72% |
| | 1 | 11 | 13.58% |
| | ≥ 2 | 3 | 3.70% |

Table 3. Clinical outcomes of pregnant women and fetal who underwent to ultrasound scan.

| Findings | Variables | Participants | Percentage |
|--------------------------------|-----------------------|---------------------|-------------------|
| Pregnant women outcomes | | | |
| Mortality | | | |
| | Yes | 3 | 3.7% |
| | No | 78 | 96.3% |
| Morbidity | | | |
| | None | 60 | 74.07% |
| | Mild | 10 | 12.35% |
| | Moderate | 7 | 8.64% |
| | Severe | 4 | 4.94% |
| Types of delivery | | | |
| | Vaginal | 57 | 70.37% |
| | Caesarean | 24 | 29.63% |
| Adverse outcomes | | | |
| | Gestational diabetes | 3 | 3.70% |
| | Preeclampsia | 2 | 2.47% |
| | Postpartum depression | 6 | 7.41% |
| Fetuses' outcomes | | | |
| Mortality | | | |
| | Yes | 5 | 6.17% |
| | No | 76 | 93.83% |
| Morbidity | | | |
| | None | 68 | 83.95% |
| | Mild | 6 | 7.41% |
| | Moderate | 4 | 4.94% |
| | Severe | 3 | 3.70% |
| Adverse factors | | 12 | 14.81% |
| | Spina bifida | 3 | 3.70% |
| | Cardiac abnormalities | 2 | 2.47% |
| | Limb abnormalities | 4 | 4.94% |
| | Diaphragmatic hernia | 1 | 1.23% |
| | Others | 2 | 2.47% |

Table 4. BIOPHYSICAL PROFILE (BPP).

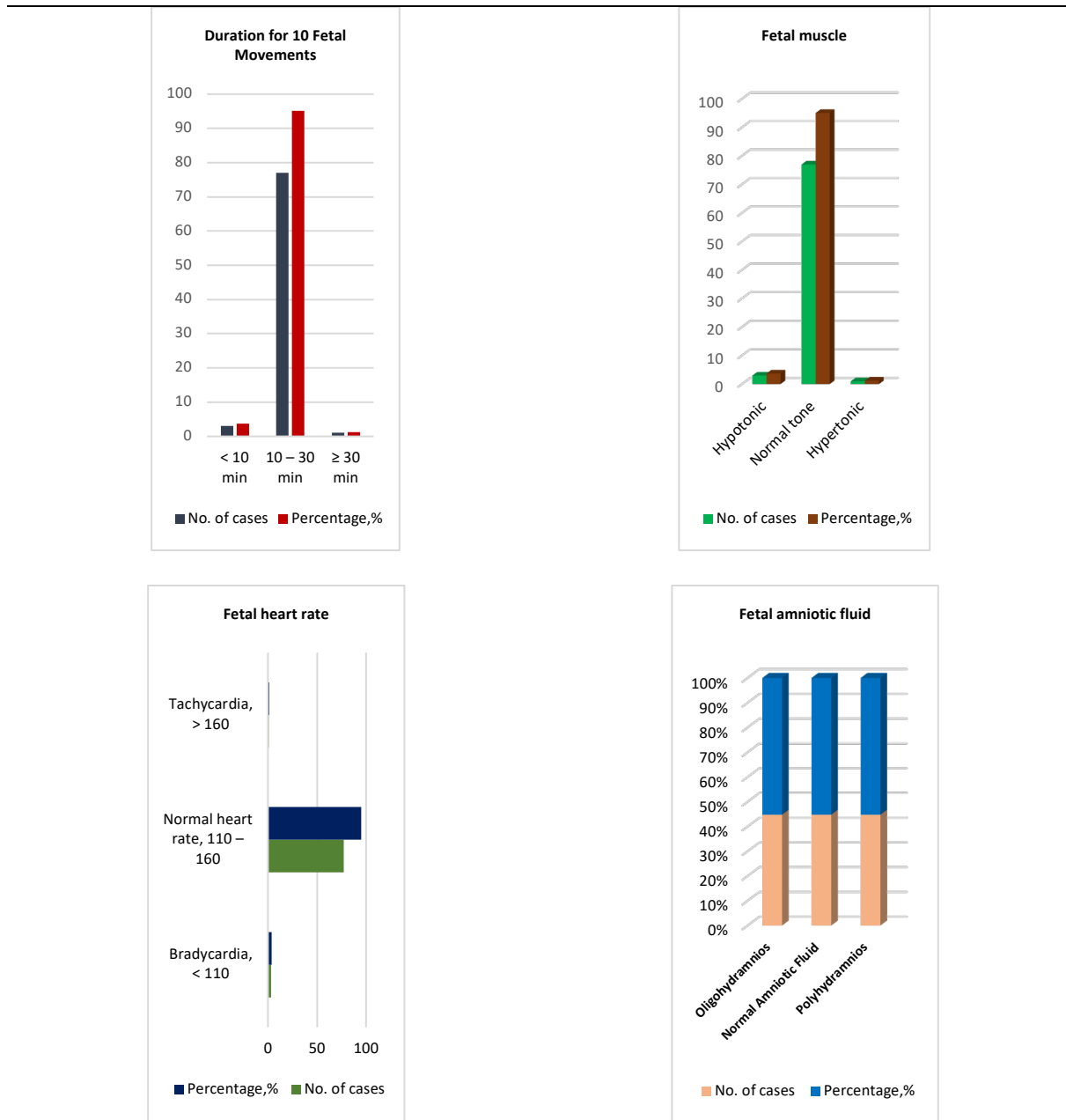


Table 5. Univariate analysis of risk factors affecting maternal and fetal health.

| Risk factors | OR | CI 95% |
|-----------------------|------|-----------|
| Preeclampsia | 3.10 | 0.4 – 6.3 |
| Postpartum depression | 2.9 | 1.0 – 5.2 |
| Smoking | 1.6 | 0.7 – 2.8 |
| Brith weight | 0.9 | 0.2 – 3.0 |
| Miscarriage | 1.4 | 0.8 – 4.0 |
| Induced abortion | 2.7 | 2.0 – 3.4 |
| Morbidity | 2.1 | 0.5 – 3.2 |
| Types of delivery | 2.5 | 1.9 – 4.6 |

DISCUSSION

Prenatal ultrasound is a vital tool for monitoring the physical development of the fetus in the maternal womb and thus represents one of the most crucial methods for safeguarding the health of the developing infant. Such abnormalities or complications can be identified at an earlier stage and treated in a timely manner [19]. Our findings found maternal ages (31 - 40) years were the most prevalent in our study, which involved 48 cases, Miscarriage, who 1 got 13 cases; induced abortion, who 1 got 11 cases, gestational ages with 37.0 – 40 weeks had 46 cases. The utilisation of obstetric ultrasound for the evaluation of pregnancy facilitates the identification of any abnormalities at an early stage, which is beneficial for both the mother and child, as well as for the purposes of management. The application of new technologies and the implementation of quality control measures ensure that the process is highly efficient. Furthermore, ultrasound has been demonstrated to be an effective imaging technique for the assessment of fetal growth and the identification of structural anomalies, thereby reducing perinatal complications and mortality [20]. As evidenced by the data, there was a high incidence of chromosomal abnormalities among fetuses with increased nuchal translucency thickness, which underscores the importance of screening at younger ages. Research indicates that the utilization of ultrasound imaging may also encourage parents to engage more with their infants positively, thus promoting the healthy development of the infant [21]. Ultrasound imaging is an essential tool for the assessment of pregnancy-related complications. Since it only employs sound waves to develop pictures of the baby in the mother's womb, the practice has been deemed unsuitable for side effects [22,23]. Additionally, such magnification reveals other significant findings regarding the fetus, namely, congenital abnormalities. In similar with other studies, we had a mortality of pregnant women had 3 cases and moderate morbidity got 7 cases, while mortality of fetuses had 5 cases, and morbidity had 4 cases, limb abnormalities got 4 cases, and spina bifida got 3 cases. The amount of amniotic fluid that is either too much or too little may indicate a possible abnormality with the fetus. Prior research on the utilisation of ultrasound screening has demonstrated enhanced diagnostic outcomes, including, but not limited to, the earlier identification of multiple pregnancy and the rectification of erroneous gestational age assignments, among others [24]. Additionally, it has highlighted the diverse effects of ultrasound screening on treatment variables such as etiology and length of hospitalization. Such diagnostic measures and the subsequent treatment effects serve to minimise perinatal and neonatal morbidity and mortality. Furthermore, ultrasound evaluation can be employed for the assessment of multiple pivotal fetal variables, including congenital anomalies. [25]

CONCLUSION

The use of ultrasound scans has become a routine practice in maternal healthcare. Statistics show that this practice has drastically improved the health of both mothers and their babies. Progress maternity ultrasound is vital in evaluating both fetal growth and fetal structures. It can also be used during pregnancy to screen for deformities, thus facilitating corrective measures that improve the outcome for the baby once they are born.

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