



Gestational age estimation in second and third trimesters of pregnancy by fetal *Occipitofrontal* diameter

Sumit Kumar Dixit ^{1*}, Subhash C Sylonia ², Umesh C Garga ³, Ishfaq Ayoub Kuchay ⁴

¹ Student, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India

² Professor and HOD, Department of Radio Diagnosis, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India

³ Professor in Radio Diagnosis, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India

⁴ Senior Resident, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India

* Corresponding Author: Sumit Kumar Dixit

Article Info

ISSN (online): 2582-8940

Volume: 03

Issue: 04

October-December 2022

Received: 17-11-2022;

Accepted: 06-12-2022

Page No: 68-70

Abstract

Aim and objectives: The aim of this study was to evaluate the usefulness of *occipitofrontal* diameter (OFD) in estimation of Gestational age (GA) in the second and third trimester of pregnancy.

Materials and method: This was a cross-sectional study done to perform sonographic examination among pregnant woman in 2nd and 3rd trimester of pregnancy. The fetal biometrics (OFD, FL, and BPD) were calculated. Pearson correlation test was used to find correlation of GA with the fetal biometrics (OFD, FL, and BPD).

Results: The patients mean age was 25.12±4.56 years and mean GA depending on ultrasound was 27.98±0.53 (27–30) weeks. GA was strongly correlated with OFD (0.896), BPD (0.879) and FL (0.901).

Conclusion: OFD is an essential and reliable fetal biometric measure. OFD, FL, BPD, and GA demonstrated a strong correlation as well as a linear relationship. When BPD and FL are combined in regression models of OFD, GA is more accurately predicted than when BPD and FL are used separately.

Keywords: Gestational age, *Occipitofrontal* diameter

Introduction

The accurate determination of gestational age is essential for the delivery of obstetric and neonatal care as well as the public health monitoring of pregnancy outcomes ^[1]. Independent of maternal variables, uncertain gestational age has been linked to poor pregnancy outcomes, such as low birth weight, spontaneous preterm delivery, and perinatal death ^[1].

Since 10-40 percent of all patients seen in antenatal clinics are unaware of their last menstrual periods, have a history of irregular menstrual cycles, or have used oral contraceptives within two months of their LMPs, the last menstrual period (LMP) cannot be used for all patients, which is unfortunate ^[2, 3, 4]. Uterine fibroids and the mother's body habits can have an impact on the ability to estimate gestational age from the palpable dimensions of the uterus. Because of this, it is necessary to estimate gestational age in most pregnancies because the timing of ovulation or conception cannot be correctly anticipated using the other methods described above ^[5].

Fetal age and growth can be determined using sonographic readings. They are employed to determine estimated foetal weight, gestational age, EDD, and to identify growth problems. A technique called foetal biometry is used to gauge the size of several foetal anatomical components ^[6].

The gestational age can be calculated using a variety of ultrasonic biometric parameters provided by real-time ultrasound scanners. The most often used foetal biometric measurements to estimate gestational age, foetal weight, and growth in different trimesters are the crown-rump length, foetal biparietal diameters (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL). These measures are helpful in determining the gestational age of the foetus when the LMP is unknown or when fundal height does not coincide with date ^[5].

Dating pregnancies after 14 weeks is especially important in low- and middle-income countries, because many pregnant women wait until 20 weeks before seeking prenatal care. After 20 weeks of pregnancy, up to 80% of women in some areas visit for their first antenatal appointment [7]. This trend of late initial prenatal sessions and restricted access to ultrasound⁸ impedes both accurate estimations of preterm delivery and small-for-GA new borns in areas with the highest burden and the best care of pregnant women [9].

In earlier research, the OFD served as a crucial foetal biometric measure to calculate the cephalic index (CI), which is an essential indicator for spotting foetal head shape abnormalities such dolichocephaly and brachycephaly [10, 11]. The same level as BPD allows for an easy and quick measurement of the OFD, which is a function of HC. The various foetal presentations, however, are not always helpful for assessing BPD, and since the foetus occasionally faces the placenta, the foetal head position shifts to the OF position. In order to get an accurate BPD measurement, this requires challenging manoeuvre. According to several earlier research, placenta location has a major impact on foetal appearance [12, 13]. Because of this, particularly in these circumstances, OFD serve as an accurate foetal biometry for determining the GA.

Aim and objectives

The aim of this study was to evaluate the usefulness of *occipitofrontal* diameter (OFD) in estimation of GA in the second and third trimester of pregnancy.

Materials and method

This was a cross-sectional conducted from feb 2022 to July 2022 in Saraswathi Institute of Medical Sciences, Hapur. Sonographic examination was done among pregnant woman in 2nd and 3rd trimester of pregnancy.

A total of 333 pregnant females were selected. The fetal biometrics (OFD, FL, and BPD) were calculated.

The participants were certain about the date of their last menstrual period (LMP) and underwent routine sonographic examination for antenatal care.

Informed consent was taken from the participants. The study was approved by the ethical committee of the institution.

The sonographic procedure

Ultrasound investigation was done early at four and five weeks of gestation for all the participants to confirm the accurate date of the pregnancy. The participants were scanned in the supine position with the ultrasound machine with 3.5 mhz curvilinear transducer. A standard ultrasound machine (Philips Clear View 350) was utilized for the investigations.

The OFD was measured perpendicular to the falx cerebri at the midline at the widest region of the hemispheres of the fetal brain. The posterior horns of the lateral ventricles, hypothalamus, and the cavum pellucidum are visible at this

level, and the head is typically oval in shape. The intersection of the callipers was placed on the outer border of the occipital thinner side of skull table (occipito-frontally) at the longest part of the skull. At this level, the image was saved.

OFD was measured twice, and the average was calculated. To do this, an axial picture of the foetal skull was acquired as nearly horizontally as feasible at the level of the thalami. BPD measurements were done parallel to the OFD. The FL was then measured using the same obstetrical technique.

Inclusion Criteria

The inclusion criteria included normal pregnant women in second and third trimester with normal singleton pregnancy and Uneventful pregnancy till date or without any bad obstetric history.

Exclusion Criteria

The exclusion criteria were High-risk pregnancy or in emergency crisis, multiple pregnancies, pregnancies with confirmed congenital abnormalities, pregnancies complicated by hypertension and preeclampsia, maternal diabetes mellitus, and chronic maternal diseases.

Statistical Analysis

The data were analyzed using statistical software program (SPSS, version 26.0, Chicago, USA). Quantitative (Numerical) data were measured in the form of mean and standard deviation. Pearson correlation test was used to find correlation of GA with the fetal biometrics (OFD, FL, and BPD). Linear quantitative regression analysis was used to derive models for estimation of GA from OFD, FL, and BPD.

Results

Table 1

	Mean	SD
Mothers' Age in years	25.12	4.56
Mothers' Height in cms	148.56	6.10
Mothers' Weight in Kg	58.79	8.79
GA at third trimester in weeks	27.98	0.53

The patients mean age was 25.12±4.56 years and mean GA depending on ultrasound was 27.98±0.53 (27–30) weeks (Table 1).

Table 2

	Pearson correlation	p-value
OFD: <i>Occipitofrontal</i> diameter	0.896	0.001*
BPD: Biparietal diameter	0.879	0.001*
FL: Femur length	0.901	0.001*

GA was strongly correlated with OFD (0.896), BPD (0.879) and FL (0.901) (Table 2).

Table 3

Fetal biometrics	Equations	Correlation coefficient R	Adjusted R2	SE
OFD	$GA = 3.209 + 0.357 \times OFD$	0.896	0.803	2.509
BPD	$GA = 5.298 + 0.294 \times BPD$	0.879	0.773	2.567
FL	$GA = 7.982 + 0.317 \times FL$	0.901	0.812	2.418
OFD, BPD and FL	$GA = 4.209 + 0.095 \times BPD + 0.112 \times FL + 0.120 \times OFD$	0.903	0.815	2.074

Table 3 reveals Sets of equations were obtained from regression models to estimate the GA from foetal biometrics: OFD, BPD, and FL.

Discussion

The optimal obstetric care of pregnancies depends on accurate gestational dating, which is of utmost significance and the cornerstone of pregnancy management. Clinically significant gestational dating parameters for sonography include reliable foetal biometric measurements^[14]. This is true particularly for deciding the best time to do various prenatal tests, measurement the baby's growth, and schedule the birth. Because of poor memory and irregular cycles, Campbell *et al.*^[15] found that 45% of pregnant women are unsure of the dates of their menstrual periods.

The femur length (FL) is the most accurate measurement for the late third trimester.

In current study we observed a significant linear correlation between BPD, FL, OFD and GA. (TABLE-3)

This outcome is in line with Peter *et al.*'s^[16] findings which showed a significant association between GA and FL ($r = 0.946$).

Chang *et al.*^[17] found a significant association between GA and OFD and the best-fitting equation in the prediction of fetal GA using OFD was $GA = 0.44325 \times OFD + 0.16763 \times OFD^2 + 11.66546$ ($R = 0.96411$, $p < 0.0001$).

Hussein *et al.*^[18] observed that the model regression equation was $GA = 3.663 + .286 OFD$ with standard error (SE) = 2.882 when OFD was utilised to calculate the GA alone. A significant linear association was found. This result corroborated the significant linear association between OFD and LMP observed by Blaas *et al.*,^[19] the accuracy (SE = 2.271) and linear correlation ($r = 0.90$) both increased when all three parameters (FL, BPD, and OFD) were included. A more precise assessment of GA in the second and third trimesters was obtained by the combination of OFD with BPD and FL. This result was in agreement with the GA from OFD estimate made by Abuzeed *et al.*^[20]

Conclusion

OFD is an essential and reliable fetal biometric measure. OFD, FL, BPD, and GA demonstrated a strong correlation as well as a linear relationship. When BPD and FL are combined in regression models of OFD, GA is more accurately predicted than when BPD and FL are used separately.

References

- Naseem F, Ali S, Basit U, Fatima N. Assessment of gestational age; comparison between trans cerebellar diameter versus femur length on ultrasound in third trimester of pregnancy. *Professional Med J.* 2014; 21(2):412-417.
- Shan BP, Madheswaran M. Revised estimates of ultrasonographic markers for gestational age assessment of singleton pregnancies among Indian population. *Int J Adv Sci Technol.* 2010; 17:1-12.
- Hadlock FP, Deter RL, Harrist RB, *et al.* Estimating fetal age: computer-assisted analysis of multiple fetal growth parameters. *Radiology.* 1984; 152:497-501.
- Campbell S, Warsof SL, Little D, *et al.* Routine ultrasound screening for the prediction of gestational age. *Obstet Gynecol.* 1985; 65:613-20.
- Sumit Babuta, Sangita Chauhan, Rohin Garg, Meenu Bagarhatta. Assessment of fetal gestational age in different trimesters from ultrasonographic measurements of various fetal biometric parameters. *Journal of the Anatomical Society of India.* 2013; 62(1):40-46.
- Shehzad K, Ali M, Zaidi S. Fetal biometry. *Pak J Med Sci.* 2006; 22:503-8.
- Kaswa R, Rupesinghe GFD, Longo-Mbenza B. Exploring the pregnant women's perspective of late booking of antenatal care services at Mbekweni Health Centre in Eastern Cape, South Africa. *Afr J Prim Health Care Fam Med.* 2018; 10(1):e1-9
- Aliyu LD, Kurjak A, Wataganara T, de Sá RA, Pooh R, Sen C, *et al.* Ultrasound in Africa: what can really be done? *J Perinat Med.* 2016; 44(2):119-23.
- Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R, *et al.* National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. *Lancet.* 2012; 379(9832):2162-72.
- Gray DL1, Songster GS, Parvin CA, Crane JP. Cephalic index: A gestational age-dependent biometric parameter. *Obstet Gynecol.* 1989; 74:600-3.
- Merz E, Bahlmann F. Ultrasound in obstetrics and gynecology. Thieme Medical Publishers, 2005. ISBN: 1588901475.
- Sekulić S, Ilinčić M, Radeka G, Novakov-Mikić A, Simić S, Podgorac J, *et al.* Breech presentation and the cornual-fundal location of the placenta. *Croat Med J.* 2013; 54:198-202.
- Filipov E, Borisov I, Kolarov G. Placental location and its influence on the position of the fetus in the uterus. *Akush Ginekol (Sofia).* 2000; 40(4):11-2.
- Cinnusamy M, Shastri D, Martina JA. Estimation of gestational age by ultrasound measurement of fetal transcerebellar diameter. *J Anat Soc India.* 2021; 70:19-24.
- Campbell S, Warsof SL, Little D, Cooper DJ. Routine ultrasound screening for the prediction of gestational age. *Obstet Gynecol.* 1985; 65:613-20.
- Peter M, Nayak AK, Giri PP, Jain MK. Fetal kidney length as a parameter for determination of gestational age from 20th week to term in healthy women with uncomplicated pregnancy. *Int J Res Med Sci.* 2017; 5:1869-73.
- Chang CH, Chang FM, Yu CH, Yao BL, Liang RI, Ko HC, *et al.* Fetal occipito-frontal diameter in normal pregnancy: Reappraisal by Altman's model. *Journal of Medical Ultrasound.* 1997; 5(1):5-11.
- Hussein R, Gameraddin MB, A Malik BH, Yousef M, Turki Q. Evaluation of gestational age by fetal *occipitofrontal* diameter in second and third trimesters of pregnancy in Sudanese women. *Trop J Obstet Gynaecol.* 2018; 35:63-7.
- Blaas HG, Eik-Nes SH, Bremnes JB. The growth of the human embryo. A longitudinal biometric assessment from 7 to 12 weeks of gestation. *Ultrasound Obstet Gynecol.* 1998; 12:346-54.
- Khadmallah AA, Mona MA. Estimation of Gestational Age by *Occipitofrontal* Diameter Using Ultrasound. *SUST Repository,* 2015, 83-4.