



ORIGINAL RESEARCH PAPER

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REVISITING FOETAL HEAD ENGAGEMENT, CLINICAL SCORES AND LABOUR OUTCOMES IN INDIAN RURAL PRIMIGRAVIDAE

KEY WORDS: Primigravida, head engagement, Bishop score, rule of fifths, labour outcomes, rural India.

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ABSTRACT

Background: Childbirth, a complex physiological process, involves critical events such as foetal head engagement. This study focuses on the clinical assessment of foetal head engagement and its impact on labour outcomes in Indian rural primigravidae. Primigravidae, experiencing their first pregnancy, present unique challenges due to the significant changes in uterine and pelvic structures. The study aims to bridge the gap in existing knowledge by investigating the engagement status and its implications on labour outcomes in this demographic. **Methods:** The study was conducted at a tertiary care centre in Northern India, utilizing patient records from September 2023 to February 2024. The study included 140 primigravida patients from rural areas, with a gestation period of at least 37 weeks. Clinical examination of foetal head engagement was assessed using per abdominal and Bishop's scoring methods. Patients with obstetric complications or gestation beyond 40 weeks and peripartum complications were excluded. **Results:** Of the 140 patients, the mean age was 22.94 years and mean gestation period was 39 weeks. Foetal head engagement before labour was noted in 85 patients, during labour in 23, and unengaged in 32. Engagement status significantly influenced the mode of delivery, with unengaged heads more likely to result in caesarean sections. Lower Bishop's score and higher per-abdomen scores were found to be statistically significant predictors of adverse labour outcomes. Younger patients were also more prone to caesarean sections. Statistically significant differences were observed in mean baby weight and gestation period between vaginal deliveries and caesarean sections. **Conclusion:** Foetal head engagement is a crucial predictor of labour outcomes, with unengaged heads at labour onset being more likely to necessitate caesarean sections. Clinical scores like Bishop's and per abdominal scores are valuable tools for predicting delivery mode, especially in resource-limited rural settings. Early and accurate assessments can improve labour outcomes by enabling timely interventions and referrals. Addressing the disparities in maternal healthcare between rural and urban areas through education and clinical practices is essential for better pregnancy outcomes.

INTRODUCTION

Childbirth is a natural physiological phenomenon, yet it involves a series of intricate events, each playing a significant role in the safe delivery of the infant. One of these critical events is foetal head engagement, which refers to the descent of the foetal head into the maternal pelvis.¹ Successful engagement is pivotal for the progression of labour and eventual parturition. The process of foetal head engagement is multi-faceted, involving a combination of foetal and maternal factors that dynamically interact.

Primigravida females, being in their first pregnancy, present a unique set of circumstances and challenges since the uterine and pelvic structures are undergoing significant changes for the first time. Various maternal and foetal factors contribute to foetal head engagement, and their understanding is essential for providing comprehensive care to primigravida women.² Ultrasound imaging, clinical examination, and non-invasive techniques are commonly employed to evaluate the position and engagement status of the foetal head.³ Understanding the reliability and accuracy of these assessment methods is crucial for predicting labour outcomes and guiding clinical decision-making. Monitoring intrapartum foetal head descent in primigravida women is important since deviations from the normal patterns may warrant closer attention and intervention.⁴

Despite the significance of foetal head engagement and perinatal clinical examination, there is paucity of research on Indian rural females. Most existing studies have primarily focused on multiparous women, neglecting the distinctive factors associated with first pregnancies.⁵ Clinical examination is particularly important since rural areas tend to lack advanced radiological facilities as well as lack of awareness about regular follow-up and monitoring. Diligent clinical examination, near term, has the potential to improve maternal and foetal outcomes by early identification of complicated labour and assess the need to referral to a

specialised facility. Therefore, this article aims to bridge the gap in existing knowledge by specifically investigating foetal head engagement, clinical examination and outcomes in Indian rural primigravida women.

METHODS

This study was conducted at a tertiary care centre in Northern India and the data consisted of patient records from September 2023 to February 2024. The study was approved by institutional ethics committee (Ref: KDMCHRC/IEC/2022/4021). Records were explored for history, general examination and obstetrical findings. Primigravida patients who had completed 37 weeks of pregnancy at the time of presentation were included in the study. Participant anonymity was ensured during data collection and processing. In total, 702 primigravida patients records were obtained and using systematic sampling, every 5th patient was included in the study. The finding of station of foetal head on per abdominal examination was recorded by fifths rule methods and Bishop's scoring was done on vaginal examination. Exclusion criteria consisted of patients with obstetric complications like pregnancy induced hypertension, pre-existing hypertension, gestational diabetes mellitus, eclampsia, antenatal scans with documented foetal anomalies, period of gestation more than 40 weeks etc.

MedCalc version 22 (MedCalc Software Ltd, 2024) was used for tests like chi-square, student t-test, odds ratio and relative risk wherever relevant according to the type of data. Significance of p-value was set at 0.05.

RESULTS

In total, 140 patients were included in the study. The mean age was 22.94 years (± 3.23 years) and the mean period of gestation (POG) was 39 weeks (± 6 days) (Table 1). Out of 140 births, 84 were females and 56 were male births and the mean baby weight was 2.77 kg (± 0.38 kg) (Table 1). Out of 140

deliveries, 101 were vaginal deliveries and 39 were caesarean sections. 85 patients were found to have foetal head engaged before going into labour, foetal head got engaged during labour for 23, while 32 patients had unengaged head at the time of presentation.

Younger patients (those with age below mean age of study participants) were found to be more likely to proceed to caesarean section and the odds ratio for younger patients to deliver via LSCS was found to be 12.82 and the result was statistically significant ($p < 0.0001$). However, there was no significant difference in foetal head engagement status based on age (Table 1).

Table 1 Mean Age, Pog, Weight And Age Related Outcomes

	Mean	SD
Age (Years)	22.94	3.23
POG (Weeks)	39	6 Days
Baby Weight (kg)	2.77	0.38
Age and Outcomes		
	Below Mean (22.94 years)	Above Mean
FTNVND	35	66
LSCS	34	5
Engaged	44	47
Unengaged	25	24
FTNVND: Full term normal vaginal delivery, LSCS: Lower segment caesarean section, POG: Period of Gestation, SD: Standard Deviation		

Table 2 compares foetal head engagement and mode of delivery on the basis of period of gestation and mean baby weight. Patients with engaged foetal head at or before labour were noted to have slightly lesser mean period of gestation as compared to those who had unengaged foetal head (38 + 5 weeks vs 38 + 6 weeks). Mean baby weight was noted to be lower for those with engaged foetal heads (2.75 vs 2.84 kg). However, both the differences could not reach statistical significance, $p=0.2035$ and $p=0.1757$ respectively. Patients who delivered via vaginal delivery were noted to have slightly lesser mean period of gestation as compared to those who delivered via LSCS (38 + 5 weeks vs 39 weeks). Mean baby weight was also noted to be lower for those with vaginal delivery (2.74 vs 2.89 kg). Both the differences were found to be statistically significant $p=0.0385$ and $p = 0.0333$, respectively (Table 2).

Table 2 Mean Pog, Baby Weight And Outcomes

	Mean POG (weeks)	SD	p-value
Engaged	38 + 5	0.873	0.2035
Unengaged	38 + 6	0.744	
Mean baby weight (kg)			
Engaged	2.75	0.38	0.1757
Unengaged	2.84	0.36	
Mean POG (weeks)			
FTNVND	38 + 5	0.861	0.0385
LSCS	39	0.711	
Mean baby weight (kg)			
FTNVND	2.74	0.36	0.0333
LSCS	2.89	0.38	
FTNVND: Full term normal vaginal delivery, LSCS: Lower segment caesarean section, POG: Period of Gestation, SD: Standard Deviation			

Table 3 represents comparison of mode of delivery on the basis of clinical scores. On dividing patients into categories based on favourability of Bishop's score, it was noted that all the patients who were delivered via LSCS had Bishop score less than 5. The results were found to be statistically significant ($p < 0.0001$, chi square trend). Odds ratio of patients with Bishop score less than 8 proceeding to LSCS was 476.72 ($p < 0.0001$). On dividing patients based on per

abdomen scores into two groups (less than 2 and more than 3), it was noted that all the patients having score equal to or less than 2, delivered via FTNVND (Table 3). The findings were found to be statistically significant ($p < 0.0001$, chi square). Odds ratio for patients with per abdomen score more than 3 proceeding to LSCS was 263.89 and the value was statistically significant ($p = 0.0001$). Mode for Bishop scores for vaginal delivery and caesarean section were 12 and 1 respectively. The comparison of means was statistically significant ($p < 0.0001$, DF = -8.05, 95% CI -8.87 to -7.23). Mode for per abdomen examination scores, as per rule of fifths, for vaginal delivery and caesarean section were 2 and 4 respectively (Table 3). The comparison of means was found to be statistically significant (DF 2.44, $p < 0.0001$, 95% CI 2.13 to 2.61).

Table 3 Bishop Scores, Per Abdomen Scores And Modes Of Delivery.

	Mode Bishop score	Mode Per abdomen score	
FTNVND	12	2	
LSCS	1	4	
Per Abdomen Score and outcome			
	=<2	=>3	
FTNVND	78	23	
LSCS	0	39	
Bishop Score and outcome			
	<5	6-7	>8
FTNVND	6	8	87
LSCS	39	0	0
FTNVND: Full term normal vaginal delivery, LSCS: Lower segment caesarean section			

Patients with unengaged foetal head at the onset of labour were found to be more likely to proceed for caesarean section and the finding was statistically significant ($p < 0.0001$, two-way chi square test). Relative risk of progressing to LSCS in case of unengaged foetal head was found to be 4.37 ($p < 0.0001$) and Odd's ratio of LSCS in case of unengaged head was 11.78 ($p < 0.0001$).

DISCUSSION

The current study focus on the critical role of foetal head engagement during childbirth, particularly for first-time mothers in rural India. Notably, foetal head engagement status significantly influenced delivery outcomes, with unengaged heads at the onset of labour being more likely to result in caesarean sections. This is in conjunction with findings from previous studies, that foetal head engagement and maternal pelvic factors affect delivery outcomes due to factors like shorter labour durations and reduced need for medical interventions^{6,7,8}. Additionally, younger patients were more likely to undergo caesarean sections, with a statistically significant odds ratio of 12.82 ($p < 0.0001$). Multiple studies have observed that younger females were more likely to have adverse perinatal outcomes due to factors like physical immaturity, less efficient uterine contractions, higher likelihood of shoulder dystocia etc.^{9,10,11,12}

Differences in mean baby weight and gestational period between vaginal deliveries and caesarean sections were also statistically significant, with lower baby weights and shorter gestational periods associated with vaginal deliveries. Infants with lower birth weights are generally easier to deliver vaginally because their smaller size reduces the risk of complications such as shoulder dystocia and cephalopelvic disproportion¹³. Additionally, births with lesser gestational age and hence lower birth weight often result in vaginal deliveries as the labour process tends to be shorter and less physically taxing for the mother¹⁴. Evidence suggests that infants weighing lesser than average were more frequently delivered vaginally compared to those with higher birth weights. Furthermore, deliveries with lesser gestational

period had higher vaginal delivery rates due to the decreased need for caesarean intervention given the smaller size of the foetus^{13,14}.

Furthermore, the predictive value of the Bishop score and per abdomen score in determining the mode of delivery is evident from the study. The current study demonstrated that higher Bishop scores and lower per abdomen examination scores are strong predictors of vaginal delivery. Traditionally also, these scores have been proven to be highly effective in predicting whether a patient would deliver vaginally or via caesarean section.^{8,18} These scores provide valuable insights that can help in making timely and informed decisions, potentially reducing the incidence of emergency caesarean sections and associated morbidities. This reinforces the utility of these assessment tools in clinical practice, particularly in rural settings where advanced imaging may not be readily available.

Clinically, these findings suggest that healthcare providers in rural areas should place greater emphasis on early and accurate foetal head engagement assessments using Bishop and per abdomen scores. These practices could improve labour outcomes by identifying potential complications early and allowing for timely interventions; particularly because of limited access to healthcare facilities and specialized obstetric care. This lack of access can lead to inadequate prenatal care, delayed diagnosis of complications, and a higher likelihood of adverse pregnancy outcomes. Diligent clinical examination and determining clinical scores have the potential of early identification of patients proceeding towards unfavourable outcomes and hence referral to a more specialised centres. Studies have shown that rural women in India are more likely to experience higher rates of maternal and neonatal mortality compared to their urban counterparts, mostly due to the above mentioned factors, along with poor nutritional status, higher prevalence of anaemia and lower socioeconomic status.^{16,17} Steps are needed to address the difference in maternal outcomes between rural and urban areas and education about significance of clinical scores may play an important part.

The study despite its significant findings, it not without its limitations. Firstly, it was a retrospective cross-sectional study and a longitudinal study involving follow-up and progression of clinical scores would further increase significance of the findings. Secondly, most of the patients belonged to lower socioeconomic status which may have affected birth weight, frequency of seeking medical care and hence labour outcomes. Furthermore, obtaining radiological correlation may have helped in better association of clinical scores and progression of labour.

In conclusion, clinical scores to monitor progression of labour play an important role in predicting outcome of the labour along with gestational age and birth weight. This is of particular significance in rural areas where there is paucity of advanced medical facilities and lack of regular follow-up. Increasing awareness among practitioners of rural areas regarding these clinical examination methods can help in improving pregnancy outcomes in rural areas by identifying at-risk pregnancies and assist in prompt escalation to a higher medical facility and planning intervention.

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