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Original Research Article

Evaluation and Management of Utility of First Trimester Ultrasound before 12 Weeks of Gestation

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Abstract:

Background: The first trimester begins on the first day of your last period and lasts until the end of week 12. It is the most critical and tenuous period in human existence. We showed the utility of first trimester ultrasonography before 12 weeks of gestation. Ultrasonography has drastically changed validation and management of first trimester pregnancies. The purpose of this study was to evaluate the utility of first trimester ultrasound before 12 weeks of gestation in diagnosing and management of various conditions of pregnancy at an early stage.

Methods: We conducted a retrospective data analysis on randomly selected 300 pregnant women (<12 weeks of gestation) at SKMCH, Muzaffarpur, Bihar from July 2022 to December 2022. These patients underwent first trimester ultrasonography (transvaginal/abdominal). Maternal age, parity, gestational age, and maternal gestational history were compared with ultrasonographic findings. Patients were divided into 11 groups based on ultrasonographic diagnoses.

Results: We noted 71.3% patients to have single, viable, intrauterine pregnancies, while 28.7% had abnormal or complicated pregnancies with uterine anomalies, ovarian cysts, fibroids, or sub chorionic haematomas.

Conclusion: The study emphasizes the fact that first trimester ultrasonography before 12 weeks of gestation is an important tool for predicting pregnancy outcomes, particularly with respect to detecting complicated or unviable pregnancies. It is a cheap and easily accessible imaging modality to be used during pregnancy. First trimester ultrasonography is helpful to date pregnancy, to define embryonic landmarks in developmental stages with reference to gestational age, early diagnosis of abortion, early detection of ectopic pregnancy, diagnose multifetal pregnancy for assessing chorionicity, detect pregnancy with fibroid, diagnose suspected uterine anomaly and detection of pre-eclampsia, IUGR babies with the help of uterine artery PI.

Keywords: First Trimester, Ultrasound, Pregnancy Outcome, Uterine anomalies, ovarian cysts, Fibroids.

Introduction

First trimester of pregnancy is – "The dynamic period that spans ovulation, fertilization, implantation and organogenesis". It is the most critical and tenuous period in human existence. However, it is fraught with a high complication rate. [1,2] The last menstrual period (LMP) is used to date the pregnancy.

The first trimester begins on the first day of your last period and lasts until the end of week 12. [1] First trimester ultrasound is helpful to date pregnancy, to define embryonic landmarks in developmental stages with reference to gestational age, early diagnosis of abortion, early detection of ectopic pregnancy, diagnose multifoetal pregnancy for assessing chorionicity, detection of vesicular mole, diagnose pregnancy with fibroid and ovarian cyst, diagnose suspected uterine anomaly and detection of pre-eclampsia, IUGR babies with the help of uterine artery pulsatility index (PI).

Gestational sac (GS) is the first sonographic evidence of early pregnancy which can be seen on transvaginal scan (TVS) as early as 4.5 weeks. [2] The GS size/ crown rump length (CRL) should be compared with the menstrual age for the assessment of first trimester pregnancy. A GS in which the embryo fails to develop is called anembryonic pregnancy. The first structure to become visible inside the GS is the yolk sac. [5] The second structure that is seen within the GS is the embryo, which is seen approximately when the GS measures 18 mm on TVS, and ≥25 mm on transabdominal scan (TAS). The number of GSs within the uterus can be

counted accurately by 5 weeks of gestation. This "chorionic sac count" only predicts the chronicity of multifetal pregnancies, if any. [3] In multiple gestations, ultrasound examination should comprise of examination of number of foetuses; foetal biometry; confirmation of viability; chorionicity/ amnionicity; and nuchal translucency assessment. [4]

Ectopic pregnancy is a common obstetric emergency seen in routine clinical practice and leading cause of maternal morbidity in the first trimester. Early diagnosis by ultrasound is therefore potentially lifesaving.

Subchorionic haemorrhage is bleeding beneath the chorion membranes that enclose the embryo in the uterus. It appears to occur due to partial detachment of the chorion membranes from the wall of the uterus. [5] The presence of subchorionic haemorrhage during the first trimester may identify a population of patients at increased risk for adverse pregnancy outcome. [6] Fibroids size can increase in size during pregnancy and which may obstruct the birth passage. [7] Moreover, uterine anomalies are associated with a high pregnancy failure rate. [8] Careful inspection of the uterus and adnexae is suggested in the first trimester evaluation.

The objective of the present study was to evaluate the utility of first trimester ultrasound before 12 weeks of gestation in diagnosing and management of various conditions of pregnancy at an early stage.

Material and Methods

The present retrospective data analysis was conducted on randomly selected 300 pregnant women (<12 weeks of gestation) at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar from July 2022 to December 2022. The study was approved by Institutional Ethics Committee. The subjects were selected from both outpatient and patients in wards. Both normal as well as symptomatic patients with history of bleeding per vaginum, abdominal pain, excess vomiting, brownish discharge, giddiness, and positive serum β-hCG level (above 1500 IU/mL) were selected. Selection of patients for ultrasonography was from both outpatient and patients in wards. The patients were selected by a simple randomized method. The subjects excluded from the study were pregnant patients with chronic metabolic diseases and known genital tract pathology or lesions. Written informed consent was taken from all the eligible patients. Patients were scanned by TVS probe with empty bladder after explaining the procedure and filling the F form. Ultrasound was done with transabdominal convex probe (3-3.5MHz) and transvaginal probe (6.5 MHz).

Abnormal pregnancies included embryonic pregnancies. Complicated pregnancies included viable single pregnancies with fibroids, ovarian cysts, subchorionic haematomas, and uterine anomalies.

The patients were divided into 11 groups according to their ultrasonographic diagnosis. The groups were normal pregnancy, anembryonic pregnancy, threatened abortion, missed abortion, incomplete abortion, multiple pregnancy, and ectopic pregnancies, subchorionic hematoma, uterine anomaly, and fibroids and ovarian cysts with viable pregnancy.

Results

In our study 25% of subjects were below 20 years of age, 63% of subjects were from 21-30 years of age and 12% of subjects were more than 30 years of age (Table 1).

Table 1: Age Distribution

Age	Percentage of subjects
<20 years	25%
21-30 years	63%
>30 years	12%

We analyzed 300 first trimester pregnancy ultrasound findings (Table 2). Of these, 71.3% (214) patients had a single, viable, normal intrauterine pregnancy.

Total an embryonic pregnancy reported in the study were 10 (3.4%). Fifty four miscarriages (19%) were reported during the study. The most common type of miscarriage was threatened abortion (10%) followed by missed abortion (5%) and incomplete abortion (3%). In the present study, 17 women had complicated pregnancies.

The most common complication was subchorionic haematomas (n=11) followed by uterine anomaly (n=3), ovarian cysts (n=2) and fibroid (n=1).

Table 2: USG Diagnosis (overall diagnosis)

Groups	Total (no. of patients)	Percentage (%)
Normal	214	71.3%
Anembryonic pregnancy	10	3.4%
Threatened abortion	30	10%
Missed abortion	15	5%

Incomplete abortion	9	3%
Multiple pregnancy	3	1%
Uterine anomaly	3	0.9%
Ectopic pregnancy	2	0.7%
Fibroid	1	0.3%
Ovarian cysts	2	0.7%
Subchorionic haematoma	11	3.7%

Total number of patients showing abnormal mean uterine artery PI were nine (3%).

Table 3: Comparison of study showing abnormal uterine artery mean PI

	Our study
Number of total patients examined	300
Number of patients showing abnormalmean uterine artery PI	9
Percentage	3%

Discussion

The germinal stage (3-5 weeks of gestation) is the period of gestation from fertilization/conception to implantation of the embryo. The embryonic stage (8-10 weeks of gestation) is the period of organo-genesis, and most malformations are known to arise in this period. Our study focused on the diagnostic value of first trimester ultrasound before 12 weeks of gestation. Majority of the subjects in the present study were in the age of 21-30 years which was comparable with the previous studies. [9-11] In the present study, 71.3% of the subjects had a normal pregnancy, 19% had miscarriage, 3.4% had an anembryonic pregnancy, 4.6% had complicated pregnancies, 1% had multiple pregnancies and 0.7% had ectopic pregnancy. All the diagnosis in our study were nearly comparable to the study conducted by Celen et al. [12]

In our study, out of 300 patients, 9(3%) patients showed increased uterine artery mean PI which is early predictor of preeclampsia, IUGR, small for gestational age babies and preterm deliveries. By recognising early Doppler changes we can prevent later complications by appropriate medication like low dose aspirin and low molecular weight heparin in first trimester to the patients showing Doppler changes. The measurement of the crown rump length (CRL) in the first trimester is the most im-portant parameter to establish gestational age. In our study, 71.3% (214) patients had a single, viable, intrauterine normal pregnancy.

The first-trimester scan is beneficial in cases of multiple gestations, to establish chorionicity and amnionicity. In a dichorionic pregnancy, the dividing membrane shows thickening (“twin peak” or “lambda” sign) as it reaches the placental surface. [14] The mean gestational age (days) at which multifoetal pregnancies were diagnosed in our study was 51 days, while the incidence was 1.0 % (3 of 300 pregnancies). Uprate P in a hospital record-based study reported the frequency of twin pregnancy to be 1.9% which was higher compared to the present study. [15] A previous study diagnosed 94 cases of threatened abortion clinically, while only 46 cases were sonographically confirmed as threatened abortion. [16] In our study 35(11.6%) patients were clinically diagnosed as having threatened abortion, out of which 30(10%) patients were confirmed as threatened abortion by USG. Thus, ultrasonography helps proper diagnosis missed or misinterpreted clinically.

The incidence of ectopic pregnancy has increased over the last two decades. Therefore, early ultrasound is recommended when there are risk factors or clinical suspicion for ectopic pregnancy. [17] In our study, the incidence of ectopic pregnancy was 0.7%. Kharat D et al reported 0.76% incidence of ectopic pregnancy which was comparable to our results. [17] Maximum number of ectopic pregnancies are seen in patients between age group of 20 to 30. Intrauterine hematoma (IUH) is a common condition seen in routine obstetric ultrasonography during the first trimester.

There is a wide variation in the reported incidence of IUH that ranged from 0.46% to 39.5% depending on the populations studied, definition and gestational age at diagnosis. [18,19] The clinical significance of IUH has always been debatable. Some studies hypothesized that the presence of IUH is strongly associated with adverse events during pregnancy, while others found no association between the IUH and those adverse perinatal outcomes. [20,21] In our study, the SCH incidence was 3.7%, which was comparable with the literature.

A metanalysis of seven cohort or case-control studies concluded that women with subchorionic hematoma were at increased risk of abruption, preterm delivery, and preterm premature rupture of membranes. [22] Hence, we recommend that diagnosing SCH in first trimester ultrasonography is necessary for pregnancy follow-up. The reported prevalence of uterine anomalies in a metanalysis conducted by Chan et al was 5.5% in the unselected population, 8.0% in infertile women, 13.3% in those with a history of miscarriage and 24.5% in those with miscarriage and infertility. [23] Uterine

anomalies have been linked with an increased incidence of adverse pregnancy outcomes such as miscarriage malpresentations, preterm labour, foetal growth restriction, abnormal placentation, and ectopic pregnancies. [24] In our pregnant population, uterine anomalies were seen in 0.9%. Early first trimester ultrasonography helps to detect uterine anomalies, plan proper care and surveillance in order to avoid adverse pregnancy outcome.

The reported incidence of fibroids in pregnancy ranges from 0.1 to 10.7% of all pregnancies and increases as the female chooses to postpone pregnancy later on. [25] Most of fibroids in pregnancy are asymptomatic; however, they are related to a lot of ante-, intra-, and postpartum complications. These complications include spontaneous miscarriage, antepartum and postpartum haemorrhage, placental abruption, foetal malpresentation, fetopelvic disproportion, premature rupture of membranes, placental retention, preterm labour, low birth weight infants, dysfunctional labour, and increased need to caesarean deliveries. [26] In our study, the incidence of uterine fibroids with pregnancy was 0.3%, which correlated with previous reports. Ovarian cysts were noted in 0.7% of our patients.

Conclusion

Ultrasonography is a cheap and easily accessible imaging modality to be used during pregnancy. The use of first trimester USG helps to confirm the status of intrauterine embryo or diagnose extra uterine ectopic pregnancy for which medical treatment with low morbidity is possible with early detection. It helps to detect abnormalities in embryonic landmarks according to gestational age that can predict adverse pregnancy outcomes. Early trimester scan can help in predicting accurate gestational age, type of twins, detection of suspected uterine anomalies, associated pathology which is difficult to see as pregnancy advances. First trimester uterine artery mean pulsatality index helps in predicting early preeclampsia, intrauterine growth restriction, and small for gestational age babies.

It is likely that technological development of ultrasound will continue that will further improve image resolution of early pregnancies which will enhance our ability to assess early pregnancies in depth.

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