

Original Research Article

A COMPARISON OF THE ACCURACY OF THE USE OF LAST MENSTRUAL PERIOD AND SYMPHYSIO-FUNDAL HEIGHT FOR GESTATIONAL AGE DETERMINATION AMONG NIGERIAN WOMEN

ABSTRACT

Aims: This study used an early ultrasound scan as a reference in comparing the mean percentage accuracy of the last menstrual period (LMP) and the symphysio-fundal height (SFH), to ascertain the more accurate parameter for gestational age assessment

Study design: Hospital-based prospective cross sectional study.

Place and Duration of Study: Maternity unit of the Jos University Teaching Hospital, Jos, Nigeria, between December 2012 and April 2013.

Methodology: A total of 289 consecutive consenting women with singleton uncomplicated pregnancies at gestational ages of less than or equal to 20 weeks were recruited at the maternity unit of Jos University Teaching Hospital between December 2012 and April 2013. Ultrasound scan (USS) was used to confirm eligibility after which other information including the LMP were documented on a questionnaire. The women returned after 22 weeks' gestation based on ultrasound recorded GA for SFH assessment and some weeks thereafter for a second SFH assessment.

Results: Mean age of the women was 28.9 ± 4.8 years with a range of 16-42 years. Most of them were of parity 1 – 4 (58.1%). The mean GA at booking was 15.3 ± 3.1 weeks based on LMP and 14.9 ± 3.1 from early ultrasound scan. The mean percentage accuracy for SFH method was 95.8% and that of LMP was 91.0%. This difference was found to be statistically significant ($P = .02$).

Conclusion: The study showed a significant difference between the LMP and early ultrasound scan dating but not between SFH and early ultrasound scan. Also, the mean percentage accuracy was statistically higher for SFH, suggesting that SFH was a more accurate tool for gestational age assessment among these women.

Keywords: Comparison, Gestational age, Menstrual date, Symphysiofundal height, Nigeria

1. INTRODUCTION

The accurate determination of gestational age is the cornerstone of optimal obstetric care. The diagnosis and interventions given to a pregnant woman including antepartum haemorrhage, intrauterine growth restriction, pre-term and post-term deliveries, the categorisation of pre-labour rupture of membranes(whether at term or pre-term)and the need for steroid administration, tocolysis or induction of labour, all rest on the correct assessment of the gestational age at the time of evaluation. In addition, it is important to the pregnant woman and her family who wants to know when to expect the baby¹⁻⁴.

There are different ways of assessing the gestational age. Traditionally, the first day of the last menstrual period has been used to calculate the day of delivery (which is supposed to occur 280 days later) and date the pregnancy^{5,6}. But this Naegele's rule is based on certain assumptions hence if a woman has irregular menstrual cycles, has been on hormonal contraception, had lactational amenorrhoea prior to conception, or has poor recollection of her last menstrual period, then the application of the rule becomes difficult^{2,3,7,8,9}.

The symphysiofundal height (SFH) measurement in centimetres using a non-elastic tape, can be used after the 20weeks to 34weeks of gestation but it has its own limitations in dating pregnancy in multiple pregnancy, co-existing fibroid and pregnancy, polyhydramnios, oligohydramnios, fetal transverse lie^{2,10,11}.

The gold standard for assessing gestational age has been the use of early ultrasound scan done at first half of the pregnancy^{2,4,12}. In resource endowed countries, ultrasound scan has become an essential part of obstetric practice but the same cannot be said of low resource countries like Nigeria especially in the rural areas¹³. In this setting, when available, the ultrasound machine is often of poor quality and operated by undertrained technicians. Furthermore, late presentation of our women for antenatal care in our environment, is a factor that limits the usefulness of ultrasound in assessing gestational age^{3,7,14,15}.

In a study conducted by Adewale and Ijaiya on symphysio-fundal height measurement as a means of gestational age assessment among 390 pregnant Nigerian women at the University of Ilorin Teaching Hospital, Nigeria, they concluded that accurate measurement of SFH is a reliable method of gestational age assessment in the second half of pregnancy¹³. In another study from University Teaching Hospital, Ibadan, Nigeria, by Kuti and his colleagues to compare the accuracy of Symphysio-fundal height with ultrasound measurements in assessing gestational age in the third trimester, the authors concluded that there was no significant difference between Symphysio-fundal height measurement and ultrasound parameters in determining gestational age in the third trimester of pregnancy¹⁶.

Similarly, a study done in Pakistan suggested that symphysio-fundal height measurement was more accurate than the reported last menstrual period as a tool for assessing gestational age when the ultrasound scan was used as a reference².

In developing countries where illiteracy compounds the general poor recollection of the LMP among pregnant women and where ultrasound facility is still not so widely available^{2-4,7,13,17}, an alternative method that is independent of patient's recollection but based on the accurate measurement on the spot by the physician, will go a long way to solve the dilemma of inaccurate assessment of gestational age. Hence, this study was carried out in our center to compare the accuracy of the LMP with the symphysio-fundal height in assessing gestational age, using the ultrasound as a reference.

2. MATERIAL AND METHODS

This hospital-based cross-sectional prospective research was carried out in the maternity unit of the Department of Obstetrics and Gynaecology, Jos University Teaching Hospital (JUTH), a tertiary health institution situated in Jos, Plateau state. The hospital is one of the three federal teaching hospitals in the North-Central zone of Nigeria. It serves as a referral center for the neighbouring states of Bauchi, Gombe, Benue, Kogi, Nasarawa, Taraba, Adamawa, part of Kaduna States. Jos is the capital city of Plateau State.

The study population comprised of consecutive pregnant women with singleton pregnancy in the antenatal clinic with estimated gestational age less than or equal to 20 weeks' gestation who consented to participate in the study. Women with co-existing pelvic mass, polyhydramnios or oligohydramnios, a fetus in transverse lie or fetal intrauterine growth restriction were excluded from the study.

2.1 Study Procedure

On presentation for booking at the maternity unit of JUTH, eligible women were directed to the investigator who explained the purpose of the study to them. Those who consented to participate signed a written consent form. The investigator, who has received training in obstetric ultrasonography, then proceeded to have their gestational age determined by ultrasound to confirm eligibility after which other information were collected on a questionnaire including the first day of their last menstrual period (LMP) as they recalled. For those who could not recall the first day of their LMP, the 15th day of the recalled month was used. The number of weeks between the LMP and the day of enrolment provided the gestational age estimates.

The ultrasound scan was performed by means of a real-time Toshiba model (OTPS- 320A ultrasound machine fitted with a 3.75MHz sector probe (Otagawa, Japan, 2001). The fetal gestational sac, crown-rump (CRL) and biparietal diameter (BPD) were used depending on the gestational age (GA), using reliable landmarks and planes¹⁹.

The women were allowed to go home to return for the study after 22 weeks of the ultrasound recorded gestational age for SFH assessment by a senior registrar who was blinded to the GA estimated previously. The subjects had their bladder emptied and after lying down in supine position, each fundus of the uterus was outlined by gentle palpation. A non-elastic tape was then used with the graduation in centimetres facing the abdomen (to reduce bias) to take the measurement in the midline from the fundus uteri to the upper part of the pubic symphysis. Two measurements were taken for each subject and each measurement was rounded up to the nearest centimetre. The average of the two measurements was taken and the number of centimetres considered corresponding to GA in weeks^{20,21}. A second measurement of the symphysiofundal height was done in a similar manner four to six weeks later. The women were then seen by their respective managing units in subsequent antenatal clinics until delivery.

The data was collected using the study questionnaires including results of the early ultrasound findings and the subsequent SFH measurements. The information obtained was entered into a pre-design program in the Epi-info software version 3.5.4 and analyzed. The mean gestational ages were calculated for the Ultrasound scan estimation, LMP and SFH readings for the first and second visits after the 22 weeks of gestation and the mean differences determined. The test of hypothesis was done using the student t-test and a *P*-value of less than .05 was considered statistically significant.

3. RESULT

A total of 301 women were screened between December 2012 and April 2013 for the study at booking. Nine of them were excluded as a result of the diagnosis of twin pregnancy and another 3 for pregnancy coexisting with uterine fibroids.

Table 1 shows the socio-demographics features of the 289 study population analyzed. The mean age of the women was 28.9 ± 4.8 years with a range of 16-42 years. Most of them were within the age group of 20-34 years (82.0%) and 9 (3.1%) were teenagers. Most of the women were of tribes from Plateau state (Plateau tribes) (50.9%), Christians (80.6%), had at least secondary school education (88.2%), Married (99.3%) and Civil servants (45.0%). One hundred and twenty one of them were nulliparous (41.9%), while 168 (58.1%) have had at least one prior delivery, out of which 21 (7.2%) were grandmultiparous women.

The average gestational age at booking from the LMP was 15.3 ± 3.1 weeks while that from the early ultrasound scan done was 14.9 ± 3.1 . The total number of women who were unsure of the first day of their LMP was 24, giving a prevalence of 8.3% of the total population. Table 2 presents the mean differences between the gestational ages obtained by the ultrasound scan and those of the last menstrual period (LMP) and symphysio-fundal height (SFH) for both the first and the second visits after 22 weeks of gestation. The mean differences were higher for the LMP values and these were found to be statistically significant ($P = .001$). The mean differences for the SFH values were not statistically significant.

Table 3 shows the mean percentage accuracy which is higher for the SFH compared to the LMP (95.8% Vs 91%) and this is statistically significant ($P = .02$).

TABLES

Table 1: Baseline Characteristics of the Women

Variable	Total (N=289)	Percent (%)
Age Group (Mother)		
≤19 years	9	3.1
20-34 years	237	82.0
≥ 35 years	43	14.9
Ethnicity		
Hausa	40	13.8
Igbo	20	6.9
Plateau tribes	147	50.9
Yoruba	22	7.6
Others	60	20.8
Religion		
Christian	233	80.6
Muslim	56	19.4
Education of the Mother		
None	28	9.7

Primary	6	2.0
Some Secondary	182	63.0
Completed Secondary	17	5.9
Tertiary	56	19.4
Education of Spouse		
None	4	1.4
Primary	8	2.8
Some Secondary	9	3.1
Completed Secondary	180	62.3
Tertiary	88	30.4
Marital Status		
Married	287	99.4
Never Married	1	0.3
Widowed	1	0.3
Occupation of Mother		
Civil Servant	130	45.0
Trader	41	14.2
Seamstress	85	29.4
Housewife	21	7.3
Others	12	4.1
Parity		
0	121	41.9
1-4	147	50.9
≥5	21	7.2

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Table 2: Comparing the accuracy of the LMP and SFH using Ultrasound as the Standard

Variables	Mean difference	Standard deviation	95% Confidence Interval	t-test	P-Value
EGAUSS-EGALMP	-0.391	1.501	(-0.565 to -0.217)	4.429	.001
EGA2USS-EGA2LMP	-0.388	1.508	(-0.562 to -0.213)	4.370	.001
EGAUSS-EGASFH1	-0.028	1.504	(-0.202 to -0.146)	0.313	.755
EGA2USS- EGA2SFH2	-0.031	1.449	(-0.199 to -0.137)	0.365	.715

134

135 EGAUSS= Ultrasound estimated gestational age first visit after 22 weeks

136 EGALMP= Last menstrual period estimated gestational age first visit after 22 weeks

137 EGA2USS= Ultrasound estimated gestational age second visit after 22 weeks

138 EGA2LMP= Last menstrual period estimated gestational age second visit after 22 weeks

139 EGASFH1= SFH estimated gestational age first visit after 22 weeks

140 EGA2SFH2= SFH estimated gestational age second visit after 22 weeks

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142 **Table 3: Comparison of Mean Percentage accuracy of LMP and SFH**

Method	No of Subjects	Gestational age Assessment		P-value
		Mean Accuracy* n(%)	Inaccurate n(%)	
SFH	289	277 (95.8%)	12 (4.2%)	.02
LMP	289	263 (91%)	26 (9%)	

143
144 *Accuracy was defined by the number of Subjects within 2 weeks of USS estimated gestational age.

146 4. DISCUSSION

147
148 Accurate gestational age assessment is a desirable exercise by every obstetrician attending to his clients for diagnostic,
149 investigative or therapeutic reasons. The available commonly used clinical tools in our setting have been evaluated to
150 ascertain which is more accurate between LMP and SFH when an early ultrasound scan is used as the standard.

151
152 The mean gestational age at booking calculated from the last menstrual period was 15.3 weeks $\pm$ 3.1SD, while that
153 calculated from the early ultrasound scan was 14.9 weeks $\pm$ 3.1SD. These values are lower than that reported by an
154 earlier study from the same centre by Mutihir and his colleagues (22.3%)¹⁵. The higher value from their study is likely due
155 to the fact that all pregnant women irrespective of their gestational ages at booking were recruited while this study
156 specifically recruited pregnant women before or at 20 weeks of estimated gestational age. As regards the difference in the
157 mean gestational age values from the LMP and early ultrasound scan, the finding is in keeping with the conclusion from
158 the study by Yang H et al, that early ultrasound scanning reduces gestational age estimate relative to last normal
159 menstrual period estimates²².

160
161 The prevalence of those who were unsure of the first day of their LMP was 8.3%.This is slightly lower than the lower limit
162 of the reported 10-45%^{16,23}. The lower prevalence recorded in this study could be attributed to the high level of literacy
163 found in these women. It is important to note that 88.2% of the women from this study had at least a secondary school
164 education which could explain this low prevalence, as lower educational attainment is one of the sociodemographic
165 characteristics associated with uncertain LMP²⁴.

166
167 The paired mean differences of the LMP with the early ultrasound scan were higher and found to be statistically significant
168 ($P = .001$) compared to the mean differences of the SFH with the early ultrasound scan which were not as high and
169 statistically insignificant ($P = .001$). This implied that the SFH assessment from the study was not statistically different
170 from the early ultrasound scan as a tool for gestational age assessment and may be more useful than the LMP in the
171 absence of an early ultrasound scan. Furthermore, the mean percentage accuracy of the last menstrual period compared
172 to early ultrasound scan was 91% as against the mean percentage accuracy of 95.8% for the symphysio-fundal height
173 compared to the early ultrasound scan. And this higher accuracy with the symphysio-fundal height method was found to
174 be statistically significant ($P = .02$). The implication of the findings above is that the symphysio-fundal height was found to
175 be more accurate in gestational age estimation compared to the last menstrual period. This is similar to the findings from
176 the study by Adewale and Ijaiya that the SFH is a reliable method of gestational age assessment in the second half of
177 pregnancy¹³. Although in that study, the researchers did not compare the SFH with the LMP to ascertain the more
178 accurate tool. In a prospective study conducted in Cape Town, South Africa to compare different dating methods
179 commonly used in their setting, the authors concluded that ultrasound dating was most accurate of all the other methods,
180 but their study also revealed a better agreement between the ultrasound dating method and the SFH compared with the
181 LMP²⁵.

182
183 In a longitudinal study conducted in rural Guatemala between 1996 and 1999 for 171 women–infant pairs, comparing
184 LMP, neonatal examination and SFH using ultrasound as the reference, the authors concluded that the recalled LMP
185 provided the best estimate of gestational age³. They observed in addition, that the SFH measure during the second
186 trimester may provide a reasonable alternative when the LMP is unavailable³. In their study however, the researchers

used SFH measured between 15 and 24 weeks of gestation on the assumption that this earlier measure would be less influenced by growth retardation. But as a tool for determining gestational age (GA), it is generally reported that SFH in centimeters equals GA in weeks between 20 and 34 weeks^{10,11}. Hence, the early measure could have provided a suboptimal assessment of the SFH in that population.

The limitation of this study is that although ultrasound was used as the gold standard in this study, it has its own error margin even with the best biometric measurement which is the CRL (± 5 to 7 days). And the convenience sampling technique is subject to sampling bias, hence, the sample might not be representative of the entire population. This limits the ability to generalize the findings of the study to the entire population.

5. CONCLUSION

The findings from this study showed a significant difference between the last menstrual period and the early ultrasound scan as tools for gestational age assessment, but not between symphysio-fundal height and early ultrasound scan. In addition, the mean percentage accuracy of the symphysio-fundal height was higher and statistically more significant compared to that of the last menstrual period. This suggests that barring factors which may erroneously increase the symphysiofundal height estimation like multiple pregnancy, polyhydramnios, co-existing pelvic mass or other factors which may abnormally decrease the symphysiofundal height estimation like fetal transverse lie, oligohydramnios or intrauterine growth restriction, the SFH estimation is a more accurate tool for gestational age assessment after the 22nd week of gestation compared to the LMP in this Nigerian obstetric population.

It is our recommendation that, there should be training and re-training of Doctors, Midwives and Nurses at different levels of health care in the proper technique for symphysio-fundal height measurement for GA assessment as described in this study especially in low resource settings where ultrasound is a luxury and where women have poor recollection of their LMP.

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ABBREVIATIONS

EGAUSS= Ultrasound estimated gestational age first visit after 22 weeks
EGALMP= Last menstrual period estimated gestational age first visit after 22 weeks
EGA2USS= Ultrasound estimated gestational age second visit after 22 weeks
EGA2LMP= Last menstrual period estimated gestational age second visit after 22 weeks
EGASFH1= SFH estimated gestational age first visit after 22 weeks
EGA2SFH2= SFH estimated gestational age second visit after 22 weeks