Material
and
Methods
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The present study was undertaken in the department of Obstetrics and Gynaecology in collaboration with the Radiology Deptt. Of M.L.B. Medical College, Jhansi where the Ultrasound machine was available.

Antenatal patients belonging to 28-40 weeks gestational age were studied. The cases selected, were from those attending the antenatal clinic of this department and for those lying in wards. After history taking and examination the patients were scanned.

The study was carried out in two groups of cases –

Group I : Control group (Normal cases)

Group II : Study group (IUGR cases)

Group I :

This group consisted of normal patients of known maturity belonging to 28-40 weeks gestational age without any obstetrical and medical problems. These patients were subjected to an ultrasonographic examination of the following parameters.

(i) Biparietal diameter

(ii) Fetal femur length

(iii) (Abdominal circumference

(iv) Head circumference / Abdominal circumference (HC/AC).
(v) Femur length / Abdominal circumference (FL/AC).

**Group II:**

It was conducted of patients in whom there was a clinical suspicion of IUGR or having a present or past history that could adversely affect the fetal growth e.g. toxaemia, anaemia and other conditions.

**Pre-requisites for selection of patients (Group I).**

(i) History of regular menstrual cycles.

(ii) A known last menstrual period.

(iii) A close relationship (±1 week) between menstrual age and clinical evaluation.

(iv) No maternal diseases known to affect normal fetal growth (e.g. diabetes mellitus, hypertensive disorders etc).

(v) Absence of multiple gestation.

(vi) Amongst multigravidas – those who did not have history suggestive of previous IUGR or still birth.

(vii) Patients belonging to 28-40 weeks of gestation.

(viii) Average weight gain in third trimester of more than 250 gm/week.

**Pre-requisites for Selection of Patients (For Group II)**

I) Patients with a known last menstrual period and history of regular menstrual periods.
II) Patients whose fundal height was clinically less than the gestational age and/or low weight gain i.e. less than 250gm/week in the third trimester.

III) Patients between 28-40 weeks of gestation with clinical suspicion of IUGR.

IV) High risk cases were selected who were more prone to produce growth retarded babies such as pre-eclamptic patients, hypertensive patients, previous history of IUGR, still birth, IUD etc.

The cases of both groups selected were examined clinically in the antenatal clinic. They were subjected to detailed history, general examination and called for an ultrasound scan on a certain date. A similar procedure was adopted for indoor patients.

History of Cases:

After recording the name, age caste, addresses and other identifying details of the patient history regarding the following was elicited.

a) Presenting complaints.

b) Menstrual history (including last mestural period and regularity of the cycles.

c) Obstetrical history with special reference to any history suggestive of IUGR or history of IUD or still birth.
d) Past history including history suggestive of maternal diseases like diabetes, pre-eclamptic toxemia, and other medical problems.

e) Family history

f) Relevant personal history as regards per capita income.

**Clinical Examination:**

This was carried out under the following headings:

(i) **General examination:** The following points were observed – general condition of the patients, pulse rate, blood pressure, pallor, edema, jaundice, weight and height.

(ii) **Obstetrical examination:** this included abdominal examination to assess fundal height, fetal heart sound, lie, amount of liquor, and attempts to rule out multiple gestation specifically.

(iii) **Supportive investigation:** Hemoglobin percentage and urine testing for albuminuria were done.

**Ultrasound Scanning:**

All examinations of the patients were performed using a real time USG 3.5-5 Mhz. The ultrasonic measurements were recorded regularly on separate proformas for each patient along with the information already mentioned above.
A. Procedure of Scanning:

(i) The patient was made to lie supine on the examination couch and the abdomen extending from the symphysis pubis Xiphisternum was exposed.

(ii) The procedure of scanning was explained to the patient in an attempt to allay her apprehension.

(iii) An oil based medium was applied liberally over the abdominal area of prospective scanning so that the ultrasonic beam would not penetrate air when the transducer was brought in to contact with the skin of the patient.

(iv) To start with a mid line, sagittal scan of the abdomen was first done to see the position of the fetus. Parasagittal scans were then performed to observe the different parts of the body of the fetus to rule out the possibility of multiple pregnancy. Fetal cardiac activity was noted, position of the placenta in relation to the segment of the uterus was also noted placental maturity in an attempt was graded and the amount of liquor amnii was assessed.

Each scan was performed in as short time as possible, consistent with taking accurate measurements and to expose the fetus and mother to the ultrasonic waves for as short time as possible. The scan was performed each time by the same person.
B. Measurement made for both the above mentioned groups the following measurements were made:

1. **Biparietal Diameter**: After visualizing the head in the sagittal section the transducer was rotated by 90° and inclined to meet the asynclitism. Gain settings were adjusted so that the width of skull tables near the transducer was 3-5 mm. The BPD was measured from outer to inner parietal skull tables obtained in the standard plane where the falx cerebi, cavum septum pellucidum, thalami and sylvian fissure could all be described.

![Ultrasound Image]

2. **Fetal Femur Length**: Long axis of the fetus was determined by visualizing the fetal neural tube. The transducer was shifted to the other side of the fetal body in the same plane. Direct visualization of the fetal femur was possible in
this plane when the lower limbs were flexed and in some cases the transducer was rotated obliquely or by 90° depending on the attitude of the limbs. Fetal femur length was measured from the greater trochanter to the lateral epicondyle. The measurements was made on anterior femur rather then posterior one. Thin bright reflection of cartilagenons epiphysis should not be included in measurement.

3. Abdominal circumference:

The fetal long axis was determined by visualising the fetal spine. At the level of umbilical vein the transducer was rotated by 90° to obtain a transverse section the fetal abdomen. Care was taken to obtain the transverse section of the abdomen by ascertaining that the entire umbilical vein which runs obliquely was not visualized. To obtain the most appropriate plane the picture of the scan was made to include the entry
point of umbilical vein, a small section of the fetal stomach and inclusion
of fetal kidney or suprarenal glands.

At this particular plane the anteroposterior diameter was measured
from the abdominal wall facing the lowest part of umbilical part of left
portal vein, to the processus spinosus of the thoracic spine. The transverse
diameter was taken as the largest diameter parallel to a virtual tangent to
the processes spinosus.

The patients studied were followed up till the time of delivery and
during labour and the following points were noted:

- Course of labour
- Signs of fetal distress
- Type of delivery and complications during delivery
- Examinations of newborn including assessment of Apgar score and weight at birth.
The data obtained was evaluated for:

(i) Construction of normal mean curves of the ultra sonic parameters in relation to gestational age.

(ii) Regression analysis of these parameters and gestational age.

(iii) Comparison of fetal femur length and biparietal diameter abdominal circumference HC/AC & FL/AC for the prediction of IUGR.

These were observed for both the groups (I and II) i.e. the normal cases and IUGR cases, the results of which were compared. By these subsequent observation and analysis, normograms could be established for further use for assessing the size of the foetus of unknown gestational age and estimate the maturity of the fetus.