To whom it may concern

Dr Dewi Anggraini has reviewed 1 submission in the journal *International Journal of Women's Health* during 2020.

This contribution is greatly appreciated.

Regards

Angela Jones
General Manager, Dove Medical Press Ltd

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Manuscript ID number: 241310

Title of paper: Estimating gestational age by symphysis fundal height and last normal menstrual period in third trimester pregnancy at Gandhi Memorial Hospital, Addis Ababa, Ethiopia: a comparative study

Reviewed by: Dr Anggraini on 20 January 2020

Evaluations (peer review comments for the author)

1. In general, how do you rate the degree to which the paper is easy to follow and its logical flow?

Good

2. Do the title and abstract cover the main aspects of the work?

No. The title says "estimating GA by SFH and LNMP in third trimester pregnancy...: a comparative study". However in the abstract and main paper, it does not show how did the authors estimate GA or what methods or formulas did the authors use to estimate GA based on SFH and LNMP. Also, this study is in fact comparing the accuracy of GA estimates based on SFH and LNMP measurements at third trimester of pregnancy with the estimate of GA based on early Ultrasound measurements (first trimester of pregnancy, as a standar or baseline). Therefore, the title should be about accuracy assessment/comparison of GA estimation based on SFH, LNMP, and Ultrasound measurements.

3. If relevant are the results novel? Does the study provide an advance in the field?

No. As GA is one of important variables to be determined during pregnancy, this study has put effort to estimate GA (when Ultrasound facility is not available or affordable in most developing countries) using approximation based on clinical measurements, such as symphisis fundal height and last menstrual period. However, since there is no detail explanations on what methods/formulas used to estimate GA based on SFH, LNMP, and Ultrasound and what type of error measurements used to show the accuracy of GA prediction, the novelty of the results and the advance of the study in the field could not be clearly determined and justified.

4. Did the study gain ethical approval appropriate to the country in which the research was performed if human or animal subjects, human cell lines or human tissues were involved and is it stated in the manuscript?

Yes

Does the paper raise any ethical concerns?

No

5. If relevant, are the methods clear and replicable?

No. There is no sufficient information regarding technical work/methodology to answer the research question, particularly on how to:
1. estimate GA (what methods or formulas used to estimate GA) based on SFH, LNMP, and Ultrasound measurements and
2. calculate errors (the difference between the actual/standard value of GA or in this case GA estimate based on early Ultrasound scan in the first trimester of pregnancy and the GA estimates based on SFH and LNMP measurements in the third trimester of pregnancy).

In the comparison study, although the authors have mentioned the period of pregnancy in measuring SFH and LNMP, there is no clear information on the week interval of pregnancy that the authors used when measuring SFH and LNMP.

It also seems that the authors have used different time intervals/periods in assessing the accuracy of GA estimates by SFH and LNMP (the third trimester of pregnancy) and early Ultrasound measurement (the first trimester of pregnancy). Please give more explanations here.

6. If relevant, do all the results presented match the methods described?

Yes. However, the results have not fully answer the research question.

Figure 1 shows the mean GA estimates by SFH, LNMP, and Ultrasound in the third trimester of pregnancy. This result seems has a contradiction on what have been stated in the earlier part of the paper that the authors aimed to assess the accuracy of GA estimates by SFH and LNMP that were measured in the third trimester of pregnancy and compare the estimates with early Ultrasound scan (the first trimester of pregnancy) as standard. Please give more explanation here whether the authors used the same time frame for comparison.

Table 2 shows the result of paired sample T-test to identify whether there is a significant mean difference of GA when it is estimated using SFH and Ultrasound and when it is estimated using LNMP and Ultrasound. When the authors used a different time frame when estimating GA by SFH (measured in the third trimester of pregnancy) and Ultrasound (scanned in the first trimester of pregnancy) as standard and when estimating GA by LNMP (measured in the third trimester of pregnancy) and Ultrasound (scanned in the first trimester of pregnancy) as standard, the results should show a significant difference.

However, if the authors used the same time frame (in the third trimester of pregnancy) to compare the GA estimates by SFH and LNMP with Ultrasound scan as standard, the results should show no significant difference to show that SFH or LNMP can be the best predictor/approximation of GA estimation when Ultrasound is not available in low resource settings. Then, these results can be justified by the results shown in Table 3 about the correlation between GA estimates by SFH and LNMP and the GA estimates by Ultrasound.

The authors should add some error measurements to show the accuracy of GA estimates by SFH and LNMP using Ultrasound scan as standard with appropriate determination of time frame for comparison purposes (the third trimester or the first trimester of pregnancy). This can assist the authors to appropriately answer their research question.

7. If relevant, is the statistical analysis appropriate to the research question and study design?

No. The research question is to assess the accuracy of GA estimates that were calculated using SFH and LNMP measurements during the third trimester of pregnancy using early Ultrasound measurement at the first trimester of pregnancy as control or standard. However, the authors have just used Paired sample t-test and Pearson correlation which are insufficient to answer their research question by only identify the mean difference and the correlation.

Again I should say that the authors should add some error measurements to show the accuracy of GA estimates by SFH and LNMP using Ultrasound scan as standard with appropriate determination of time frame for comparison purposes (the third trimester or the first trimester of pregnancy). This can assist the authors to appropriately answer their research question.

8. If relevant, is the selection of the controls appropriate for the study design. Have attempts been made to address potential bias through analytic methods, eg., sensitivity analysis

No. The authors have used early ultrasound scan in the first trimester of pregnancy as standard to assess the accuracy of GA estimates based on SFH and LNMP measurements in the third trimester of pregnancy. This could create a potential bias since the time frame for comparison purposes is different unless the authors could give more explanation about the appropriate time frame for comparison.

9. How do you rate how clearly and appropriately the data are presented

Good. However, there is inconsistency in presenting data in Table 3 where the authors used 1% significant level instead of 5% as mentioned earlier in the methodology part.

10. If relevant, did the authors, make the underlying data available to the readers?

No. The underlying data are only available from the corresponding author on a reasonable request.

11. Do the conclusions correlate to the results found?

Yes. The results need further clarification, particularly on the methodology and time frame for comparison as I mentioned earlier. This may affect the conclusions that the authors have been made.

12. Are the figures and tables clear and legible?

Yes

Are images clear and free from unnecessary modification?

Yes

13. I have serious concerns about the validity of this manuscript

Yes. I have serious concern on the validity of this manuscript since the authors did not put sufficient and detail information on their methodology. This is particularly on how the accuracy assessment of GA estimates has been done (what formulas that the authors used to calculate the GA estimates, the reasons behind the use of those formulas, and what types of error measurements that the authors use in assessing/comparing the accuracy of GA estimates), so that the research question can be appropriately answered.

14. Does the paper use appropriate references in the correct style to promote understanding of the content?

Yes

15. Do you think that the manuscript requires its English grammar, punctuation or spelling to be corrected?

Yes

Recommendations to the Editor

16. Recommendations to Editors

Fair

17. Would you be willing to review a revision of this manuscript?

Yes

Evaluation

The authors have put good concern on the way to estimate GA when Ultrasound facility is not available or affordable in most developing countries by using approximation based on clinical measurements, such as symphisis fundal height and last menstrual period.

As I mentioned in the previous comments, the authors should:
1. explain in details on how to estimate GA using SFH and LNMP measurements as well as the ultrasound measurement. This includes which formulas that the authors used to calculate the GA estimates and the reasons behind the use of those formulas. Although the authors have referred to specific references, they need to explain more details on the methodology so that it is clear and can be reproducible/replicable.
2. define the week interval of trimester pregnancy that is observed in this study.
3. explain in details on how to calculate the errors (the difference between GA estimate by SFH and Ultrasound and the difference between GA estimate by LNMP and Ultrasound).
4. be aware of a time difference in comparison study where the estimates of GA using SFH and LNMP were calculated in the third trimester of pregnancy and then these estimates were compared with the estimate of GA using the early measurement of CRL using Ultrasound in the first trimester of pregnancy. Here, more detail explanation is needed.

Confidential comments to Editor

The manuscript has put attention on the way to estimate GA when Ultrasound facility is not available or affordable in most developing countries by using approximation based on clinical measurements, such as symphisis fundal height and last menstrual period. Although the manuscript has 5% plagiarism, it has some issues on the contextual spelling (47 errors); grammar (82 errors); punctuation (28 errors); sentence structure (2 errors); style (58 errors); and vocabulary enhancement (23 errors).

I have serious concern on the validity of this manuscript since the authors did not put sufficient and detail information on their methodology. This is particularly on how the accuracy assessment of GA estimates has been done (what formulas that the authors used to calculate the GA estimates, the reasons behind the use of those formulas, and what types of error measurements that the authors use in assessing/comparing the accuracy of GA estimates).

Financial disclosure

Conflicts of Interest

I have no conflicts of interest.

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Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Fwd: Peer Review Invitation Reminder [ID: 241310]
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Dear Dr Anggraini,

Recently we invited you to review the manuscript:

Manuscript title: Estimating gestational age by symphysis fundal height and last normal menstrual period in third trimester pregnancy at Gandhi Memorial Hospital, Addis Ababa, Ethiopia: a comparative study

Article type: Original Research

Author: Mr Geta

Journal: International Journal of Women's Health

Purpose: Gestational age is age of unborn babies and can be predicted based on menstrual history, maternal sensation of fetal movement, assessment of uterine size by bimanual examination, uterine fundal height measurement and ultrasound measurement. The aim of the study was to assess the accuracy of estimating gestational age by symphysis fundal height and last normal menstrual period during third trimester pregnancy by using early ultrasound as standard.
Patients and Methods: Hospital based comparative cross sectional study was carried out from July to September 2018 at radiology unit of Gandhi Memorial Hospital. The participants were all third trimester pregnant women with known gestational age estimated by first trimester ultrasound. Sociodemographics and obstetrics data were collected by using pre-tested structured questionnaire. Measurement of symphysis fundal height was done by using none elastic tape meter. Statistical analysis of the data (Pearson correlation and paired t- test) was done using SPSS version 23.
Results: Total of 182 women with first trimester ultrasound determined gestational ages were recruited for the study. The mean gestational age of pregnancy from the last normal menstrual period was 36.3 ± 3.35 weeks. The mean gestational age by symphysis fundal height measurement was 34.88 ± 2.71 weeks. The mean gestational age estimated by certainly recalled last normal menstrual period was significantly different from estimate by early ultrasound (p< 0.001). The mean symphysis fundal height estimate had 0.36 weeks difference from estimate by early ultrasound (p = 0.002). The symphysis fundal height measurement had stronger correlation with ultrasound measurement than last menstrual period.
Conclusion: Both symphysis fundal height and last menstrual period estimation of gestational age during third trimester is significantly different from early ultrasound. Both of them are unreliable methods.

As yet, we have not heard from you about whether you will be prepared to give up your time to review this paper
Undertaking a review of the paper would only involve writing a brief review of the paper and providing a recommendation as to whether it should be accepted.

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Many thanks for giving this your attention.

Kind regards
Ms Elferink
On behalf of Professor Al-Chaer

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Dear Dr Anggraini

Thank you for agreeing to review the manuscript:

Manuscript title: Estimating gestational age by symphysis fundal height and last normal menstrual period in third trimester pregnancy at Gandhi Memorial Hospital, Addis Ababa, Ethiopia: a comparative study

Article type: Original Research

Author: Mr Geta

Journal: International Journal of Women's Health

We would appreciate receiving your comments by 21 Jan 2020.

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Kind regards
Ms Elferink
On behalf of Professor Al-Chaer

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Dewi Anggraini <dewi.anggraini@ulm.ac.id>

Fwd: Dove Medical Press invites you to review a paper for International Journal of Women's Health Submission ID: 241310

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We invite you to join our peer review community to complete a review of the following manuscript:

Manuscript title: Estimating gestational age by symphysis fundal height and last normal menstrual period in third trimester pregnancy at Gandhi Memorial Hospital, Addis Ababa, Ethiopia: a comparative study

Article type: Original Research

Author: Mr Teshome Gensa Geta

Journal: International Journal of Women's Health
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Abstract:
Purpose: Gestational age is age of unborn babies and can be predicted based on menstrual history, maternal sensation of fetal movement, assessment of uterine size by bimanual examination, uterine fundal height measurement and ultrasound measurement. The aim of the study was to assess the accuracy of estimating gestational age by symphysis fundal height and last normal menstrual period during third trimester pregnancy by using early ultrasound as standard.
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Conclusion: Both symphysis fundal height and last menstrual period estimation of gestational age during third trimester is significantly different from early ultrasound. Both of them are unreliable methods.

ORIGINAL RESEARCH

 [Teshome Gensa Geta] et al

Estimating gestational age by symphysis fundal height and last normal menstrual period in third trimester pregnancy at Gandhi Memorial Hospital, Addis Ababa, Ethiopia: a comparative study

Teshome Gensa Geta[1]*, Abay Mulu [1], Gashaw Garedew Woldeamanuel[2],

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Abstract

Purpose: Gestational age is age of unborn babies and can be predicted based on menstrual history, maternal sensation of fetal movement, assessment of uterine size by bimanual examination, uterine fundal height measurement and ultrasound measurement. The aim of the study was to assess the accuracy of estimating gestational age by symphysis fundal height and last normal menstrual period during third trimester pregnancy by using early ultrasound as standard.

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Conclusion: Both symphysis fundal height and last menstrual period estimation of gestational age during third trimester is significantly different from early ultrasound. Both of them are unreliable methods.

Key words: Last menstrual period, Symphysis fundal height, Ultrasound, gestational age

Introduction

Gestational age is age of unborn babies. It has been estimated by combination of historical information and physical examination. Prediction of gestational age was made based on menstrual history, maternal sensation of fetal movement, assessment of uterine size by bimanual examination, initial detection of fetal heart tone and physical measurement by ultrasound (US) and uterine fundal height measurement. [1] Normally, human gestation lasts for an average of 266 days from the date of conception or 280 days from the first day of the last normal menstrual period (LNMP).[2] This based on the assumption that typical menstrual cycle lasts 28 days with ovulation occurring on approximately day 14.

The reliability of estimating gestational age by LNMP may depends on a number of factors like woman`s accurate recall of her LNMP and regularity of her menstrual cycles. The inaccurate estimate of gestational age by LNMP is mainly due to misreporting of first day of last normal menstrual period. The agreement between the LNMP estimate and the clinical estimate was lowest among very preterm and moderately preterm infants (28–36 weeks), higher among extremely preterm infants (20–27 weeks), and highest among term infants (37–42 weeks).[3] The subjective problem with the LNMP could be because a woman may fail to remember for sure the first day of her last menstrual period and just assigned one of the days around it. This is generally compounded by the level of literacy.[4]

Symphysis to fundal height (SFH) by tape meter is used as one of the methods to estimate gestational age.[5] SFH measurement for assessing gestational age in the second half of pregnancy among the selected group (excluding malpresentation, intrauterine growth restriction, pregnancy induced hypertension and diabetes mellitus) of pregnant women has no significance difference from US estimation.[6] Different factors can affect accuracy of estimating gestational age by SFH. Multiple symphysis fundal height measurement has good accuracy depending on the number of SFH measures recorded per mother.[7]

 The SFH measured from different population shows different value with in the same trimester. There is significant difference in fundal height values of Nigerian women especially in late pregnancy compared with other published values in the literature.[8]

As fetal ultrasound (US) scan is based on biometric measurements of the fetus, it is considered as the gold standard for establishing GA when done before 20 weeks of gestation, as the biologic variations in fetal size and the effects of growth restriction are still small.[8] However, US equipment is often unavailable in low-resource countries, especially in rural areas. In places where the equipment is available, it is expensive to use, often of poor quality and operated by undertrained technicians. In addition, women often seek prenatal care late in pregnancy, which further limits the use of ultrasound to assess GA.[8, 9] Assessment of gestational age from the time of in vitro fertilization (IVF), crown rump length (CRL) and bi-parietal diameter (BPD) has high agreement. This supports ultrasound as a reliable method for estimation of gestational age.[10, 11]

For low-resource countries, especially in rural areas accuracy of LNMP and symphysis fundal height should be assessed since they are commonly used. There is also scarcity of study on this area. So this study is aimed to determine accuracy of estimating gestational age by SFH and LNMP during third trimester using early ultrasound as standard. The outcome of this research helps health care providers to know optimal timing for necessary intervention or treatment and avoidance of unnecessary treatment especially for late presenters to antenatal follow up.

Materials and Methods

Hospital based comparative cross sectional study was carried out from July – September 2018 at Gandhi Memorial Hospital, Addis Ababa, Ethiopia. The study was conducted at antenatal care (ANC) outpatient department and Radiology unit of Gandhi Memorial Hospital, Addis Ababa, Ethiopia. This hospital was selected for the reason that, it is the referral hospital and most prestigious center of ANC in Addis Ababa, Ethiopia.

Participants were all third trimester pregnant women with known gestational age estimated by first trimester ultrasound (CRL). The mothers of third trimester singleton pregnancy who attend ultrasound examination were included based on the inclusion criteria. These criteria includes mothers who; had CRL estimate of gestational age during first trimester, are certain on LNMP and had regular menstruation on last three months prior to LMP, have no history of taking tobacco and drug abuse, have no history of diabetes and hypertension and mothers who have no history of chronic diseases, malnutrition and infection. Those mothers, who were obese (weight

more than 90 kg), with polyhydramnios, oligohydramnios, ruptured membranes, oblique and transverse lie, breech presentation, obvious congenital abnormalities of fetus, ovarian and uterine tumor, abruption placenta, placenta previa and placental infraction were excluded from the study.

Sample size was determined by using sample size calculation for comparison of two means. Initial sample was 166 pregnant women of third trimester. Assuming a non-response rate of 10%, the total sample size was 182. The study participants were consecutively recruited in the study until the sample size was filled.

The structured questionnaire in the first part included socio demographic information about the respondent's age, marital status, education level, religion, ethnic group, residence, occupation and weight. Second part of the questionnaire included obstetric and gynecological question like gravidity, parity and regularity of last menstrual period. Data was collected by trained nurses using interviewer administered pre- tested questionnaire. The estimation of GA by LNMP was done by data collectors who were blind to GA estimation by other procedures.

Symphysis fundal height was measured by using non-elastic tape meter. The measurement was distance from the uterine fundus to the superior border of the pubic symphysis. The pregnant mothers were told to empty the bladder 10 minutes prior to measurement. Measurements were made by health professional that has no prior knowledge of the patients' gestational age. The graduation in centimeters of tape facing the abdomen during measurement before turning the tape to take the actual reading. All measurements were recorded to the nearest centimeter.

The quality of data that gives reliability and representativeness to the study was maintained by incorporating only the complete data of the subjects with in the study period. The data was collected by two phases; first the questionnaire including LMP was collected by well trained nurses, second SFH was measured by senior nurse who is blind to gestational age estimate by LMP. Gestational age by LMP and SFH estimated by two different people was compared with first trimester ultrasound record done by senior radiologist. The collected data was checked at different levels for completeness and consistency by investigator at the end of each day. Whenever an error was found at any level, the investigator was traced back and corrected as needed. Double data entry was done.

Data collected was entered and analyzed using SPSS version 23 computer program. The mean gestational age by each method were computed. Mean difference were tested by using paired t-test. $P < 0.05$ was considered to show statistical significance. The Pearson correlations among different methods were tested. The data was presented by using statements, figure and tables.

Results

Total of 182 women with first trimester ultrasound determined gestational age was recruited for the study. Among them 6 were excluded from the study due to incompleteness of the data. Socio-demographic characteristics of the study participants were shown in table 1. The mean age of the participants were 26.6 years with standard deviation of 4.23. Almost all participants had at least primary school education (98.29%, Table 1).

Table 1: Socio-demographic characteristics of the pregnant women at Gandhi Memorial Hospital, Addis Ababa, Ethiopia, 2018 (n=176)

Variables	Category	Frequency (%)
Age in years	< 20	6 (3.40)
	20 – 25	64(36.37)
	26-30	82(46.59)
	31-35	18(10.23)
	>35	6(3.41)
Religions	Orthodox Christian	121 (68.75)
	Muslim	29 (16.48)
	Protestant Christian	26 (14.77)
Level of educations	Cannot read and write	1 (0.57)
	Can read and write	2 (1.14)
	Primary school	74 (42.05)
	Secondary school	63(35.79)
	College and above	36(20.46)

	Housewife	91 (51.70)
Occupations	Government employed	37 (21.02)
	Self employed	47 (26.70)
	Others	1 (0.57)

Regarding the history of parity, sixty three (35.80%) of the mothers were nulliparous, 109 (61.93%) were primparous and multiparous, and 4(2.27%) were grandmultiparous. The mean parity was 1.07 with a range of zero to seven. The mean gravidity of the women was 2.23.

The mean gestational age of pregnancy from the LNMP was 36.35weeks with standard deviation of 3.35 weeks. The mean gestational age by SFH measurement was 34.88 weeks with standard deviation of 2.71 weeks (figure 1).
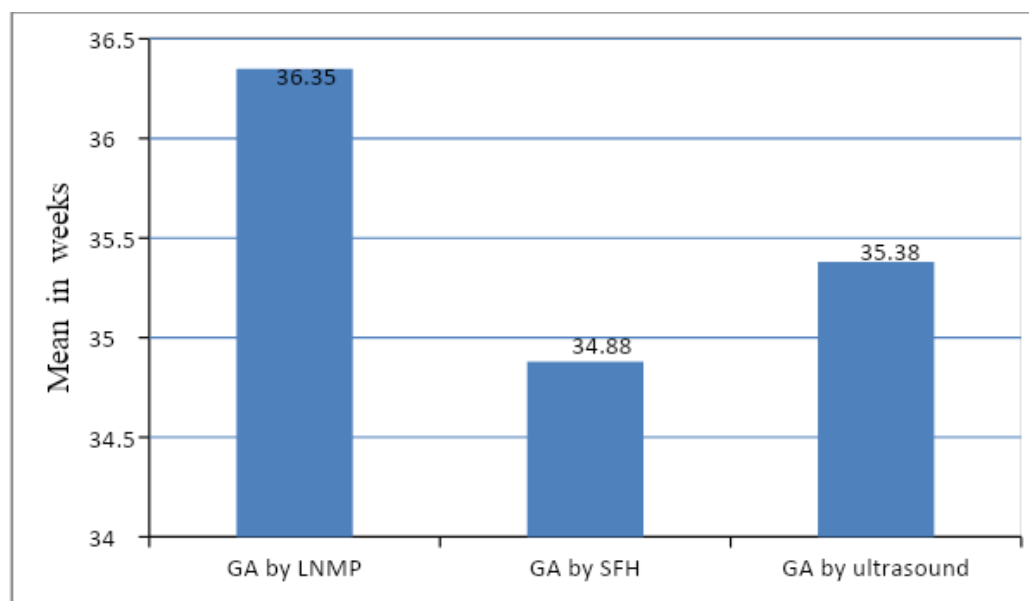

Figure 1: Mean gestational age in weeks measured by LNMP, SFH and ultrasound at Gandhi Memorial Hospital, Addis Ababa, Ethiopia, 2018.

The mean gestational age estimated by certainly recalled LNMP were significantly different from estimate by early ultrasound (p < 0.001). The mean SFH estimate had 0.36 weeks difference from estimate by early ultrasound (p = 0.002, Table 2).

Table 2: Mean difference between GA by LNMP and SFH with US as standard, and results of statistical significance test at Gandhi Memorial Hospital, Addis Ababa, Ethiopia, 2018.

Pairs	Variables	Paired difference			t- test value	p- value
		Mean (in weeks)	Standard deviation	95% confidence interval		
Pair 1	GA LNMP- GA US	1.13	2.01	(0.82, 1.43)	7.25	0.000
Pair 2	GA SFH - GA US	- 0.36	1.44	(-0.58, 0.14)	-3.21	0.002

Note: *GA LNMP- Gestational age by LNMP, GA US- Gestational age by ultrasound, GA SFH- Gestational age by SFH*

The SFH had stronger correlation with ultrasound measurement than LNMP (r = 0.84). The detail of Pearson correlation analysis among LNMP, SFH and US measurement were shown in table 3.

Table 3: Correlation between gestational age by LNMP, SFH and US at Gandhi Memorial Hospital, Addis Ababa, Ethiopia, 2018.

	GA by LNMP	GA by SFH	GA by US
GA by LNMP (n= 176)	1.00	0.70[**]	0.79[**]
GA by SFH (n=176)	0.70[**]	1.00	0.84[**]
GA by US (n= 176)	0.79[**]	0.84[**]	1.00

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

Discussions

This study compared gestational age estimated by LNMP and SFH during third trimester pregnancy with early ultrasound estimate by CRL.The current study showed that mean difference

of gestational age determined by SFH, recalled LNMP and ultrasound had statistically significant difference (p < 0.05). This finding was consistent with research done on dating gestational age by last menstrual period, symphysis fundal height, and ultrasound in urban Pakistan which reported significant differences in the mean GA estimates obtained by the three methods for Pakistan women.[4]

The gestational age measurement by US during first trimester has statistically significant difference from gestational age by LNMP. This finding was consistent with study done at Jeddah, out of total participants, 84.62% pregnant woman had gestational age by US is different from gestational age by last normal menstrual period (LNMP). [12]

The Current study showed mean difference between LNMP and US was higher than mean difference between SFH and US. This shows SFH is proxy measurement in absence of ultrasound than LNMP. This result is in line with other study, which showed paired mean differences of the LNMP with the early ultrasound scan were higher than mean differences of the SFH with the early ultrasound scan. This implied SFH was more useful than the LNMP in the absence of an early ultrasound.[11]

 The LNMP overestimated gestational age by 1.33 weeks. This result is inconsistent with other study that showed LNMP in a low-resource setting was a more reliable measure of gestational age.[13] The over estimation of gestational age in this study is different to what has been found in other studies, where LNMP under estimate gestational age.[14]   This variation among the study may be due to subjectivity in recalling first day of last normal menstrual period.

 The Paired sample t-test result of this study showed GA by SFH had statistically significant difference from GA by ultrasound measurement (p < 0.05). This result is not in line with other study done on assessment of symphysis fundal height as means to gestation age determination in second half of pregnancy that showed there is no significant difference of gestational age by SFH and ultrasound.[5]

The current study showed that there was stronger correlation between SFH and ultrasound than that of LNMP and US measurement. This result is consistent with other study showed that

accurate measurement of the symphysis fundal height is reliable method of gestational age assessment in the second half of pregnancy.[6]

Limitations of the study

Gestational age calculated by LNMP was only from those mothers who are clearly certain for the first day of last normal menstrual period but their certainty is still subjective

Conclusion and Recommendation

Both SFH and LNMP estimation of gestational age during third trimester is significantly different from early ultrasound. Both of them are unreliable methods. Meticulous research that assesses accuracy of SFH and LNMP all across total duration of pregnancy with larger sample size should be done.

List of abbreviations

AC: Abdominal circumflex, ANC: Antenatal care, BMI: Body mass index , BPD: Bi-parietal diameter, CI: Confidence interval , CRL: Crown rump length, FL: Femoral length, GA: Gestational age, HC: Head circumference, IUGR: Intrauterine growth retardation , LNMP: Last normal menstrual period, NICE: National Institute for Health and Care Excellence, OR: Odds ratio, PROM: Premature rupture of membrane, SD: Standard deviation , SFH: Symphysis- fundal height, SGA: Small for gestational age, SPSS: Statistical package for social sciences, US: Ultrasound

Ethical approval and informed consent

Ethical clearance was obtained from Institutional review board of College of Heath Science, Addis Ababa University with meeting number 005/16 and protocol number 019/16/anatom. Then permission was taken from Gandhi Memorial Hospital clinical director office and written informed consent was obtained from the study participants after providing enough information about the study. Strict confidentiality of responses was maintained during the study.

Consent for publication: Not applicable

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Authors' contributions

All authors contributed on data analysis, drafting and revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

References

1. Babuta S, Chauhan S, Garg R, Bagarhatta. M. Assessment of fetal gestational in different trimesters from ultrsonographic measurements of various fetal biometric parameters. Journal of the anatomical society of India. 2013;62:40-6.

2. Lynch CD, Zhang J. The Research Implications of the Selection of a Gestational Age Estimation Method. PaediatrPerinatEpidemiol 2007;21(2):86-96.

3. Qin C, Hsia J, Berg CJ. Variation between Last Menstrual Period and Clinical Estimates of Gestational Age in Vital Records. American Journal of Epidemiology. 2008,;167:646–52.

4. Jehana I, Zaidia S, SameeraRizvia, NaushabaMobeena, McClureb EM, Munozb B, et al. Dating Gestational age by Last Menstrual Period, Symphysis -Fundal height, and Ultrasound in Urban Pakistan. Int J Gynaecol Obstet 2010;110(3): 231–4.

5. Negussie S. Obstetrics and Gynecology Lecture Note for Health Science Students. The Carter Canter (ephti) and The Federal Democratic Republic of Ethiopia Ministry of Education and Ministry of Health. 2006:29.

6. Adewel FB, Munir'deena.Ijaiya. Symphysis Fundal Height Measurement as Means to Gestational Age Assessment in Second Half of Pregnancy at University of Ilorin Teaching Hospital, Nigeria. Bangladesh J obstetgynaecol. 2011;26(1):3-9.

7. Lisa J. White, Sue J. Lee, Kasia Stepniews, Julie A. Simpson, Saw Lu Mu Dwell, Ratree Arunjerdja, et al. Estimation of gestational age from fundal height: a solution for resource-poor settings. J R Soc Interface. 2012;9:503–10.

8. Mador ES, Pam SD, Pam IC, TuriMutihir J, IchenuAdoga G, Ogunranti JO. Symphysio-Fundal Height Nomogram in Ultrasound dated Pregnancies. Asian Journal of Medical Sciences. 2010;1:64-7.

9. Gameraddi M, BaderldinAlhaj, ZainAlabdeen M. The Reliability of Biparietal diameter and Femoral length in Estimation the Gestational Age using Ultrasonography. Journal of Gynecology and Obstetrics. 2014;2(6):112-5.

10. Falatah HA, Awad IA, Abbas HY, Khafaji MA, Alsafi KGH, Jastaniah SD. Accuracy of Ultrasound to Determine Gestational Age in Third Trimester. Open Journal of Medical Imaging. 2014;4:126-32.

11. Ogbe AE, Ekwempu CC, Musa J, Anzaku AS. Comparison of the Accuracy of the Use of Last Menstrual Period and Symphysio-Fundal Height for Gestational Age Determination among Nigerian Women. International Journal of Tropical disease & Health. 2015;7(1):32-9.

12. Bakliwal M. Multiple Fetal Parameters in Third Trimester Gestational Age Estimation. International Journal of Scientific and Research Publications. 2014;4:1-4.

13. Rosenberg Re, Ahmed Asmnu, Ahmed S, Saha Sk, Chowdhury Maka, Black Re, et al. Determining Gestational Age in a Low-resource Setting: Validity of Last Menstrual Period. J Health Popul Nutr. 2009;27(3):332-8.

14. Pereira Ape, Dias Mab, Bastos Mh, Gama Sgnd, Leal Mdc. Determining gestational age for public health care users in Brazil: comparison of methods and algorithm creation. BMC Research Notes. 2013 6:60

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