

Original Research

Diagnostic accuracy of humeral length in assessment of gestational age

¹Shambhu Sah, ²Manoj Rungta, ³Rani Jha, ⁴RN Pandit

¹Assistant Professor, ²Associate Professor, Department of Radiology, Janaki Medical College & Teaching Hospital, Ramdaiya, Janakpur, Nepal;

³Associate Professor, Department of Obstetrics & Gynaecology, Janaki Medical College & Teaching Hospital, Ramdaiya, Janakpur, Nepal;

⁴Senior Consultant, Department of Obstetrics & Gynaecology, MIHS, Janakpur, Nepal

ABSTRACT:

Background: It is possible to determine foetal age by combining measurements of the femur, humerus, tibia, and ulna. The purpose of this study was to assess the diagnostic efficacy of humeral length in estimating gestational age by using sonographic measurement of foetal humeral length. **Material and method:** The ultrasounds of 120 healthy pregnancies were analysed using a 3.5MHz probe and standard obstetrics practise to determine the biometrics of the foetal skeleton. The length of the humerus was determined by measuring its diaphyseal apophysis from apex to apophysis. **Results:** In the present study total 120 pregnant females were selected in the study in which 43.33% were nulliparous whereas 56.66% were multiparous. In the study mean Humerus length with respect to POG by LMP was highest at 37 to 40 weeks (59.99 ± 2.65 mm) and lowest at <20 weeks (25.21 ± 5.43). **Conclusion:** Based on the findings of the present study, the length of the foetal humerus may be used as a valid indicator of gestational age.

Keywords: humeral length, gestational age, Diagnostic accuracy

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Corresponding author: Manoj Rungta, Associate Professor, Department of Radiology, Janaki Medical College & Teaching Hospital, Ramdaiya, Janakpur, Nepal

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INTRODUCTION

Ultrasonography is the gold standard for monitoring foetal development throughout pregnancy. The transducer, comprised of piezoelectric crystals that emit ultrasound beams and receive reflected signals, uses high-frequency (3.5 -7.5 MHz), low-intensity sound waves to examine the developing foetus and assess its health. Grayscale visuals are generated from these impulses and shown on the screen. Ultrasound can be used in pregnancy in two ways: transabdominally or endo-vaginally.^{1,2} Sonographic measurements of the foetus provide information about foetal gestational age and growth, and can be used to estimate gestational age, EDD, foetal weight, and diagnose growth disturbances.³ Fetal biometry is a method that can be used to evaluate foetal anatomy and growth. Ultrasonography uses a number of biometric markers to calculate the expected due date. Biometric features such as crown rump length, biparietal diameter, head size, femur length, and abdominal circumference are used to estimate

gestational age, foetal weight, and growth in the first four trimesters of pregnancy.^{4,5} If the expectant mother cannot recall the first day of her last menstrual cycle or if the fundal height measured during an abdominal examination does not match the date on which the prenatal multiplier approach for limb length prediction was used, then the femoral and humeral lengths can be used to estimate the foetal age.^{6,7} Femoral length, humeral length, tibia, and ulna were used in amalgamation to allow for better assessment of foetal age and can be useful when biparietal diameter measurements are unpredictable, unobtainable, or abnormal, and they were used in BPD/FL ratio and BPD/HL ratio as categorical variables in Down syndrome.⁶

The purpose of this study was to determine the gestational age by measuring the foetal humeral length using sonography and to evaluate the diagnostic accuracy of humeral length in determining gestational age, given that the accuracy of

determining gestational age decreases as pregnancy progresses due to intensifying biological variation^{6,7}

MATERIAL & METHODS

The present study was descriptive observational conducted among 120 pregnant females selected from the OPD of Janaki Medical College Teaching Hospital, Tribhuvan University, Ramdaiya, Bhawadi, Dhanusha, Nepal. The study was conducted over the period of sixmonths, from June 2021 to November 2021. The ethical clearance was taken before starting of the study from the Committee of the Ethics of the institute. After explaining the study to the pregnant female written informed consent was taken from the pregnant female / guardian by the investigator.

CRITERIA FOR ACCEPTANCE

- Amenorrhea's Past
- The exact day that your previous menstrual period began
- Periods that come and go as they should

CONDITION(S) OF REJECTION

- Twin pregnancies
- Pregnancies involving anomalies such as anencephaly, hydrocephalus, Short limb dysplasia, IUGR.

METHODOLOGY

Data was collected from the pregnant females.

THE SONOGRAPHIC METHODS

The ultrasounds were performed while the pregnant women were lying flat on their backs, and a transducer of 3.5 MHz was used. Sagittal, coronal, and transverse views of the foetus were obtained to confirm viability and presentation. During longitudinal scanning of the foetal chest to measure the humerus, the chest was identified while the heart was beating.

HUMERUS SCANNING TECHNIQUE

After scanning through the foetal ribs/thorax and shoulder girdle to the adjacent humerus, the transducer was rotated until the whole length of the humerus was obtained, allowing for detection of the unborn heart inside the foetal chest. At least three measurements were taken in each examination to arrive at an accurate mean value for the humerus length between two locations at each end of one shaft. Examined data was summarised using mean and standard deviation. Statistical testing was performed using SPSS for Windows (SPSS Inc., Chicago, IL, USA) version 16, and a p value of 0.005 was considered significant.

RESULTS

In the present study total 120 pregnant females were selected i the study in which 43.33% were nulliparous whereas 56.66% were multiparous (Table 1). In the

study mean Humerus length with respect to POG by LMP was highest at 37 to 40 weeks (59.99 ± 2.65 mm) and lowest at <20 weeks (25.21 ± 5.43) (Table 2).

Table 1: Distribution of parity

Parity	N(%)
Null	52(43.33%)
Multi	68(56.66%)
Total	120(100%)

Table2: Humeral length wrt to gestational age

Gestational age by LMP(weeks)	Humeral length Mean±SD
<20	25.21±5.43
21-24	31.35±2.34
25-28	39.58±2.78
29-32	52.45±2.36
33-36	56.31±2.11
37-40	59.99±2.65

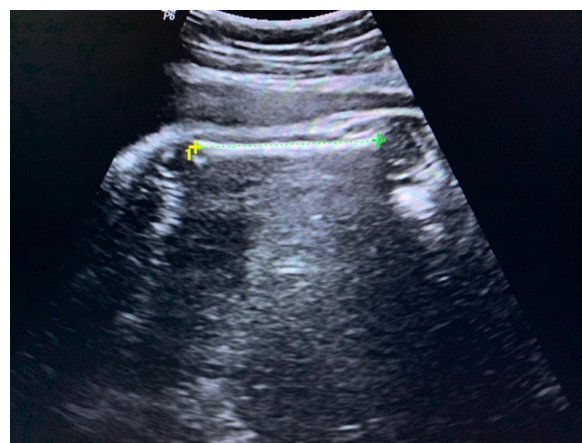


Fig:1 Humeral Length in Gestational Age

DISCUSSION

In the first trimester of pregnancy, ultrasound has replaced other methods as the gold standard for estimating the age of the developing foetus. Both the transvaginal and the transabdominal probe estimations are used to offer a more precise measurement of the gestational age of the foetus. Transvaginal is the method of choice during the first trimester, according to studies.^{8,9}

In the present study total 120 pregnant females were selected i the study in which 43.33% were nulliparous whereas 56.66% were multiparous. In the study mean Humerus length with respect to POG by LMP was highest at 37 to 40 weeks (59.99 ± 2.65 mm) and lowest at <20 weeks (25.21 ± 5.43).

Systematic differences in the measurement of FL and HL appear especially during the first trimester of pregnancy, a phase in which the upper and lower bones are extremely difficult to measure correctly, as reported by Rosati et al. (2002), which accounts for the variations in precision in calculating bone length

using formulae derived from data obtained during early pregnancy.^{10,11}

Roberto et al. (2005) examined the relationship between the length of the humerus and the likelihood of a diagnosis of Down syndrome in the unborn child, and they found no evidence of a difference in the detection rate or the false-positive rate. When the femoral and humeral lengths were combined, the number of false positives dropped considerably. Based on these results, it seems that using both femoral and humeral lengths together may be more effective than using either length alone when using ultrasonography to test for Down syndrome.¹²

In order to estimate the gestational age of a foetus, the Australian Society for Ultrasound in Medicine (ASUM) has produced a statement on Normal Ultrasonic Fetal Measurements and developed a humeral length chart.¹³

CONCLUSION

Based on the findings of the present study, the length of the foetal humerus may be used as a valid indicator of gestational age.

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