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Review Article

Symphysio-fundal height measurement as a tool in antenatal care: current understanding: narrative review

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ABSTRACT

Symphysio-fundal height (SFH) measurement during pregnancy was recognized as a simple clinical indicator for monitoring fetal growth since decades. However, its significance and validity are questioned in recent era of Sonography. This is a narrative review of the topic published. Conclusions of systematic reviews, meta-analysis as well as studies which compared SFH and ultrasound for fetal growth monitoring were included. The review revealed SFH has poor sensitivity as a tool for screening and diagnosing fetal growth restriction and inter-observer variations are high and hence fallacious. However multiple measurement model incorporating standard international guidelines may be useful in resource poor settings. Limitations of SFH include that it is not useful in hydramnios, multiple pregnancies and pregnancies with uterine or ovarian masses and fetuses in transverse lie. For screening and early diagnosis of growth restriction, estimation of gestational age and fetal weight estimation USG is the standard tool.

Keywords: Antenatal care, SFH measurement, Fetal growth, USG

INTRODUCTION

Fetal growth monitoring is one the essential components of antenatal care. Identifying growth restricted fetuses early is important to initiate interventions to achieve good perinatal outcome and to prevent stillbirth. Uterine height measured by abdominal palpation and expressed in gestational weeks and measurement in centimeters from symphysis pubis to the fundus of the uterus (SFH) were the two clinical parameters used till date. SFH is used as a screening tool as well as diagnostic tool for intrauterine growth restriction. Its validity is questioned in recent era of Ultrasound in screening as well as in diagnosing fetal growth restriction. Hence literature is reviewed regarding recommendations for utility of SFH in antenatal care.

This is a narrative review of the literature on SFH measurement and its utility in antenatal care. Observational studies, Cohort studies, Systematic reviews and meta-analysis are included for their findings and recommendations. The objective is to find out whether SFH has good validity in antenatal care when used alone as a single tool

SFH is used for estimating gestational age, screening and diagnosing fetal growth restriction and for estimation of fetal weight at term or onset of labor. It was Rumbolz and Mc Googan who showed the association between reduced SFH and intrauterine growth restriction in 1953. But in 1970's Beazley and Underhill questioned the value of SFH as he found wide patient variation in measurements.[1]

SFH TO ESTIMATE GESTATIONAL AGE

SFH is expected to correlate with gestational age from 24 weeks of gestation to 32 weeks of gestation. The limits of variations are taken as±3 cm or±2 cm and assumptions were made that one-week gestational age is equivalent to one cm of SFH. The one-week gestation=one cm rule does not correlate and also does not apply to all pregnant population.[2]

A prospective cohort study to improve the accuracy of gestational age used a combination of SFH, uterine volume and maternal anthropometric data in 1516 pregnant women who had USG dating at <20 weeks of pregnancy. Follow-up measurements were done by community health workers at 28,32,34 and 37 weeks of pregnancy. SFH was found to underestimate the gestational age in late pregnancy with a mean difference of 4.4 weeks. At GA <28 weeks, SFH <26 cm had 85% sensitivity and 81% specificity; and for GA <34 weeks, SFH <29 cm had 83% sensitivity and 71% specificity. The authors concluded that SFH and other clinical parameters and mathematical models are less accurate and low income and middle-income countries should focus on increase on coverage in ultrasonography by Lee et al.[3]

A study to address the issue of gestational age estimation in resource poor settings, compared SFH with early ultrasound estimation with multiple mathematical models. The multiple measures model with 6-7 SFH measurement was found to be more accurate (95% accuracy).[4]

SFH AS A SCREENING AND DIAGNOSTIC TOOL FOR FETAL GROWTH RESTRICTION

Single estimation

Single measurement of SFH as a screening and diagnostic tool is inaccurate and there are no studies on this aspect. The reproducibility of this measurement was investigated in two groups of six patients, each measured six times by six different observers. The intra-observer coefficient of variation was 4 6% and the interobserver coefficient of variation 6.4% show that the measurements were not precise. In practice the end point is not easy to identify, and fetal movements change the apparent fundal height.[5]

SFH measurements in 761 women were assessed alone and in combination of other variables like past obstetric history, smoking etc., to predict intrauterine growth restriction. False positive rates were unacceptably high. It is concluded that fundal height measurement is of little use as a screening test for growth retardation.[6]

The value of symphysis-fundus measurement as a screening procedure for fetal growth was assessed by Rogers and Needham in 1985. The reproducibility of measurements between staff of differing antenatal experience was ±2 cm in 95% of cases. Fundal height correlated with ultrasound measurement of biparietal diameter and abdominal circumference, and coefficients of 0.84 and 0.74 respectively were obtained. Babies weighing below the 10th percentile for gestation were detected by one measurement of 3 cm or more below the mean for gestation in73% of cases.[7]

Serial estimation

A prospective randomized controlled study conducted between 1986-87 among 1639 antenatal women after 29th week till delivery did not find SFH as a good predictor of small for gestational age.[8] SFH expressed in percentile curves among 42018 pregnant women who gave birth at Sahlgrenska university hospital in Gothenburg in the period 2005-2010 were analysed for prediction of small for gestational age fetuses who correlated with birth weight. The AUC values showed that a symphysis-fundus measurement late in pregnancy was a stronger predictor for determining fetuses that are small for gestational age than a measurement early in pregnancy. The gestational age ranged from 24-42 weeks. With a threshold value at the 10th percentile, symphysis-fundus measurement had a total sensitivity of 47% and a specificity of 79%.[9]

The Cochrane data base systematic reviews in 1998 and 2015 could not find any randomized controlled studies comparing SFH with USG in diagnosis of small for gestational age or growth restricted fetuses. They analysed one RCT which compared SFH with abdominal palpation and did not find any significant difference in both techniques. They concluded that there is insufficient evidence whether SFH is an effective tool in detecting intrauterine growth restriction and more RCTs comparing SFH and USG are required to address this issue.[10]

The recommendations by national institute of excellence are that fundal height measurement should start at 25 weeks and to be repeated at an interval of 2 to 3 weeks to monitor growth of the fetus. SFH measured weekly or less frequently than 2-to-3-week interval is not recommended as the increments are small and leads to error in interpretation (RCOG green top 2002, NICE 2008).[11,12]

A systematic review published in 2015 included 51 studies and examined the different cut-off values for diagnosis of fetal growth restriction viz <10th percentile, <5th percentile and SFH >2 SD below mean. They found that the standard of using <10the percentile had some value but high false positives were the outcomes in spite of adequate sensitivity. They could not derive any conclusions for the standard of using<5th percentile and >2 SD below the mean because of insufficient number of studies using these cut-offs as standards. Further, the study was conducted only in European population and there was no homogeneity in the studies.[13]

There is a great variation in representing and plotting the fundal height measurement and a standard method has to be adopted across all pregnant population. On recognizing this fact, the "INTERGROWTH -21" project formulated international standards for SFH from the results of prospective cohort studies conducted in 8 countries. These were arrived based on the data from serial SFH measurements of pregnancies in healthy pregnant women with good maternal and perinatal outcome. The women were included from Brazil, China, India, Italy. Kenya, Oman, UK and USA. The data of 3976 pregnant women who fulfilled the inclusion criteria with a median of 5 antenatal visits was analysed to arrive at 3rd, 50th and 97th percentile.[14]

The pregnancy care guidelines of Australia recommend assessment of risk factors for growth restriction at early pregnancy visit. The diagnosis should not be based soley on abdominal palpation and SFH and all women with a 3 cm lag of SFH and those with inaccurate SFH measurements should be subjected to USG examination by trained personnel.[15]

In resource rich countries USG is the tool to determine gestational age and monitor the fetal growth but in resource poor countries SFH is a cost-effective method and multiple measures model is found to be more accurate. [4]

SFH FOR FETAL WEIGHT ESTIMATION AT TERM OR PRIOR TO DELIVERY

A prospective observational study among 795 parturient determined birth weight prediction at term using SFH and abdominal girth in Iranian population. ROC (Receiver operative characteristic) curves were plotted to arrive at best cut-off points. They found that the product of abdominal girth and fundal height predicted macrosomia (>4000 gm) at a cut-off of 3900 gm. For low birth weight, regression model of fundal height emerged as a best predictor at a cut-off of 3000 gm.[16]

A registry- based population study from Sweeden which aimed to develop charts for risk of small for gestational age fetuses being born included 42,018 USG dated pregnancies between 24-42 weeks of pregnancy. Using a relative risk cut-off of ≥ 2-fold for diagnosing SGA, they found the sensitivity was only 50% with a specificity of 80%. Further it was found that only the recent SFH measurements before birth predicted this and not the earlier measurements.[13]

Chen and colleagues assessed the combination of abdominal circumference and SFH in women with GDM and normal pregnancy to predict the birthweight. They called the product as "ISFHAC" (index of the SFH algorithm multiplied by the square of AC). They determined the association between ISFHAC and fetal weight and validated. ISFHAC was evaluated by area under the curve (AUC) analysis among 1087 women with GDM and 657 normal pregnant women. The ISFHAC cut-off points were 41.7 for GDM and 37 for normal pregnant women. The sensitivity of ISFHAC for prediction of macrosomia was 75.9% for GDM and 81.3% for normal pregnant women.[17]A single SFH at delivery was not reliable enough to estimate foetal weight in South Africa but it was used as a proxy for gestational age estimation.[18] SFH cannot be used as a predictor in women with hydramnios, multiple gestations, pregnancy with uterine or ovarian masses and when fetus is in transverse lie.

CONCLUSION

Measuring SFH is to be practiced as per the international standards. SFH measurements need to be done serially, preferably by the same care provider to reduce inter-observer variation.

SFH alone has poor sensitivity as a screening and diagnostic tool but it is useful in resource poor settings as an initial test and it is to be done multiple times and women should to be stratified for USG evaluation based on risk factors for screening of growth restriction. In resource rich settings USG evaluation is to be practiced to screen and diagnose growth restricted fetuses as it is the gold standard. Thus, in modern era of imaging, SFH alone cannot be used as a standard of antenatal care.

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REFERENCES

1. Beazley JM, Underhill RA. Fallacy of the fundal height. BMJ. 1970;404-6.
2. Morse K, Willams A, Gardosi J. Fetal growth screening by fundal height measurement. Best Pract Res Clin Obstetr Gynaecol. 2009;23:809-18.
3. Lee ACC, Whelan R, Bably NN, Schaeffer LE, Rahman S, Ahmed S et al. Prediction of gestational age with symphysis-fundal height and estimated uterine volume in a pregnancy cohort in Sylhet, Bangladesh. BMJ Open. 2020;10(3):e034942.
4. White LJ, Lee SJ, Stepniewska K, Simpson JA, Dwell SL, Arunjerdja R et al. Estimation of gestational age from fundal height: a solution for resource-poor settings. J R Soc Interface. 2012;9(68):503-10.
5. Calvert JP, Crean EE, Newcombe RG, Pearson JF. Antenatal screening by measurement of symphysis-fundus height. Br Med J (Clin Res Ed). 1982;285(6345):846-9.
6. Rosenberg K, Grant JM, Tweedie I. Measurement of fundal height as a screening test for fetal growth retardation. Br J Obstet Gynaecol. 1982;89(6):447-50.
7. Rogers MS, Needham PG. Evaluation of fundal height measurement in antenatal care. Aust N Z J Obstet Gynaecol. 1985;25(2):87-90.
8. Lindhard A, Nielsen PV, Mouritsen LA, Zachariassen A, Sørensen HU, Rosenø H. The implications of introducing the symphyseal-fundal height-measurement. A prospective randomized controlled trial. Br J Obstet Gynaecol. 1990;97(8):675-80.
9. Pay ASD, Frøen JF, Staff AC, Jacobsson B, Gjessing HK. Symphysis-fundus measurement-the predictive value of a new reference curve. Tidsskr Nor Laegeforen. 2017;137(10):717-20.
10. Robert Peter J, Ho JJ, Valliapan J, Sivasangari S. Symphysial fundal height (SFH) measurement in pregnancy for detecting abnormal fetal growth. Cochrane Database Syst Rev. 2015;9:CD008136.
11. Royal College of Obstetricians and Gynaecologists. The investigation and management of the small-for-gestational age fetus. RCOG Green Top Guideline 2002. Available at:

http://www.rcog.org.uk/files/rcog-corp/uploaded-files/GT31SmallGestationalAgeFetus.pdf. Accessed on 25 March, 2022.
12. National Institute for Health and Clinical Excellence. Antenatal care, routine care for the healthy pregnant woman. London: NICE. 2008. Available at: http://guidance.nice.org.uk/CG62. Accessed on 25 March, 2022.
13. Pay AS, Wiik J, Backe B, Jacobsson B, Strandell A, Klovning A. Symphysis-fundus height measurement to predict small-for-gestational-age status at birth: a systematic review. BMC Pregnancy Childbirth. 2015;10;15:22.
14. Papageorghiou AT, Ohuma EO, Gravett MG, Hirst J, da Silveira MF, Lambert A et al. International Fetal and Newborn Growth Consortium for the 21st Century (INTERGROWTH-21st). International standards for symphysis-fundal height based on serial measurements from the Fetal Growth Longitudinal Study of the INTERGROWTH-21st Project: prospective cohort study in eight countries. BMJ. 2016;355:i5662.
15. Homer CS, Oats J, Middleton P, Ramson J, Diplock S. Updated clinical practice guidelines on pregnancy care. Med J Aust. 2018;209(9):409-12.
16. Mortazavi F, Akaberi A. Estimation of birth weight by measurement of fundal height and abdominal girth in parturients at term. East Mediterr Health J. 2010;16(5):553-7.
17. Chen ZG, Xu YT, Ji LL, Zhang XL, Chen XX, Liu R et al. The combination of symphysis-fundal height and abdominal circumference as a novel predictor of macrosomia in GDM and normal pregnancy. BMC Pregnancy Childbirth. 2020;20(1):461.
18. Onah HE, Ikeme AC, Nkwo PO. Correlation between intrapartum fundal height and birth weight. Afr J Reprod. Health. 2022;6:23-9.

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