



## ESTIMATION OF GESTATIONAL AGE IN SECOND & THIRD TRIMESTERS FROM ULTRASONOGRAPHIC AGE OF HUMERUS LENGTH AND ITS CORRELATION WITH LMP GESTATIONAL AGE IN WOMEN OF CENTRAL INDIA

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### ABSTRACT

**Background:** Evaluation of GA using ultrasound is based on measuring one parameters of the fetus. HL used to give a good GA estimate. The present study was determining gestational age by USG GA of humerus length and it's correlated with LMP gestational age in central Indian population.

**Methods:** This was an observational cross sectional study conducted in the Department of Radiology in collaboration with Department of Anatomy at L.N. Medical College and Research Centre, Bhopal. A total size of 200 pregnant women, targeting 5 – 40 weeks of gestation shall be considered. A straight measurement of length is determined from a sagittal line between 2 points at each end of the bone shaft; three or more measurements were taken in each examination, disregarding any curvature.

**Results:** The correlation between 2nd and 3rd trimester LMP & humerus length gestational age, which is found to be highly correlated and it is statically significant (P value - 0.01).

**Conclusion:** It can be concluded from the result that the length of the humerus is the best parameter for assessing the gestational age in the 2nd trimester. HL is less accurate than other fetal parameters for estimation of GA followed by BPD, HC in the 3<sup>rd</sup> trimester.

**KEYWORDS :** Humerus length, Second trimester, Third trimester, USG gestational age, LMP gestational age, Central Indian population.

### INTRODUCTION:

Gestational age (or menstrual age) is a proportion of the time of pregnancy, where the source is the women LMP or the corresponding age assessed by other methods. Such methods include the addition of 14 days to the known duration from fertilization (as is possible within vitro fertilization) or obstetric ultrasound<sup>1</sup>. In the 19<sup>th</sup> century obstetrician Franz Karl Negele developed a simple calculation of the expected birth date, which included adding 9 months and 7 months days before day one LMP<sup>2-3</sup>.

Evaluation of GA using ultrasound is based on measuring one or more biometric parameters of the fetus. FL, HL, tibia, and ulna were used in combination to give a good GA estimate, which can be useful when measuring BPD may be unreliable, inaccessible or abnormal, used in the BPD / FL ratio and the BPD / HL ratio as a categorical variable in down syndrome<sup>4</sup>.

Nuha Ahmed Mohammed Yousif (2017)<sup>5</sup> concluded that both femoral and humeral lengths were similar and reliable to estimate the GA. In general, the accuracy of gestational age prediction in the 2nd trimester is approximately +7 days before 20 weeks and +10 days after 20 week; the accuracy of fetal age prediction in the 3rd trimester is about +21 day<sup>6-7</sup>.

To the best of our knowledge we know, this is the first research that has assessed the presentation of LMP GA (days) correlation with the ultrasound humerus length GA (days) to evaluate gestational age in second and third trimesters pregnant patients.

### MATERIALS AND METHODS:

This was an observational cross sectional study conducted in the Department of Radiology in collaboration with Department of Anatomy at L.N. Medical College and Research Centre, Bhopal. The study was conducted from April 2017 to April 2019. A total size of 200 pregnant women, targeting 5 – 40 weeks of gestation shall be considered. They will be divided (trimester wise) into groups.

### EXCLUSION CRITERIA:

- Patients who are not sure of dates or with a history of irregular cycles.
- Chronic medical diseases like diabetes, hypertension, chronic renal disease
- Pregnant women who did not satisfy the inclusion criteria.

Each patient would be scanned twice following the international scanning guidelines and protocols. The images of 5 to 40 weeks of

gestation shall be obtained using high resolution scanning Systems on Transverse plane, mid sagittal plane, and longitudinal plane. Intracavitary probes are employed if necessary to get a clear quality image.

The total length of the humerus is obtained in a plane as close as possible to the right angles of the ultrasound beam. A straight measurement of length is determined from a sagittal line between 2 points at each end of the bone shaft; three or more measurements were taken in each examination, disregarding any curvature<sup>8</sup>.

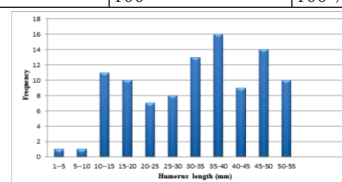
Appropriate statistical methods will be applied to research. Ethical approval was granted by the Institutional Ethics Committee (IEC).

### RESULTS:

The result of our study shows that out of 100 patients the table no :1 (Fig No :1) shows that maximum numbers of patients were in humerus length range between 35-40 mm and minimum patients belong to humerus length range between 1-10 mm.

**Table No: 1 showing distribution of study subjects based on Humerus length (HL) in 2<sup>nd</sup> trimester (n=100)**

Humerus length (mm)	Frequency	Percentage
1-5	1	1%
5-10	1	1%
10-15	11	11%
15-20	10	10%
20-25	7	7%
25-30	8	8%
30-35	13	13%
35-40	16	16%
40-45	9	9%
45-50	14	14%
50-55	10	10%
Total	100	100 %



**Figure 1 showing distribution of study subjects based on humerus length in 2<sup>nd</sup> trimester**

Table no : 2 (Fig no : 2) shows that out of 100 patients in 3<sup>rd</sup> trimester maximum numbers of patients were in humerus length range between 60-65 mm and minimum patients belong to humerus length range between 75-80 mm.

**Table No: 2 showing distribution of study subjects based on Humerus length (HL) in 3<sup>rd</sup> trimester (n=100)**

Humerus length (mm)	Frequency	Percentage
35-40	2	2%
40-45	2	2%
45-50	7	7%
50-55	12	12%
55-60	16	16%
60-65	29	29%
65-70	28	28%
70-75	3	3%
75-80	1	1%
Total	100	100 %

**Figure 2 showing distribution of study subjects based on humerus length in 3<sup>rd</sup> trimester**

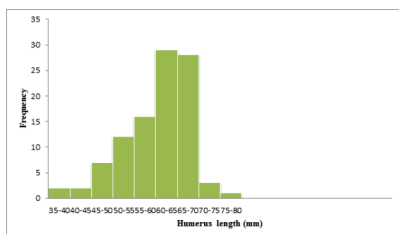


Table No: 3(Fig No :3) showing correlation between 2<sup>nd</sup> trimester LMP & humerus lengths gestational age, which is found to be highly correlated (Pearson Correlation value .979) and it is statically significant (P value - 0.01).

**Table No: 3 showing correlation between 2<sup>nd</sup> trimester LMP & Humerus Lengths Gestational age (n=100)**

Variables	Mean	Std.deviation	Pearson Correlation	P value
LMP	152.3	30.3	0.979	0.01**
Humerus Lengths Gestational age	149.6	29.4		

\*\*Correlation is significant at the 0.01 level (2-tailed).

**Fig No: 3 showing correlation between 2<sup>nd</sup> trimester LMP & Humerus Lengths Gestational age.**

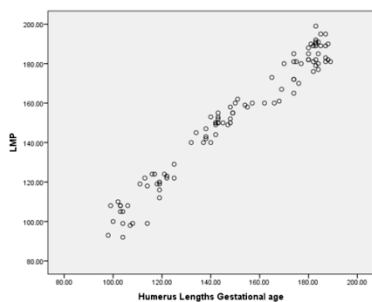


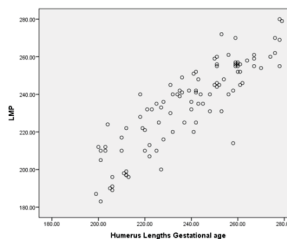
Table No: 4 (Fig No:4) showing correlation between 3<sup>rd</sup> trimester LMP & humerus length gestational age, which is found to be highly correlated (Pearson Correlation value .872) and it is statically significant (P value - 0.01).

**Table No: 4 showing correlation between 3<sup>rd</sup> trimester LMP & Humerus Lengths Gestational age (n=100)**

Variables	Mean	Std.deviation	Pearson Correlation	P value
LMP	234.8	22.8	0.872	0.01**
Humerus Lengths Gestational age	238.6	22.2		

\*\*Correlation is significant at the 0.01 level (2-tailed).

**Fig No: 4 showing correlation between 3<sup>rd</sup> trimester LMP & Humerus Lengths Gestational age**



**DISCUSSION:**

The diaphyseal length of humerus and femur step by step expanded from 15 weeks to 40 weeks of development and by applying multiple correlations, a formula was determined to compute the gestational age<sup>9</sup>.

In this research result showing the correlation between the 2<sup>nd</sup> trimester humerus length LMP GA & USG GA found to be highly correlated (Pearson value =0.979) and it is statically significant (p=0.01). It is the most reliable parameter in the 2<sup>nd</sup> trimester. Femur and humerus lengths correlation coefficient value are same in the 2<sup>nd</sup> trimester, so that both parameters are reliable for estimation of gestation age. Vivek et al<sup>8</sup> HL compared with standard charts and scatter graphs were plotted. A statistically significant correlation was (0.9704) was found between HL and USG GA.

Our study is evident that correlation in 3<sup>rd</sup> trimester between LMP GA and humerus length USG GA found to highly correlated (Pearson value 0.872) and it is statically significant (P=0.01). HL is less accurate than other fetal parameters for estimation of GA followed by BPD, HC in the 3<sup>rd</sup> trimester. Nuha Ahmed et al<sup>7</sup> study have positive finding to confirm the main objective of the study by demonstrating a strong correlation between FL and HL, HL and GA (LMP) that lead me to say that the US has more accurate in estimation of GA by using HL and FL in late second and third trimesters.

**CONCLUSION:**

We concluded that there was positive significant correlation between humerus length USG GA and LMP GA in the 2<sup>nd</sup> trimester. According to proximity, the length of the humerus is the best parameter for assessing the gestational age in the 2nd trimester. HL is less accurate than other fetal parameters for estimation of GA followed by BPD, HC in the 3<sup>rd</sup> trimester. Using several parameters for GA estimation is better than one parameter.

**REFERENCES:**

- Gestational age Wikipedia, the free encyclopedia
- Baskett, T.F. and F. Nagele, Naegele's rule: a reappraisal. BJOG, 2000. 107(11): p. 1433-5.
- Nägele, Lehrbuch der Geburtshilfe für Hebammen. Akademische Buchhandlung von J.G.B., 1836.
- Buckshee K, Arora V, Hingorani V. Evaluation of fetal development by real time sonar cephalometry in Indian pregnant women. India J Obstet-Gynaecol 1983; 33: 284.
- Nuha Ahmed Mohammed Yousif. The Determination of Gestational age by Humerus and Femur Length measurements by using ultrasound. Thesis Submitted The National Ribat University 2017.
- Hadlock FP, Harrist RB, Shah YP, Sharman RS, ParkSK. Sonographic fetal growth standards: are current data applicable to a racially mixed population. J Ultrasound Med, 1990, 9,157-160.
- Ruvolo KA, Filly RA, Callen PW. Evaluation of fetal femur length for prediction of gestational age in a racially mixed obstetric population. J Ultrasound Med, 1987, 6:417-419.
- Vivek Patre, Abhay Kumar Aryan, Preeti Sahu, Vibha Patre. Ultrasonographic Evaluation of Fetal Humerus Length for Assessment of Gestational Age and Its Comparison with Other Conventional Parameters. International Journal of Scientific Study | October 2015 | Vol 3 | Issue 7.
- Chaithra Rao B. R.1\*, Sunkeswari Sreepadma2. The study of the humerus and femur length as combined predictors of the gestational age of human fetuses using ultrasonography. Int J Res Med Sci. 2017 Jun;5(6):2701-2705.