E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.01.04

Research Article

Diagnostic Accuracy of Symphysio-Fundal Height in Detection of FGR by Taking Ultrasound as a Standard

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Received: 11.11.25, Revised: 10.12.25, Accepted: 06.01.26

ABSTRACT:

Objectives: To measure the diagnostic accuracy of symphysio-fundal height in detection of fetal growth restriction by taking ultrasound as a gold standard.

Study Design: validation study

Settings: Department of Obstetrics and Gynaecology, BBH, Rawalpindi.

Study Duration: 5th April 2022 to 4th October 2022.

Materials & Methods: A total of 225 women with singleton pregnancies between 28 and 36 weeks of gestation, aged 18 to 40, were enrolled. We excluded patients with fetal cardiac activity, congenital abnormalities, and polyhydroamnios. A researcher measured the fundal height every two weeks between weeks 28 and 38 at prenatal clinic visits. The distance between the uterine fundus and the top of the symphysis pubis was measured using a non-stretchable tape that came into touch with the skin of the abdominal wall. The researcher was facing the inch side of the tape to avoid bias. The inspecting hand's palm applied light pressure at a straight angle to the abdomen wall to delineate the fundus. Plotting of the measurements onto the normogram was done after they were measured in centimeters (to the nearest 0.5 cm). A radiologist performed an ultrasound to confirm FGR if it did not match gestational age.

Results: Overall sensitivity, specificity, PPV, NPV and diagnostic accuracy of symphysio-fundal height in detection of fetal growth restriction by taking ultrasound as a gold standard was 92.08%, 88.37%, 92.76%, 87.36% and 90.67% respectively.

Conclusion: This study concluded that symphysio-fundal height is a highly sensitive and accurate parameter for detecting fetal growth restriction.

Keywords: Symphysio-Fundal Height, Fetal Growth Restriction, Sensitivity.

INTRODUCTION

A fetus's development rate falling below the 10th percentile for gestational age is known as fetal growth retardation, or FGR.[1] Serious morbidities associated with IUGR include postpartum hypoxia, early onset sepsis, hypoglycemia, hyaline membrane disease, meconium aspiration syndrome, delayed milestones, and in extreme cases, stillbirth.[2,3] IUGR is "one of the most common and complex problems in modern obstetrics," according to the American College of Obstetricians and Gynecologists.[4] Given the different published criteria, low detection rate, lack of available preventive or treatment options, numerous related morbidities, and elevated risk of perinatal mortality linked to IUGR, this classification makes sense. Impaired cognitive function and adult conditions like obesity and hypertension are associated with suboptimal growth at birth. 4. A third of these unfavorable perinatal outcomes—26 percent—were stillbirths.[5]

Low birth weight (LBW) babies are 20 times more likely to die as newborns worldwide than bigger babies (≤2.5 kg). Eleven percent of all developing babies are FGR. FGR newborns are more likely to experience neonatal problems.

Thus, prompt FGR screening is necessary.[2] FGR is a global health concern, and there is an immediate need to increase our knowledge of the crucial elements that cause FGR and the ensuing damage to the developing organs.[3] Early diagnosis of FGR is critical because it allows for the etiology of the illness to be identified and proper fetal status monitoring to be conducted, reducing the risk of intrauterine hypoxia and premature birth.[4]

A non-invasive test called symphysis-fundus height (SFH) measurement can be used to identify women who are at risk. It has been proposed that measurements of fundal-symphysial height could be helpful in identifying prenatal growth retardation, especially in isolated locations without access to ultrasound. It offers an impartial record of prenatal development and can be utilized by qualified health professionals.[5]

A research by Calvert et al. evaluated SFH ≥ 3 cm below mean.[3] They discovered that SFH has a 76% sensitivity and a 79% specificity in predicting FGR. The probability ratios were 0.40 for the negative and 1.91 for the positive. The odds ratio for diagnosis was 4.7. In Pakistan, 31.73% of people have FGR.[6] In contrast, SFH's sensitivity and specificity for predicting FGR were 73% and 92%, respectively, in another study by Rogers et al. The ratios of positive and negative likelihood were 9 and 0.29, respectively. The ratio of diagnostic odds was 13. Thus, one measurement of 3 cm or more below the gestational mean identified 73.1% of newborns weighing below the 10th percentile.[7] The most accurate way to identify low birthweight was to take a single measurement at 32 to 33 weeks gestation.[7,8] Ultrasound growth markers include femur length (FL), head circumference (HC), abdominal circumference (AC), and biparietal diameter (BPD) to assess fetal growth.[9,10]

The sensitivity and specificity of SFH and ultrasonography will be evaluated in this study. In our resource-constrained world, it will be useful in forecasting FGR. It is an economical procedure. It is utilized in places without access to ultrasound equipment and other resources, allowing us to quickly and effectively forecast FGR in remote and underdeveloped areas.

METHODOLOGY

From April to October 2022, a validation study was carried out in the BBH Gynecology Department in Rawalpindi. The data was obtained using a successive, non-probability sampling technique. The IRB gave its approval to the project. After being properly informed of the study's objectives, reassured of the confidentiality of the data they provided, and told that there would be no dangers, each patient gave their informed consent to take part. Utilize a calculator to determine the following: 225 sample size, 31.73% prevalence, 76% sensitivity, 79% specificity, 95% confidence level, and 10% absolute precision.[6]

Included were women between the ages of 18 and 40 who had a singleton pregnancy with a gestational age of 28 to 38 weeks. We excluded twin pregnancies, polyhydroamnios, fibroid pregnancies, congenital abnormalities, and absent fetal heart activity. A specific proforma has been created to document the study's results. Every woman who met the requirements for inclusion was chosen from the Department of Obstetrics and Gynecology. The Institutional Ethical Committee has granted the appropriate authorization to carry out this investigation. Every patient and attendant gave their informed consent to take part in the trial.

A researcher measured the fundal height every two weeks between weeks 28 and 38 at prenatal clinic visits. The distance between the uterine fundus and the top of the symphysis pubis was measured using a non-stretchable tape that was in touch with the skin of the abdomen wall. To prevent bias, the tape's inch side faced the researcher. The inspecting hand's palm applied light pressure at a straight angle to the abdomen wall to delineate the fundus. Plotting of the measurements onto the normogram was done after they were measured in centimeters (to the nearest 0.5 cm). A radiologist performed an ultrasound to confirm FGR if it did not match gestational age. It was described as the occurrence of the following ultrasound findings between weeks 28 and 38 of pregnancy: Fetal weight (EFW) below the 10th percentile during 28–38 weeks of gestation (e.g., 1.635 kg is the WHO 10th percentile of EFW at 32 weeks). Abdominal circumference, head circumference, biparietal diameter, and femur length were used to determine the fetal weight on ultrasonography. SPSS-24 was used to enter all of the data. Maternal age, EFW, and SFH at 28 to 38 weeks were measured, along with their means and standard deviations. Frequency and percentage were used to display the presence of FGR in categorical data. According to the operational

definition, a ROC curve was computed for SFH in order to forecast FGR using the weight defined by USG. By creating two-by-two tables, the cut of values obtained from the area under the curve was used to determine sensitivity specificity, PPV, NPV, and SFH. For the study's statistics, a 95% confidence level was used.

IUGR According To SFH	IUGR on USG (Gold Standard)	
	+	-
+	TP	FP
-	FN	TN

RESULTS

Mean age was 27.03 ± 4.12 years. 84.44% of the patients were between the ages of 18 and 30. According to Table I, the mean gestational age was 31.20 ± 1.90 weeks.

Ten (False Positive) individuals had no FGR on USG, but 128 (True Positive) SFH positive patients had FGR. Table II shows that of the 87 SFH negative patients, 11 (False Negative) showed FGR on USG while 76 (True Negative) had no FGR on USG (p=0.0001). Using ultrasound as the gold standard, the overall sensitivity, specificity, PPV, NPV, and diagnostic accuracy of symphysio-fundal height in identifying fetal growth restriction were 92.08%, 88.37%, 92.76%, 87.36%, and 90.67%, respectively. Figure I displays the ROC curve.

Table I: Descriptive Statistics (N=225)

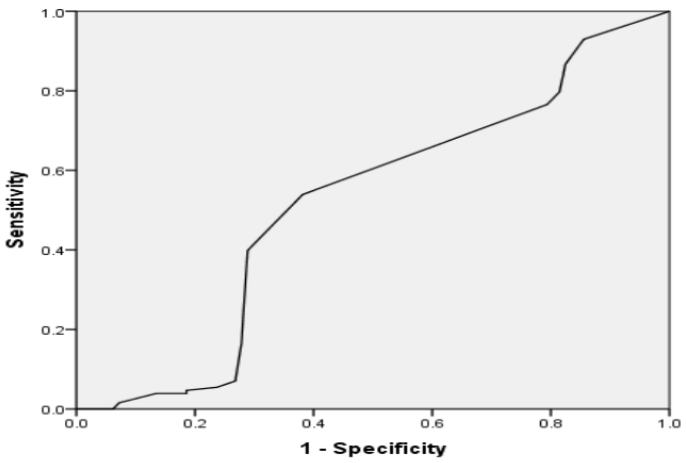
		Frequency	**%age**
Age (years)	18-30	190	84.44
	31-40	35	15.56
Gestational age (weeks)	28-32	165	73.33
	33-36	60	26.67

Table-II: Diagnostic Accuracy of Symphysio-Fundal Height in Detection of Fetal Growth Restriction by Taking Ultrasound as a Gold Standard.

	Positive result on USG	**Negative result on USG**	**P-value**
Positive on SFH	128 (TP)	10 (FP)	
Negative on SFH	11 (FN)	76 (TN)	0.0001

Sensitivity: 92.08%
Specificity: 88.37%
Positive Predictive Value (PPV): 92.76%
Negative Predictive Value (NPV): 87.36%
Diagnostic Accuracy: 90.67%

Figure I: ROC Curve



E-ISSN 2250-0944
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DISCUSSION

Preterm birth, stillbirth, neonatal mortality, and long-term neurodevelopmental problems are all associated with Fetal Growth Restriction (FGR), a serious disorder. Pregnancy outcomes for both mother and fetus depend on an accurate diagnosis of FGR, especially in places with limited resources like Pakistan. The purpose of this study was to evaluate the diagnostic accuracy of USG and SFH in detecting FGR in expectant mothers. 84.44% of participants in our study were between the ages of 18 and 30, which was the largest age group. This is in line with research by Marhatta N et al.[11], who also found that younger women, especially those between the ages of 19 and 25, had a greater incidence of FGR. The age distribution shows that women of reproductive age are most likely to experience FGR, underscoring the importance of close observation in this age range.

Rural residents made up a sizable majority of the study's participants (84%)—a finding that is consistent with research by Kinare AS et al.[12], which found that rural communities frequently report smaller fetus sizes than urban populations. This might be because rural areas have less access to prenatal care and medical facilities, which highlights how crucial it is to upgrade the healthcare system there in order to better handle FGR. Furthermore, as demonstrated by the fact that 67.3% of study participants fell into lower socioeconomic categories, Sinha S et al.[13] observed that socioeconomically backward populations are at increased risk of FGR.

Ten (False Positive) individuals had no FGR on USG, but 128 (True Positive) SFH positive patients had FGR. Table II shows that of the 87 SFH negative patients, 11 (False Negative) showed FGR on USG while 76 (True Negative) had no FGR on USG (p=0.0001). Using ultrasound as the gold standard, the overall sensitivity, specificity, PPV, NPV, and diagnostic accuracy of symphysio-fundal height in identifying fetal growth restriction were 92.08%, 88.37%, 92.76%, 87.36%, and 90.67%, respectively. Using SFH measurement, Marhatta N et al.[11] examined 247 instances and discovered that the sensitivity was 71%, the specificity was 43%, the NPV was 33%, and the PPV was 79%. Additionally, they discovered patterns in belly circumference that were not consistent with SFH.[1] In a study of 100 instances, Sinha S et al[13] discovered that symphysio-fundal height was a sensitive predictor of FGR and was small for gestational age in 76% of cases. According to Cnattingus S et al[14], the SFH test has a NPV of 100%, a sensitivity of 100%, and a specificity of 92%.

A recent meta-analysis showed that the SFH has a modest value for predicting SGA births, with a pooled value of 58%.[15] Similar to other studies, ours found little to no effect from treatments to enhance screening performance using SFH.[16] However, randomized trials or prospective cohorts comparing systematic vs risk-based ultrasound exams or later routine ultrasound at 36 versus 32 weeks of gestation in the third trimester have produced contradictory results. There have been no improvements in mortality or morbidity, however some have reported an increase in the identification of fetuses with FGR.[17,18] Additionally, a recent randomized study assessing the Growth Assessment Protocol (GAP) trial carried out in the UK is in agreement with our findings.[19]

Given these findings, next research should clarify the causes of the unsuccessful prenatal identification of SGA infants in order to pinpoint elements that can be avoided, such audits.[20] Additional approaches include using more information about maternal characteristics (e.g., age, parity, height and weight, conception method, smoking, medical and obstetrical history), basing screening strategies on a broader range of risk markers, and incorporating biomarkers and biophysical tests in prediction models.[21,22] Since existing prediction models only perform marginally and have a net benefit for predicting SGA births when compared to current approaches, there have been calls to change the focus from predicting SGA to predicting negative outcomes due to poor fetal growth.[23]

Limitation - The current study requires succinct interpretation because it is based on the observation of only 245 instances and is a component of an ongoing intervention. lost to follow-up before and during delivery, which presented another difficulty because it was impossible to

study the perinatal outcomes of lost cases.

CONCLUSION

According to the study's findings, the symphysio-fundal height is a very sensitive and accurate measure for identifying fetal growth restriction. This has significantly enhanced our capacity to diagnose FGR accurately and has also improved patient care through prompt and appropriate treatment, which lowers fetal morbidity and mortality. Therefore, we advise that this simple and affordable metric be regularly used in our practice to evaluate the FGR early so that specific actions can be done to reduce the fetus's morbidity and mortality.

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