Original article

A comparative study of gestational age by last menstrual period, symphysis fundal height and ultrasound at tertiary care hospital: Observational study

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Abstract:

Background: The present study work was designed to compare accuracy of gestational age by (LMP) day with that of symphysis-fundal height (SFH) on average gestational age (GA), using ultrasound scan (US) as a reference.

Methods: Pregnancy age was assessed simultaneously in 3 ways in a population-based study conducted in Pune, India, from October 2021, to March, 2022, with 375 women with singleton pregnancies, before 24 weeks of gestation.

Results: In our study , the median gestational age estimated by ultrasound was 290 days. Gestational age was slightly overestimated by last menstrual period (median 262 days, $P < 0.001$) and by SFH was found 268 days.Gestational age estimates by last menstrual period and ultrasound were moderately correlated (ICC = 0.71) and concordant (CCC = 0.69), whereas gestational age estimates by SFH were weakly correlated (ICC = 0.20) and concordant (CCC = 0.03).

Conclusion: The SFH measurement was found to be more accurate than the reported LMP as a GA measurement tool as well as delivery date, but none as accurate as the US scanner.

Keywords: Gestational age , Ultrasonography , Pregnant women

Introduction

There has been significant progress in maternal mortality rates in both developed and developing countries in recent years, as this focuses on improving maternal outcomes. Maternal mortality rate reflects the maternity and childcare services available in the country. Accurate knowledge of Pregnancy Age (GA) is very important in getting adequate prenatal, natal, and postnatal care. [1] .Expected date of birth is important in , diagnosis of premature or late birth, to differentiate premature birth and intrauterine growth threshold, all depends on the correct measurement of gestational age (GA). Prenatal councelling, treatment for preterm labour with tocolytic, treatment for intrauterine growth restriction, all depend on the estimation of correct gestational age

[2,3]. Ultrasound (US) scanner is considered a gold standard test for gestational age when performed before 20 weeks of gestation, as it is based on biometric measurements such as crown rump length (CRL), Bi-partial diameter (BPD), etc. . It is a little more accurate when done in the third trimester [3,5,6]. The study was performed with the aim of comparing the gestation age by LMP, symphysis fundal height (SFH) and ultrasound.

Materials and methods

This was a longitudinal study, Prospective cohort study . Sample size was determined by taking prevalence as 2%, at 95% CI and acceptable errors of 5%,using WINPEP1 Software. This study was conducted in the Department of Obstetrics and Gynaecology, DY PATIL MEDICAL COLLEGE,

Material required- non-elastic measuring tape to measure symphysis-fundal height. Ultrasound scan report of the patient.

Inclusion criteria :

All women attending the antenatal clinic before 24 weeks of pregnancy with singleton pregnancy in a longitudinal lie are included in the study.

Exclusion criteria :

All women attending the antenatal clinic after 24weeks of pregnancy and those with hydramnios, fetal anomalies, and diabetes complicating pregnancy and multiple gestation pregnancy were excluded from the study.

All women gave informed consent prior to participating in the study.

Data collected using preformed data collection form and case record form. Data entry done in Microsoft Excel and analysis using SPSS (Statistical Package for Social Sciences) Software version 20/ Epi Info.

Categorical variable expressed in terms of frequency, percentage and continuous variables in terms of mean and SD.

The 3 methods of determining GA were used at enrolment. All women were asked to tell the date of the first day of her LMP as she recalled it, The number of weeks between the first day of her LMP and her day of enrolment gives a GA estimate.

The symphysio-fundal height measurement is taken with the women in supine position with the legs straight and the bladder empty. The uterine height is measured with a nonelastic tape; the highest point of the uterus is identified by gentle palpation. The zero of the tape is placed at this point. The upper border of the pubic symphysis is then palpated and the tape placed over this point and the measurement in centimetres recorded. The number of centimetres is considered to correspond to GA in weeks [18,22]

All women will undergo routine ultrasound examinations also for estimation of gestation age.The fetal biparietal diameter, femur length, abdominal circumference, and head circumference were measured using reliable landmarks and planes [19] and GA was estimated by the Hadlock method [20].

Results:

Table 1 Characteristics of 375 study women[1]

Characteristics	Value
Age,years	26±7
No. of previous pregnancies [2]	3±2
Maternal height, cm	152.4±5.6
Maternal weight at booking	65.6±11.2
No. of live births	373
Birth weight[3]	2528±538
Maternal education None Primary Secondary Higher	 45(12%) 30(8%) 135(36%) 165(44%)
Maternal employment Unemployed/homemaker Regular employment Self employment	 50(13.3%) 224(59.7%) 101(27%)
Monthly household income in rupees <10,000 10,000 -20,000 >20,000	 8(2.1%) 299(79.7%) 68(18.2%)

1 Values are expressed as mean ±SD, number, or number (percentage).

2 For 307 women who were multiparous

3 For all 373 births

Table 2 Gestational age at enrolment (20+6 wk) by the three methods, and mean differences between the tested methods and reference method

Method	No. of weeks, mean±SD	No. of weeks, median(range)	Difference in No. of weeks with the reference, mean±SD	Test statistic	*P* value
Ultrasound (reference)	22.53±1.5	22 (20-27)	——	——	——
SFH	22.97±2.0	23 (1-30)	0.44±1.7	8.74	<0.001
LMP	23.10±1.7	23 (10-36)	0.57±2.1	9.35	<0.001

LMP - Last menstrual period; SFH - Symphysis-Fundal height;

Comparison done by 'paired *t* test'.

Table 3 Precision of the predicted date of delivery by each method

Precision	LMP	SFH	Ultrasound	Test static	*P* value
>14days prior	33(8.8%)	23(6.1%)	7(1.9%)	48.44	<0.001
7-14days prior	24(6.4%)	25(6.6%)	20(5.3%)	1.93	0.38
0-7 days prior	108(28.8%)	104(27.7%)	119(31.7%)	3.47	0.18
7-14 days later	60(16.0%)	75(20.0%)	83(22.1%)	10.31	0.006
>14days later	150(40.0%)	148(39.5%)	146(38.9%)	0.20	0.90

Abbreviations: LMP Last menstrual Period; SFH Symphysis-Fundal height;

Values are given as number (percentage); the precision of the predicted date of delivery is defined as the difference between the actual date and the predicted date; comparisons are made by x^2

Table 4 Accuracy of estimated gestational age at birth by the LMP and SFH methods compared with the age estimated by US method

Precision	LMP	SFH
>14 d younger	17(4.5%)	8(2.1%)
7-14 d younger	21(5.6%)	15(4.0%)
0-7 d younger	58(15.5%)	56(14.9%)
0-7 d older	186(49.6%)	225(60.0%)
7-14 d older	43(11.5%)	47(12.5%)
>14 d older	50(13.3%)	24(6.4%)

Abbreviations: LMP Last menstrual period; SFH Symphysis-Fundal height;

Values are given as number (percentage); the precision of estimated gestational age at birth by the tested methods was defined as the difference between the age estimated by these methods and the age estimated by the Ultrasound method.

Table 5 Classification of preterm, term, and post-term/post-date, deliveries by the 3 methods.

Method	Gestational age at delivery			Test static	P value
	<37 wk (preterm)	37-40 wk (term)	>40 wk (post-term/post-date)		
LMP	57(15.2%)	262(69.9%)	56(14.9%)	2.28	0.32
SFH	58(15.5%)	268(71.5%)	49(13.0%)	4.74	0.09
Ultrasound	66(17.6%)	290(77.4%)	19(5.0%)	58.24	<0.001

Abbreviations: LMP Last menstrual period; SFH Symphysis-Fundal height;

Values are given as number (percentage); comparisons are made by the x^2 homogeneity test.

Table 6 Comparison of the classification of preterm, term, and post-term/postdate delivers by the LMP and SFH with US as reference

Classification by ultrasound method (reference)	Classification by the SFH method [1]			Classification by the LMP [2]		
	Preterm	Term	Post-term/ postdate	Preterm	Term	Post-term/ postdate
Preterm (n=66)	44	21	1	40	24	2
Term (n=290)	13	244	33	17	229	44
Post-term/ postdate (n=19)	0	3	16	0	9	10
Total (n=375)	57	268	50	57	262	56

Abbreviations: LMP Last menstrual period; SFH Symphysis-Fundal height;

Values are given as number

1 S = 83.06 (P <0.001); simple κ = 0.55, weighted κ = 0.58.

2 S = 82.63 (P <0.001); simple κ = 0.40, weighted κ = 0.44.

Discussion:

Accurate estimates of gestational age (GA) are important for both clinical practice and public health services. Clinically, GA measurements identify infants at risk of adverse health outcomes because GA is a representative of infant development and is associated with infant survival [7]. Public health indicators, as part of preterm birth, rely on an accurate measurement of GA to monitor human health, identify groups in need of intervention and evaluate public health programs [8]. An accurate measurement of gestational age is important for both clinical and community health goals. Pregnancy age estimates using fetal ultrasound measurements are considered very accurate but are usually not available in low- and middle-income countries. The purpose of this study

was to assess the appropriateness of the last menstrual period and the measurement of symphysis fundal height for estimating of the gestational age, compared it with ultrasound measurements, in a larger group of women.

In our study , the median gestational age estimated by ultrasound was 290 days. Gestational age was slightly overestimated by last menstrual period (median 262 days, $P < 0.001$) and by SFH was found 268 days.Gestational age estimates by last menstrual period and ultrasound were moderately correlated (ICC = 0.71) and concordant (CCC = 0.69), whereas gestational age estimates by SFH were weakly correlated (ICC = 0.20) and concordant (CCC = 0.03).

In low- and middle-income settings, ultrasound measurements of GA are generally not

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possible due to limited resources or entry delays in obstetric care [9]; therefore, it is necessary to evaluate the most inexpensive and effective methods of measuring GA. To date, several studies have evaluated GA ratings based on LMP and newborn test compared to ultrasound in low- and middle-income countries. A study in Bangladesh concluded that LMP is a more reliable method than tests performed on newborns but whose findings are limited to children under 33 weeks of pregnancy [10]. A study in Guatemala found similar results, but limited a small sample size [11, 12]. The purpose of this study was to evaluate the validity of LMP and newborn GA test compared with ultrasound measurements in a large group of women in Vietnam.

Ultrasound equipment is not always available in low-cost countries and alternatives such as LMP and SFH are used to determine GA and predict delivery date. Our study compares these 2 methods with the US method, which is considered a gold standard. We found significant differences in GA rates found in 3 methods for women between 20 and 26 weeks of pregnancy. In addition, the LMP and SFH methods produced higher mean and intermediate GA values, as well as a wider range of values, than the US method. In settings with limited access to ultrasound, SFH may be a very useful tool for estimating, when women present for the first time in second trimesters. Improving the facilities and capabilities of ultrasound, and early arrival, as well as the development of new technologies such as automatic image analysis and new methods of prenatal screening, are essential for research and management of premature births in low-income areas.

Conclusion

In this study of Indian women, we found the last period of menstruation to provide a more accurate measure of gestational age than SFH when compared to ultrasound. These findings provide useful information on the usefulness and accuracy of different methods of measuring gestational age and suggest that last menstrual period may be preferred over SFH in settings where ultrasound is not available.

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