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Mode of delivery in breech presentation and neonatal birth asphyxia- an observational study at Seti Provincial Hospital

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Abstract

Background

Breech presentation is the commonest malpresentation (3–4% of singleton pregnancy). Mode of delivery in breech presentation has remained a controversy till date, the higher neonatal morbidity and mortality associated with vaginal mode of delivery and its impact on raising the rate of cesarean section is significant. The relationship of mode of delivery and neonatal morbidity and mortality is most important information sought in this topic which may be different based on clinical setting and skill. Although cesarean delivery is preferable for term breech infants owing to better perinatal results, some selected patients can be delivered vaginally. Thus, this research aims to compare NICU admission and asphyxia between term breech infants delivered vaginally and via cesarean delivery.

Methods

A prospective observational study was conducted among women with breech presentation delivering at Seti Provincial Hospital from may 2022 to Feb 2023 The study population was Women with breech presentation who met the eligibility criteria were consecutively enrolled. Women with preterm birth before 34 weeks, multiple pregnancy, previous cesarean section, or another indication for cesarean delivery were excluded. Neonatal outcomes were compared between the two groups. For bivariate analysis chi-square test and simple binary logistic regression was performed and multiple binary logistic regression was performed for multivariate analysis.

Results

Among 463 women with breech presentation, 228 (49.2%) had vaginal delivery and 235 (50.8%) underwent cesarean delivery. A 5-minute Apgar score < 7 occurred in 9.2% of neonates following vaginal delivery compared with 2.1% following cesarean delivery ($p = 0.004$). NICU admission occurred in 8.8% and 2.6% of neonates, respectively ($p < 0.001$) in vaginal and cesarean delivery. After adjustment, vaginal delivery was associated with higher odds of NICU admission, although the association was not statistically significant (aOR 2.10, $p = 0.145$). Cesarean delivery was independently associated with higher odds of a normal 5-minute Apgar score (aOR 3.02, $p = 0.039$.

Conclusion

In this cohort of women with breech presentation, vaginal breech delivery was associated with higher neonatal morbidity, reflected by lower 5-minute Apgar scores and increased NICU admission. Careful case selection and appropriate intrapartum and neonatal care are essential for optimizing outcomes.

Background

Breech presentation is the commonest malpresentation. It is estimated that 3–4 percent pregnancy at term are breech. A study by Jose C.P. Ferreira et all found the incidence of breech presentation at 39week to be 4.1 percent.(1) The approach to mode of delivery has remained a topic of controversy. Landmark randomized controlled trial Term Breech Trial showed planned cesarean section is better for term fetus and similar maternal morbidity. (2) But criticism and implications of this trial especially on increasing rate of cesarean section has left this topic still unresolved. An analysis of more than 35000 neonates in Netherlands has concluded that The Term Breech Trial has resulted in an exceptionally rapid change in medical behavior by Dutch obstetricians. This change was followed by improved neonatal outcome.(3) Though there are multiple studies that shows cesarean section is superior for fetal outcome, the rising rate of cesarean section globally is a serious concern where both unmet need and overuse exist. A data (2010–2018) from 154 countries covering 94.5% of world live births shows that 21.1% of women gave birth by caesarean worldwide, averages ranging from 5% in sub-Saharan Africa to 42.8% in Latin America and the Caribbean. (4) Gerald w Lawson in his study 'The term breech trial ten years on : Primum Non Nocere ?' writes the term breech trial has violation of many research protocols and also raised issue of many maternal deaths in cesarean section group. (5) According to Oliver et al TBT had some limitations, especially those connected with the impossibility of regular and objective comparison of these two methods of delivery. In addition, the same group of authors did not find differences in long-term outcomes between the planned cesarean section and vaginal delivery. Although the rate of planned cesarean section has increased following the publication of TBT. (6) Selective vaginal breech delivery is still very successfully used in the centers where doctors have the possibility to obtain experience in vaginal breech deliveries. (6) Nepal has observed substantial increment in rate of cesarean section, a study of more than 20 thousand women who had delivery in last five year shows population based cesarean section rate increased form 0.9 percent in 1996 to 10.2 percent in 2016. (7) In low resource setting country like Nepal the impact of rising cesarean section cannot be ignored and any attempt to promote vaginal delivery are to be encouraged. One of study from Nepal, from an academic institution done among 528 breech deliveries has shown adverse outcome in 23.8 percent of vaginal group with neonatal mortality approaching 8.3 percent which is quiet unacceptable high. (8) But the neonatal outcome depend not only one mode of delivery but also on the skill and obstetric management standard of institution. In background of research showing adverse perinatal outcome and obstetric practice becoming defensive day by day rising cesarean section rate seems inevitable. With this study it is expected to add knowledge to neonatal morbidities with vaginal vs cesarean section in breech presentation at term in a tertiary hospital setting of Nepal and also help to identify the group of breech women who are prospective candidate for planned vaginal delivery.

Methods

Aim, Study design and setting

The aim is study is to compare the rate of NICU admission between vaginal and cesarean section borne neonates in breech presentation and to compare the incidence of birth asphyxia (5 min APGAR score less than 7 or 7 and more) in vaginal and cesarean section borne neonates. This was a prospective observational study conducted at Seti Provincial Hospital, Sudurpaschim Province, Nepal. The study was conducted over two year period from may 2022 to may 2024 The study included women presenting with breech presentation who subsequently delivered at the study hospital.

At the time of the study, the hospital did not have a predefined institutional policy mandating a particular mode of delivery for breech presentation. Women presenting with breech presentation were assessed by the attending obstetric team and counseled regarding the available options for delivery. The final mode of delivery was determined based on the clinical assessment, obstetric factors, counseling, and the woman's preference.

Study population

The study population consisted of women with breech presentation who delivered at Seti Provincial Hospital during the study period and fulfilled the predefined eligibility criteria.

Inclusion criteria

Had presented with a singleton breech presentation pregnancy of 34week or more at the time of delivery during study period and who had provided consent for the participation in study.

Exclusion criteria

Women were excluded if they had a gestational age < 34 weeks, multiple pregnancy, previous cesarean section, other indications for cesarean delivery (e.g., placenta previa), or intrauterine fetal death (IUFD).Gestational age less than 34 weeks.

Recruitment and allocation according to mode of delivery

All women fulfilling the eligibility criteria were enrolled prospectively. Written informed consent was obtained from participants prior to their participation and only those who provided consent were included in the styd. Participants were subsequently categorized according to the actual mode of delivery into two groups:

1. Vaginal breech delivery group; and
2. Cesarean breech delivery group.

Participants were not randomly assigned to either group. In women considered suitable for vaginal breech delivery, a trial of labor was considered after clinical assessment and counseling. According to the practice at the study hospital, women with a favorable fetal size, appropriate obstetric characteristics, and willingness to undergo vaginal delivery were considered for a trial of labor with written consent. Vaginal breech delivery was conducted by a trained midwife with an obstetrician available when required.

Data collection

Data were collected prospectively using a structured data collection format. Maternal age, parity, gestational age, mode of delivery, and neonatal outcomes were recorded.

Neonatal outcomes included admission to the neonatal intensive care unit (NICU) and Apgar score at 5 minutes after birth whether it is less than 7 or 7 and more.

Study outcomes

The primary objective of the study was to compare neonatal outcomes between vaginal and cesarean deliveries among women with breech presentation. The principal neonatal outcomes assessed were:

- NICU admission; and
- 5-minute Apgar score.

The rate of NICU admission was compared between neonates delivered vaginally and those delivered by cesarean section. The incidence of low 5-minute Apgar score, as a measure of neonatal condition at birth, was also compared between the two groups.

Statistical analysis

Data were analyzed using appropriate statistical methods. In descriptive analysis, categorical variables were summarized using frequencies and percentages. For inferential analysis, chi-square test was employed to evaluate the relationships among categorical variables. Binary logistic regression was conducted to calculate the CORs along with 95% CI. Multiple logistic regression was then done to determine the AORs while adjusting for possible confounding variables like maternal age, gravidity, parity, gestational age, and birth weight. The results were deemed statistically significant when the two-sided p-value was less than 0.05.

Ethical considerations

The study was conducted after obtaining approval from Nepal Health Research Council. Participants were enrolled after providing informed consent, according to the approved study protocol.

Results

The sample comprised 463 breech-presentation pregnancies. Most mothers were aged 20–34 years (87.7%), with only 9.7% under 20 and 2.6% aged 35 or above. 58.5% of women were Primigravida and 64.8% nulliparous while 35.2% were multiparous. The large majority of pregnancies (90.9%) were found to be term pregnancy.

(Insert Table 1 *here)*

Table 1
Pregnancy information of respondent

		Total	
		N	**%**
Maternal age (in years)	< 20 years	45	9.7
	20–34 years	406	87.7
	≥ 35 years	12	2.6
Gravidity	Primigravida	271	58.5
	2–3 gravida	167	36.1
	4 and more gravidity	25	5.4
Parity	Nulli parous	300	64.8
	Multi parous women	163	35.2
Period of gestation	Term (37 above week)	421	90.9
	Preterm(34-36wk+6d)	42	9.1
Total		463	100.0

Regarding delivery and newborn outcomes, mode of delivery was almost evenly split between vaginal delivery (49.2%) and caesarean section (50.8%) a comparatively high vaginal breech rate worth noting against national norms and trends. Majority of newborns had normal birth weight (67.6%) and reassuring APGAR scores of 7 or above (94.4%), and most(94.4%) did not require NICU admission. Adverse outcomes were: birth asphyxia with NICU admission occurred in 4.5% of newborns, and one stillbirth (0.2%).

(Insert Table 2 here) **Table 2: Neonatal Information**

		Total	
		N	%
Type of delivery	Vaginal delivery	228	49.2
	CS delivery	235	50.8
Weight at birth (gm)	Low birth weight (< 2500)	144	31.1
	Normal birth weight (2501 to 3999)	313	67.6
	Macrosomia (≥ 4000)	6	1.3
Sex of newborn	Female	230	49.7
	Male	233	50.3
APGAR score	Less than 7	26	5.6
	7 or more	437	94.4
Newborn status after delivery	Normal	431	93.1
	Birth asphyxia without NICU	5	1.1
	Birth asphyxia with NICU admission	21	4.5
	NICU admission for other causes	5	1.1
	Stillbirth	1	0.2
NICU admission	Yes	26	5.6
	No	437	94.4
Total		463	100.0

Mode of delivery was significantly associated with both low APGAR score and NICU admission. Low APGAR scores (< 7) were more common after vaginal delivery (9.2%) than after caesarean section (2.1%), a statistically significant difference ($\chi 2 = 8.44$, $p = 0.004$).

(Insert Table 3 *here)*

Table 3
Mode of delivery and APGAR

		APGAR score				Total	Chi square	
		Less than 7		7 or more		N		
		N	%	N	%		p-value	χ2
Type of delivery	Vaginal delivery	21	9.2	207	90.8	228	0.004	8.44
	CS delivery	5	2.1	230	97.9	235		
Total		26	5.6	437	94.4	463		

NICU admission also occurred more often following vaginal delivery (8.8%) than caesarean section (2.6%), also statistically significant ($\chi2 = 10.95$, $p < 0.001$). Together these bivariate results indicate that, in this sample, vaginal breech delivery was associated with poorer immediate neonatal outcomes compared with caesarean delivery.

(Insert Table 5 *here)***Table 4: Mode of delivery and NICU admission**

		NICU admission				Total	Chi square	
		Yes		No		N		
		N	%	N	%		p-value	χ2
Type of delivery	Vaginal delivery	20	8.8	208	91.2	228	< .001	10.95
	CS delivery	6	2.6	229	97.4	235		
Total		26	5.6	437	94.4	463		

In the adjusted model (Model II) for NICU admission, vaginal delivery was associated with 2.1 times higher odds of requiring NICU admission compared with cesarean delivery (95% CI: 0.76–5.69, p = 0.145), although this association was not statistically significant after adjustment (the unadjusted odds ratio was 3.67; 95% CI: 1.45–9.32, p = 0.006). Low or high birth weight (versus normal birth weight) was associated with 2.77 times higher odds of requiring NICU admission (95% CI: 1.02–7.52, p = 0.045). Likewise, multigravidity (versus primi-gravidity) was associated with 6.84 times higher odds of requiring NICU admission (95% CI: 1.51–30.94, p = 0.013). Preterm birth (versus term birth) was associated with 4.17 times higher odds of requiring NICU admission (95% CI: 1.20-14.44, p = 0.024).

Maternal age risk category, parity, and newborn sex were not significant predictors. Model-II showed a -2 Log Likelihood of 157.546 and explained 25.1% of the variation in NICU admission (Nagelkerke R^2 = 0.251).

(Insert Table 5 *here)*

Table 5
Mode of delivery and requiring NICU admission

		Model-I			Model-II		
		p-value	COR	95% CI	p-value	COR	95% CI
Type of delivery	Vaginal delivery	0.006	3.67	1.45–9.32	.145	2.1	0.76–5.69
	CS delivery (ref)		1			1	
Risk category based on maternal age	High risk (< 20 years and ≥ 35 years) (ref)					1	
	Low risk (20–34 years)				.209	3.91	0.47–32.77
Weight at birth (gm)	Low/High birth weight				.045	2.77	1.02–7.52
	Normal birth weight (2501 to 3999) (ref)					1	
Gravidity	Primi-gravidity (ref)					1	
	Multi-gravity				.013	6.84	1.51–30.94
Parity	Nulli parous (ref)					1	
	Multi parous				.724	1.29	0.31–5.31
Period of gestation	Term (ref)					1	
	Preterm				.024	4.17	1.20-14.44
Sex of newborn	Female (ref)					1	
	Male				.193	1.80	0.74–4.37
Model fit statistics for Model-II: -2 Log Likelihood = 157.546, Cox & Snell R Square = 0.088, and Nagelkerke R Square = 0.251							

In the adjusted model (Model II) for APGAR score, caesarean delivery was associated with 3.02 times higher odds of having a normal APGAR score (≥ 7) compared with vaginal delivery (95% CI: 1.06–8.60, p = 0.039); the corresponding unadjusted odds ratio was 4.67 times higher (95% CI: 1.73–12.60, p = 0.002). Multigravidity was associated with 82% lower odds of having a normal APGAR score compared with primi-gravidity (95% CI: 0.05–0.75, p = 0.019). Preterm birth was associated with 3.63 times higher

odds of having a normal APGAR score compared with term birth (95% CI: 1.10-11.97, p = 0.034). Maternal age risk category, birth weight, parity, and newborn sex were not statistically significant predictors.

Model II showed a -2 Log Likelihood of 165.638 and explained 20.5% of the variation in normal APGAR score (Nagelkerke $R^2 = 0.205$).

(Insert Table 6 *here)*

Table 6
Mode of delivery and Normal APGAR Score (≥ 7)

		Model-I			Model-II		
		p-value	COR	95% CI	p-value	COR	95% CI
Type of delivery	Vaginal delivery (ref)		1			1	
	CS delivery	.002	4.67	1.73–12.6	.039	3.02	1.06–8.60
Risk category based on maternal age	High risk (< 20 years and ≥ 35 years)				.604	0.70	0.18–2.70
	Low risk (20–34 years) (ref)					1	
Weight at birth (gm)	Low/High birth weight				.231	0.54	0.20–1.48
	Normal birth weight (2501 to 3999) (ref)					1	
Gravidity	Primi-gravidity (ref)					1	
	Multi-gravidity				.019	0.185	0.05–0.75
Parity	Nulli parous (ref)					1	
	Multi parous				0.816	1.18	0.29–4.76
Period of gestation	Term (ref)				0.034	3.63	1.10-11.97
	Preterm					1	
Sex of newborn	Female				0.092	2.15	0.88–5.22
	Male (ref)					1	
Model fit statistics for Model-II: -2 Log Likelihood = 165.638, Cox & Snell R Square = 0.072, and Nagelkerke R Square = 0.205							

Discussion

Among the 463 breech deliveries mode of delivery was almost evenly split between vaginal delivery (49.2%) and caesarean section (50.8%). Overall, 5.6% of neonates were admitted to the NICU and 5.6% had a 5-minute Apgar score < 7. Comparing with cesarean section, Vaginal mode of delivery showed

statistically significant association with both high NICU admission (8.8% vs 2.6%, $\chi 2 = 10.95$, $p < 0.001$) and low 5-minute Apgar score (9.2% vs 2.1%, $\chi 2 = 8.44$, $p = 0.004$) in the unadjusted analysis. However, after adjustment for maternal and neonatal factors, the association between vaginal delivery and NICU admission was no longer statistically significant. In contrast for APGAR score, caesarean delivery was associated with 3.02 times higher odds of having a normal APGAR score (≥ 7) compared with vaginal delivery (95% CI: 1.06–8.60, $p = 0.039$); the corresponding unadjusted odds ratio was 4.67 times higher (95% CI: 1.73–12.60, $p = 0.002$).

The proportion of vaginal delivery was relatively high compared to national and international norms and previous reports. In a large trial done in 2000 in Belgium and France among 8105 breech women, cesarean delivery was planned in 5579 women (68.8% of all breech presentation) and in addition 29% of women underwent cesarean section in whom vaginal delivery was planned with overall incidence of above 75% .(9) Similarly, a study from Nepal showed among 528 breech deliveries the mode of only 84 (17.8%) deliveries was vaginal.(8) The reason behind higher vaginal delivery may be a lower socioeconomic area, resource availability, difference in clinical practice and women's preference for vaginal delivery. However as present study didn’t directly assess the reason behind the choice of mode of delivery.

Higher incidence of low APGAR score in vaginal mode of delivery is a finding consistent with the results of term breech trial which show incidence of APGAR score < 7 to be 3 percent and 0.8%) in planned vaginal delivery group and cesarean section respectively. In our study, corresponding proportion were higher at 9.2% and 2.1% respectively .(2) The difference may partly be explained by difference in study population and management strategies. Our study enrolled women in labor whereas Term breech analyzed planned mode of deliveries.

Consequently, some fetus may have experienced intrapartum compromise happened before admission and or before decision of operative delivery is made, potentially contributing more neonate having low APGAR. After adjustment of factor in Model-II we found higher odds of having a normal APGAR score in cesarean group, a finding similar to a study done by Basnet et. al. which showed after adjustment for confounders, 13.3 times higher odds ratio for Apgar score < 7 at 5 min in vaginal delivery group. (8)

NICU admission which after adjustment of factors is statistically not significant. However, this finding should be interpreted in context of availability of neonatal care facilities. Since study site has limited NICU beds and non availability of bed is common so its quite obvious that some neonates managed in nursery which are not recorded, though they met criteria for NICU admission.

31 percent incidence of low birth weight is found in our study, which was higher than the average incidence. As per a multicountry validation study among more than 23000 births observed LBW rate is 15.6 percent.(10) A community based study in Nepal also observed LBW incidence of 16.5 percent. (11) Breech presentation has generally lower gestational age at delivery and more incidence of preterm delivery, which could be factors behind observation of higher incidence of LBW.

Overall, the findings suggest cesarean delivery for breech presentation associated with favorable neonatal outcome, particularly in reference to immediate neonatal outcome, while highlighting the importance of careful selection of candidates for vaginal breech delivery. Though statistically significant neonatal compromise is observed the frequence of poor outcome is relatively low in comparison to previous studies. Maternal morbidity and impact of cesarean section on reproductive morbidity is also significant which are beyond the scope of this study. Hence larger study with subgroup analysis for neonatal and maternal outcome with adequate sample size is required to further suggest the subgroup of women who can be favorable for vaginal delivery. When vaginal delivery is considered, appropriate case selection, skilled intrapartum management, and timely neonatal care are essential to optimize neonatal outcomes.

Limitations

There are no any set criteria made for purpose of counseling a client for mode of delivery in breech presentation, it was individual obstetrician and client decision hence obstetrician and client preferences has impact on mode of delivery which has impact on comparing the group. Also most of deliveries are not planned rather inevitable because they presented late in labor which will make the group heterogenous. In vaginal delivery we could not ascertain the events during second stage of labor that are known to cause birth asphyxia like head entrapment time, difficult extraction, unskilled provider etc. Another limitation of study is data about other neonatal morbidities of vaginal breech(like brachial plexus injury). Another limitation is non-availability of long term data on outcome of neonate, as all birth asphyxia will not lead to long tern poor neurological outcome.

Conclusion

Vaginal mode of delivery is significantly associated with both 5 min low APGAR score and NICU admission as compared to cesarean delivery is similar after adjustment of other variables. However maternal morbidity and long terms impacts on developmental milestones of newborn child are not under scope of study to recommend any mode of delivery.

Abbreviations

TBT
Term Breech Trial
NICU
Neonatal intensive care unit
LBW
Low Birth Weight
APGAR
Appearance, Pulse, Grimace, Activity and Respiration
CS

Cesarian Section
COR
Crude Odds Ratio
AOR
Adjusted Odds Ratio

Declarations

Ethical approval and consent to participate

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki after obtaining ethical approval from the Nepal Health Research Council Ethical Review Board. The study protocol was approved on 11 May 2022 under Protocol Registration No. 6012022. The study was conducted at Seti Provincial Hospital, Dhangadhi, Nepal. The study was classified as minimal risk. Written informed consent was obtained from all participant prior to enrollment to study. The confidentiality and privacy of participants were maintained throughout the study, and the data were used solely for research purpose.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

Jagadeesh Chandra Bist was the Principal Investigator and contributed to the conception and design of the study, data collection, data analysis and interpretation, and drafting and revision of the manuscript. Sristi Joshi contributed as Co-Investigator to the study and participated in data collection and critical revision of the manuscript. Both authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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Data Availability

The data collected and/or analysed during the current study are not publicly available because they are contained in hospital hardcopy registers and are subject to institutional confidentiality requirements. However, the data may be available after de-identification of the data from the corresponding author on reasonable request, subject to appropriate ethical and institutional approval.

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