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It was an analytical epidemiological study done in the purview of Department of Anatomy in collaboration with the Department of Radio diagnosis of North Bengal Medical College and Hospital, Sushrutanagar, Dist. Darjeeling; the only medical teaching institution in the northern part of West Bengal.

In this study an effort has been made to correlate fetal kidney length with the gestational age by analysing the observations, correlating the findings with that of other biometric parameters and concluded to a decision.

The subset of antenatal mothers attending the ultrasonography clinic was interviewed and maintaining the inclusion and exclusion criteria finally 939 subjects were included in this study.

- For easy interpretation, mothers were clubbed in three groups of their gestational age i.e. 19 to 24years, 25 to 29 years and 30 to 34 years where majorities (44.2%) were below 25years; 27.7% were in 25-29years and rest 28.1% of them above 30years. [Vide Table:1; Page No. 61].

- Again 28% of the total fetuses were in 24-28 wks, 25.3% of them were in 29-32 wks, 24.3% were in 33-36 wks and rest 22.4% of them having gestational age more than 36 weeks. [Vide Table:2; Page No. 62].

- Among all the antenatal mothers, 54.42 % (511) was primigravida and 45.58 %(428) was multigravida [Vide Table:3; Page No. 63].

- In the distribution of fetus according to Biparietal diameter (BPD) in mm, it was found that 24% was between 60-69 mm, 29% between 70-79, 30% between 80-89 and rest 17% was between 90-99 mm [Vide Table:4; Page No. 64].

- In the distribution of fetus according to Head circumference (HC) in mm, it was found 24% was 222-253mm; 22% was 254-285; 24% was 286-317 and rest 30% was 318-349 mm [Vide Table:5; Page No. 65].

- From the distribution of fetus according to Abdominal circumference (AC) in mm, it was seen that 29% was 207-244 mm; 25% was 245-282; 24% was 283-320 and rest 22% was 321-358 mm [Vide Table:6; Page No. 66].

- It was observed that the distribution of fetus according to Femoral length (FL) in mm, was 24% was 43-51 mm; 22% was 52-60; 32 % was 61-69 and rest 22 % was 70-78 mm [Vide Table:7; Page No. 67].

- To find out the dependence of fetal kidney length on gravida of the mothers this study could reveal that there lies no significant change among these variables [Vide Table No.8; Page No. 68].

- Age group wise mean distribution of fetal kidney length was not significantly different in different gestational weeks of different aged antenatal mothers [Vide Table No.9; Page No.69].

- Strong correlation was found with the Fetal kidney length and conventionally used fetal biometric parameters like Biparietal diameter (BPD), Head circumference (HC), Abdominal circumference (AC) and Femoral length (FL) when compared individually and in combination ($p<0.05$) [Vide Table No.10;11;12 & 13; Page No. 70,71,72 & 73]. This finding was parallel to the conclusion of previous researchers, HL Cohen, J Cooper et al [26] 1991 where they showed "Strong correlation exists between renal length and gestational age, determined by biparietal diameter, femoral length, and abdominal circumference, and an average of the three". Another researchers Saha M, Paul AK *et al* [54] 1997, mentioned in their study that the average kidney length at full term was 3.95 cm and an excellent correlation was seen between gestational age, biparietal diameter, femoral length and renal length measurement.

- Fetal kidney length in millimeter can be used as another biometric parameter as good as other conventionally used biometric parameters like BPD, HC, AC and FL [Vide analysis of Table No.10; 11;12 & 13; Page No. 70,71,72 & 73]. Again, the figure No. 10, 11, 12 and 13 shown in line diagram, the fetal kidney length(mm) compared with the gestational age (weeks) were identical whether the gestational age was derived from BPD, HC, AC, or FL. This also signified that fetal kidney length may be used as another biometric parameter as good as other

conventionally used biometric parameters like BPD, HC, AC and FL for determination of gestational age.

Similar findings showed by Bertagnoli L, Lalatta F, *et at* [6] (1983) in their study, that measurements of fetal kidney can be used as an additional parameter in the routine assessment of fetal well being.

- Age group wise mean distribution of fetal kidney length (left and right) was not significantly different in different gestational weeks of different aged antenatal mothers. The mean effect of fetal kidney length of different gestational age groups were not significantly different ($p>0.05$) [Vide Table No.14, Page No. 74]. This finding was similar to the conclusion of previous researchers, Bertagnoli L, Lalatta F, *et al* [6] 1983 where they showed that there was no significant difference between right and left renal length. Similar finding was also mentioned by HL Cohen, J Cooper *et a l* [26] 1991,in their study that there was no significant difference was found between right and left renal lengths in fetuses in whom both kidneys were imaged.

- In this study accuracy of fetal kidney length measurement expressed in millimeter increased with advancement of pregnancy and was 72.38% accurate during 37 weeks to term [Vide Table No.15; Page No.76]. This finding was supported by the previous researchers like -

  i) Sagi J, Vagman I, et al, [53] 1987, was presented a correlation of fetal kidney length and gestational age. The

results were presented to be used as an adjunct in establishing fetal gestational age and as well as the assessment of normal renal morphology in routine obstetric ultrasound assessment.

ii) Saha M, Paul AK *et al* [54] in1997, mentioned that the mean length of fetal kidneys in their study was either slightly higher or similar to that previously reported by many authors and the average kidney length at full term was 3.95 cm.

iii) Carol M. Rumack, Stephanie R.Wilson, *et al,* [13] in1997, mentioned the often quoted rule of thumb "renal length in millimeters approximates gestational age in weeks". However, a recent study and their own experience showed that renal lengths are longer than previously reported.

iv) Konje J C, Abrams KR. *et al,* [35] 2002, in their study reported the measurement of fetal kidney length by ultrasonography between 24 & 38 weeks' gestation to be very useful and recommended its incorporation into the model for dating pregnancies after 24 weeks of gestation, in particular when measurement of the bi-parietal diameter and head circumference are difficult. Kidney length is a more accurate method of determining gestational age than the fetal biometric indices of biparietal diameter, head circumference, femur length and abdominal circumference between 24 and 38 weeks' gestation. When combined with biparietal diameter, head

circumference and femur length, the precision of dating was improved by 2 days. This measurement was easy to make and could therefore be easily incorporated into the model for dating pregnancies after 24 weeks of gestation, in particular when measurements of the biparietal diameter and head circumference are difficult.

- From this study it was found that the linear regression coefficient of the fetal kidney length was 0.98 with a standard error of 0.005 and p value of 0.000; the correlation coefficient: r = 0.98.[Vide Table No.17; Page No.80].

- In this study, as the correlation coefficient (r) value was very close to +1, the fetal kidney length in millimeter was strongly related with the calculated standardised gestational age in weeks. This finding was supported by Carol M. Rumack, Stephanie R.Wilson, *et al,* [13] in their highly esteemed text book "Diagnostic Ultrasound" Vol. 2, Second Edition (1997), Chapter 37, Page1094, "renal length in millimeters approximates gestational age in weeks".

- If fetal kidney length in millimeter was considered as equivalent to gestational age in weeks then the maximum variation found in 24 weeks of gestation i.e. 1.244×2= 2.488 weeks = 2.488× 7= 17.416 days and minimum of 0.4148 ×2=0.8296 × 7= 5.8072 days in late pregnancy. So, from the calculation it was found that the variation in determination of gestational age in relation to fetal kidney

length at term is ± 6 days (95% CI) [Vide Table No. 18; Page No. 81].

Finally in the present study an equation was found based on the regression coefficient;

i.e. Gestational Age in weeks(Y) = 0.963 x X [FKL(mm)] + 1.165 (y intercept).

(Where Slope m = 0.963 and Constant = 1.165).