Pakistan Journal of Intensive Care Medicine
eISSN: 2708-2261; pISSN: 2958-4728
www.pjicm.com
DOI: https://doi.org/10.54112/pjicm.v5i02.154
*Pak. J. Inten. Care Med., volume 5(2), **2025**: 154*
Original Research Article

COMPARISON OF FETOMATERNAL OUTCOMES OF PUSH VS PULL TECHNIQUE IN SECOND STAGE CESAREAN SECTION

AWAIS S*, HUSSAIN SS

Department of Obstetrics and Gynaecology, Lady Reading Hospital, Peshawar, Pakistan
**Corresponding author email address:* ummehani358@gmail.com

(Received, 28th May 2025, Revised 25th June 2025, Accepted 07th July, Published 18th July 2025)

ABSTRACT

Background: *Management of an impacted fetal head during second-stage cesarean section presents significant fetomaternal challenges. Different delivery techniques, such as push and pull, may influence maternal and neonatal outcomes.* ***Objective:*** *To compare fetomaternal outcomes using the push versus pull technique for delivery of the impacted fetal head during second-stage cesarean section.* ***Study Design:*** *Randomized controlled trial.* ***Setting:*** *Conducted at the Department of Gynecology and Obstetrics at Lady Reading Hospital, Peshawar, Pakistan.* ***Duration of Study:*** *11 February 2025 to 11 May 2025.* ***Methods:*** *A total of 224 pregnant women aged 15–45 years, with gestational age ≥37 weeks, cephalic presentation, singleton pregnancy, and a fully dilated cervix were enrolled. Patients were equally divided into two groups: Group A (n = 112) underwent the push technique, and Group B (n = 112) underwent the pull technique. Fetomaternal outcomes evaluated included uterine incision extension, need for blood transfusion, and neonatal APGAR score <7 at five minutes. Statistical analysis was performed using SPSS, with P < 0.05 considered significant.* ***Results:*** *Mean maternal age was 28.57 ± 7.87 years in Group A and 27.79 ± 8.44 years in Group B. Uterine incision extension occurred in 25.9% of the push group versus 8.9% in the pull group (P = 0.001). Blood transfusion was required in 10.7% of neonates versus 3.6% (P = 0.03), and low APGAR scores (<7) were noted in 16.1% versus 7.1% of neonates in the push and pull groups, respectively (P = 0.03).* ***Conclusion:*** *The pull technique demonstrated superior fetomaternal outcomes compared to the push technique for delivery of impacted fetal heads during second-stage cesarean sections, with lower rates of uterine incision extension, blood transfusion, and neonatal compromise.*

Keywords: Cesarean Section, Reverse Breech Extraction, Second Stage Labor, Pull Technique

INTRODUCTION

Cesarean section (CS) has emerged as the most common delivery method in deliveries complicated by life-threatening circumstances. The decision to carry out a CS ought to happen under situations where delivery via vagina is unattainable or poses greater risks, and is thus made only with particular maternal and fetal indications (1, 2). According to the WHO Statement, CS Rates indicate that population-wide CS rates higher than 10% are not associated with decreases in maternal and neonatal mortality. Consequently, such rates are considered non-optimal, considering the potential complications in subsequent pregnancy (3-6). Nevertheless, in the preceding decade, the WHO reported a significant increase in CS rates, rising from 7% in 1990 to 21% of childbirths by 2021, with forecasts indicating an additional spike to 29% by 2030 worldwide. Should the trend persist, Eastern Asia, as well as Latin America, is expected to achieve the greatest percentages, at 63% and 54%, respectively (7).

The trends in CSs, along with their medical and non-medical justifications, make the underlying medical risk factors unclear. Scoring systems that utilize both maternal and fetal characteristics to estimate the risk of CSs have been established for obstetricians to ensure the procedure is carried out only when clinically indicated (8). CSs performed during the second stage of labor with a severely injured fetal head pose significant difficulties for obstetricians. These procedures have been linked with maternal morbidity, such as an elevated risk of major hemorrhage, bladder injury, and uterine tears, which can result in broad ligament bleeding. Additionally, fetal morbidity may occur, such as poor APGAR scores and direct trauma to the fetus. A specialist obstetrician must be present, as prompt action and expertise are essential for minimizing adverse events. The surgeon can use two distinct methods, the reverse breech extraction or abdomino-vaginal method, to remove a deeply impacted fetal skull (10-12).

There are multiple studies regarding these two techniques on the international level, but local population studies are scarce. Therefore, this study aims to compare the fetomaternal outcomes of the push and pull technique for the extraction of the baby during a second-stage CS in the local pregnant population.

METHODOLOGY

We conducted this randomized controlled trial from February 11, 2025, to May 11, 2025, at the Department of Gynecology and Obstetrics, Lady Reading Hospital, Peshawar. We obtained ethical approval from the hospital before commencing the study. Two hundred twenty-four pregnant women were enrolled in the study and allocated equally into two groups of 112 participants each, utilizing a non-probability consecutive sampling technique followed by blocked randomization. The sample size was based on the previous frequencies of need for blood transfusion in the pull technique (2.1%, 13) and the push technique (11.5%, 13), with 80% power and a 5% significance level.

Participants eligible for inclusion were pregnant women between the ages of 15 and 45 years carrying a singleton fetus in a cephalic presentation at a gestational age of 37 weeks or more, confirmed by a consultant obstetrician. Furthermore, a prerequisite for inclusion was a fully dilated cervix with the presenting part at station 0 or below. We excluded women with a history of previous uterine scars, diagnosed fetal anomalies like hydrocephaly or conjoined twins, pre-existing bleeding disorders, uterine fibroids, antepartum haemorrhage, an estimated fetal weight exceeding 3.8 kilograms, history of chorioamnionitis, or preoperative anemia indicated by a hemoglobin level below 10 g/dl before the surgery.

Consent was taken from the participants, and their baseline demographic and clinical characteristics were recorded. These parameters included maternal age, body mass index, gravidity, parity, gestational age, neonatal gender, area of residence, and maternal

education level. Surgical procedures were standardized by having all second-stage cesarean sections performed by a fourth-year Trainee Medical Officer to ensure a consistent level of surgical expertise across both cohorts.

Participants in Group A were managed using the push technique. This involved placing the patient in a semi-lithotomy position where an assistant, under sterile conditions, introduced a hand into the vagina to apply upward pressure on the fetal head. In contrast, the operating surgeon applied traction to facilitate delivery. Patients in Group B were managed using the pull technique, formally known as reverse breech extraction. In this method, the surgeon introduced a hand through the uterine incision into the fundus to identify and grasp both fetal feet, followed by the application of steady downward traction to deliver the fetus as a breech, culminating with the delivery of the buttocks and then the delivery of the head.

Fetomaternal outcomes were assessed, which included uterine incision extension, identified as an unintended tear or defect in the uterine wall occurring outside the line of the original surgical incision during fetal extraction. The need for a blood transfusion was determined by a drop in hemoglobin levels of 2 g/dL or more. Wound infection was diagnosed upon the clinical observation of redness, swelling, pain, with or without discharge at the wound site. Neonatal outcome was evaluated using the APGAR score, with a low score defined as a value of less than 7 at five minutes after birth.

Data collection was executed using a pre-formed questionnaire. Statistical analysis was performed using SPSS 20. Age, BMI, and gestational age were recorded as means and standard deviations. The gender of the baby, gravida, parity, area of residence, maternal level of education, and fetomaternal outcomes were assessed using frequency and percentages. Demographics, along with parity and gravidity, were stratified using the chi-square test, with a notable P value of ≤ 0.05.

RESULTS

The study consisted of 224 women, evenly distributed into two groups of 112 each. Group A underwent delivery via the push technique while Group B was managed with the pull technique. The mean maternal age in Group A was 28.57 ± 7.87 years, while it was 27.79 ± 8.44 years in Group B. The average gestational age was 38.63 ± 1.76 weeks for Group A and 38.38 ± 1.65 weeks for Group B. Maternal body mass index was 25.25 ± 1.44 and 25.45 ± 1.34 kg/m² in the push and pull groups, respectively. Table 1 presents the baseline characteristics of the patients in both groups.

Regarding the fetomaternal outcomes, uterine incision extension was markedly higher in the push group, affecting 29 (25.9%) cases, while 10 (8.9%) cases in the pull group (P = 0.001). The clinical need for a blood transfusion was observed in 12 patients (10.7%) managed with the push method, while four patients (3.6%) in the pull method group (P = 0.03). The incidence of postoperative wound infection was observed in 11 cases (9.8%) within the push groups and 5 cases (4.5%) within the pull group; however, the difference was not statistically significant (P = 0.12). A low APGAR score was documented in 18 (16.1%) infants delivered with the push technique and in 8 infants (7.1%) delivered using the pull technique (P = 0.03) (Table 2). Tables 3 and 4 present the stratifications of outcomes in both groups by BMI, age, parity, and gravida.

Table 1: Baseline characteristics of the patients

Baseline characteristics		Groups			
		Group A (Push technique)		Group B (Pull technique)	
		n	%	n	%
Parity	Primiparous	69	61.6%	73	65.2%
	Multiparous	43	38.4%	39	34.8%
Gravida	Primigravida	46	41.1%	48	42.9%
	Multigravida	66	58.9%	64	57.1%
Gender of the baby	Male	53	47.3%	61	54.5%
	Female	59	52.7%	51	45.5%
Maternal Education	No formal education	52	46.4%	46	41.1%
	School education or above	60	53.6%	66	58.9%
Residence	Urban	51	45.5%	53	47.3%
	Rural	61	54.5%	59	52.7%

Table 2: Comparison of fetomaternal outcomes between both groups

Fetomaternal outcomes		Groups				P value
		Group A (Push technique)		Group B (Pull technique)		
		n	%	n	%	
Uterine incision extension	Yes	29	25.9%	10	8.9%	0.001
	No	83	74.1%	102	91.1%	
Need for blood transfusion	Yes	12	10.7%	4	3.6%	0.03
	No	100	89.3%	108	96.4%	
Wound infection	Yes	11	9.8%	5	4.5%	0.12
	No	101	90.2%	107	95.5%	
Low APGAR score	Yes	18	16.1%	8	7.1%	0.03
	No	94	83.9%	104	92.9%	

Table 3: Stratification of Comparison of fetomaternal outcomes between both groups with maternal BMI and age

				Groups				P value
				Group A (Push technique)		Group B (Pull technique)		
				n	%	n	%	
BMI (Kg/m^2)	18.5 to 24.9	Uterine incision extension	Yes	13	24.5%	5	13.2%	0.17
			No	40	75.5%	33	86.8%	
			Yes	7	13.2%	0	0.0%	0.02

[Citation: Awais, S., Hussain, S.S. (2025). Comparison of fetomaternal outcomes of push vs pull technique in second stage cesarean section. *Pak. J. Inten. Care Med. 5(2), **2025**: 154*. doi: https://doi.org/10.54112/pjicm.v5i02.154]

		Need for blood transfusion	No	46	86.8%	38	100.0%	
		Wound infection	Yes	4	7.5%	3	7.9%	0.95
			No	49	92.5%	35	92.1%	
		Low APGAR score	Yes	5	9.4%	2	5.3%	0.46
			No	48	90.6%	36	94.7%	
	> 24.9	Uterine incision extension	Yes	16	27.1%	5	6.8%	0.001
			No	43	72.9%	69	93.2%	
		Need for blood transfusion	Yes	5	8.5%	4	5.4%	0.48
			No	54	91.5%	70	94.6%	
		Wound infection	Yes	7	11.9%	2	2.7%	0.03
			No	52	88.1%	72	97.3%	
		Low APGAR score	Yes	13	22.0%	6	8.1%	0.02
			No	46	78.0%	68	91.9%	
Age groups (years)	15 to 30	Uterine incision extension	Yes	17	24.3%	6	7.8%	0.006
			No	53	75.7%	71	92.2%	
		Need for blood transfusion	Yes	9	12.9%	3	3.9%	0.04
			No	61	87.1%	74	96.1%	
		Wound infection	Yes	8	11.4%	3	3.9%	0.08
			No	62	88.6%	74	96.1%	
		Low APGAR score	Yes	12	17.1%	5	6.5%	0.04
			No	58	82.9%	72	93.5%	
	> 30	Uterine incision extension	Yes	12	28.6%	4	11.4%	0.06
			No	30	71.4%	31	88.6%	
		Need for blood transfusion	Yes	3	7.1%	1	2.9%	0.39
			No	39	92.9%	34	97.1%	
		Wound infection	Yes	3	7.1%	2	5.7%	0.80
			No	39	92.9%	33	94.3%	
		Low APGAR score	Yes	6	14.3%	3	8.6%	0.43
			No	36	85.7%	32	91.4%	

Table 4: Stratification of comparison of fetomaternal outcomes between both groups with maternal parity and gravida

				Groups				**P value**
				Group A (Push technique)		**Group B (Pull technique)**		
				n	%	n	%	
Parity	Primiparous	Uterine incision extension	Yes	17	24.6%	8	11.0%	0.03
			No	52	75.4%	65	89.0%	
		Need for blood transfusion	Yes	7	10.1%	2	2.7%	0.07
			No	62	89.9%	71	97.3%	
		Wound infection	Yes	6	8.7%	4	5.5%	0.45
			No	63	91.3%	69	94.5%	
		Low APGAR score	Yes	13	18.8%	5	6.8%	0.03
			No	56	81.2%	68	93.2%	
	Multiparous	Uterine incision extension	Yes	12	27.9%	2	5.1%	0.006
			No	31	72.1%	37	94.9%	
		Need for blood transfusion	Yes	5	11.6%	2	5.1%	0.29
			No	38	88.4%	37	94.9%	
		Wound infection	Yes	5	11.6%	1	2.6%	0.11
			No	38	88.4%	38	97.4%	
		Low APGAR score	Yes	5	11.6%	3	7.7%	0.54
			No	38	88.4%	36	92.3%	
Gravida	Primigravida	Uterine incision extension	Yes	14	30.4%	5	10.4%	0.01
			No	32	69.6%	43	89.6%	
		Need for blood transfusion	Yes	6	13.0%	1	2.1%	0.04
			No	40	87.0%	47	97.9%	
		Wound infection	Yes	3	6.5%	2	4.2%	0.61
			No	43	93.5%	46	95.8%	
		Low APGAR score	Yes	6	13.0%	4	8.3%	0.45
			No	40	87.0%	44	91.7%	
	Multigravida	Uterine incision extension	Yes	15	22.7%	5	7.8%	0.01
			No	51	77.3%	59	92.2%	
		Need for blood transfusion	Yes	6	9.1%	3	4.7%	0.32
			No	60	90.9%	61	95.3%	

		Wound infection	Yes	8	12.1%	3	4.7%	0.12
			No	58	87.9%	61	95.3%	
		Low APGAR score	Yes	12	18.2%	4	6.2%	
			No	54	81.8%	60	93.8%	

DISCUSSION

Our results demonstrate a clear and statistically significant advantage for reverse breech extraction across several critical maternal outcome measures, while also suggesting a potential benefit for neonatal wellbeing.

The most pronounced finding in our study was the substantial reduction in the incidence of uterine incision extension when the pull technique was employed. We observed that extension occurred in 25.9% of cases managed with the push method compared to only 8.9% of cases where the pull method was used. Fasubaa et al. documented a 29.6% rate of uterine incision extension in the push group and approximately 11.1% in the pull group (14). Similarly, Veisi et al. reported uterine incision extensions in 68.6% of the push group and 8.1% in the pull group (15). The push method requires upward force against the baby's head, which is tightly wedged in the maternal pelvis, which can place a lot of stress on the lower uterine segment. Conversely, the pull method avoids this issue by converting the delivery into a breech extraction, applying traction along the longitudinal axis of the fetus and thus avoiding direct pressure on the uterine incision margins.

Closely linked to the issue of uterine trauma is operative blood loss. Our data indicated that the need for blood transfusion was significantly higher in the push group (10.7%) than in the pull group (3.6%). This finding aligns perfectly with the results from Fasubaa et al., who reported a mean operative blood loss of 1256.5 mL in their push cohort versus 898.4 mL in the pull cohort (14). The study by Nawaz et al. further corroborates this finding, noting a mean blood loss of 996.01 mL with the push method against 593.58 mL with the pull method (16). This association is logically consequent to the higher rate of surgical extensions; larger, complicated wounds inevitably lead to greater haemorrhage.

While our study did not find a statistically significant difference in wound infection rates, a trend was evident, with the push group experiencing a higher rate (9.8% vs. 4.5%). This trend aligns with the findings of Nooh et al., who observed a notable difference in wound infection rates between the pull and push groups. They documented lower wound infection rates for the pull group (13). Another study by Arsh et al. reported a wound infection rate of 14.12% in push deliveries compared to 4.71% in pull deliveries, although their result also bordered on significance (17).

From a neonatal standpoint, our analysis revealed a significantly lower incidence of low APGAR scores in infants delivered through the pull technique (7.1% vs. 16.1%). The forcible disimpaction of the head from the pelvis required in the push method may subject the fetus to a period of significant compression and potential hypoxia. Nooh et al. also documented similar findings, reporting that in 8.3% of infants, the APGAR score was < 7 at five minutes in the pull group, while 21.9% of neonates had an APGAR score < 7 at five minutes in the push group (13). Fasubaa et al. provided compelling evidence for this, reporting markedly lower mean APGAR scores at one minute (5.1 vs. 7.9) and five minutes (7.8 vs. 9.0) in their push group compared to the pull group (14). While other studies, such as the one by Veisi et al., found no significant difference in APGAR scores (15).

A notable strength of our investigation is the detailed reporting of baseline characteristics, which confirms that the groups were well-matched for factors such as parity, gravidity, and BMI. This strengthens the internal validity of our conclusions by reducing the likelihood that confounding variables influenced the observed outcomes. The parity distribution in our study, with roughly two-thirds of women being primiparous, is consistent with the known epidemiology of obstructed labour and second-stage cesarean sections, which disproportionately affect women undergoing their first birth (14, 16).

Our study, as well as the studies above, strongly support the superiority of the reverse breech extraction technique for delivering the deeply impacted fetal head at full cervical dilatation. It is associated with substantially less maternal trauma, reduced surgical blood loss, and a trend towards fewer infectious complications.

CONCLUSION

In conclusion, the pull technique exhibited better fetomaternal outcomes when compared to the push technique for the delivery of an impacted fetal head during the second stage of cesarean section.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRB- 572/LRH/MTI)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTION

SEHRISH AWAIS (Postgraduate Resident)

Conception of Study, Data Collection, Study Design, Review of manuscript, Manuscript drafting, and final approval of manuscript.

.SHAHZADI SAIMA HUSSAIN (Associate Professor)

Conception of Study, Critical Guidance and Supervision,and final approval of manuscript

REFERENCES

1. Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: global and regional estimates. BMJ Glob Health. 2021;6(6):e005671. https://doi.org/10.1136/bmjgh-2021-005671

2. Antoine C, Young BK. Cesarean section one hundred years 1920–2020: the Good, the Bad and the Ugly. J Perinat Med. 2021;49(1):5–16. https://doi.org/10.1515/jpm-2020-0345

3. World Health Organization. WHO statement on caesarean section rates. Geneva: WHO; 2015.

4. Ye J, Zhang J, Mikolajczyk R, Torloni MR, Gülmezoglu AM, Betran AP. Association between rates of caesarean section and maternal and neonatal mortality in the 21st century: a worldwide

population-based ecological study with longitudinal data. BJOG. 2016;123(5):745–53. https://doi.org/10.1111/1471-0528.13592
5. Betran AP, Torloni MR, Zhang J, Ye J, Mikolajczyk R, Deneux-Tharaux C, et al. What is the optimal rate of cesarean sections at the population level? A systematic review of ecologic studies. Reprod Health. 2015;12(1):57. https://doi.org/10.1186/s12978-015-0043-6
6. Larsson C, Djuvfelt E, Lindam A, Tunón K, Nordin P. Surgical complications after caesarean section: a population-based cohort study. PLoS One. 2021;16(10):e0258222. https://doi.org/10.1371/journal.pone.0258222
7. World Health Organization. Caesarean section rates continue to rise, amid growing inequalities in access. Geneva: WHO; 2021.
8. Chien P. Global rising rates of caesarean sections. BJOG. 2021;128(5):781–2. https://doi.org/10.1111/1471-0528.16666
9. Patel BS, Kedia N, Shah SR, Agrawal SP, Patel VB, Patel AB. Changing Trends in Cesarean Sections: From 1950 to 2020. Int J Reprod Contracept Obstet Gynecol. 2020;9(5):2222–6. https://doi.org/10.18203/2320-1770.ijrcog20201842
10. Jeve YB, Navti OB, Konje JC. Comparison of techniques used to deliver a deeply impacted fetal head at full dilation: a systematic review and meta-analysis. BJOG. 2016;123(3):337–45. https://doi.org/10.1111/1471-0528.13593
11. Vousden N, Cargill Z, Briley A, Tydeman G, Shennan AH. Caesarean section at full dilatation: incidence, impact and current management. Obstet Gynaecol. 2014;16(3):199–205. https://doi.org/10.1111/tog.12112
12. Waterfall H, Grivell RM, Dodd JM. Techniques for assisting difficult deliveries at cesarean sections. Cochrane Database Syst Rev. 2016;2016(1):CD004944. https://doi.org/10.1002/14651858.CD004944.pub3
13. Nooh AM, Abdeldayem HM, Ben-Affan O. Reverse breech extraction versus the standard approach of pushing the impacted fetal head up through the vagina in caesarean section for obstructed labour: A randomised controlled trial. J Obstet Gynaecol. 2017;37(4):459–63. https://doi.org/10.1080/01443615.2016.1256958
14. Fasubaa OB, Ezechi OC, Orji EO, Ogunniyi SO, Akindele ST, Loto OM, et al. Delivery of the impacted head of the fetus at caesarean section after prolonged obstructed labour: a randomised comparative study of two methods. J Obstet Gynaecol. 2002;22(4):375–8. https://doi.org/10.1080/01443610220141290
15. Veisi F, Zangeneh M, Malekkhosravi S, Rezavand N. Comparison of "push" and "pull" methods for impacted fetal head extraction during cesarean delivery. Int J Gynaecol Obstet. 2012;118(1):4–6. https://doi.org/10.1016/j.ijgo.2011.12.027
16. Nawaz S, Bibi S, Ejaz S, Shaheen T, Noor R, Waheed N. Comparison of pull breech out and push impacted head up techniques used to deliver a deeply impacted fetal head at full dilatation in emergency caesarean section. J Popul Ther Clin Pharmacol. 2025;32(3):793–8. https://doi.org/10.53555/zew47515
17. Arsh, Fatima SS, Hayat N, Liaqat N. Comparison of maternal infectious morbidity of two methods of fetal delivery during cesarean section at full cervical dilatation. J Saidu Med Coll Swat. 2024;14(3):205–9.

[Citation: Awais, S., Hussain, S.S. (2025). Comparison of fetomaternal outcomes of push vs pull technique in second stage cesarean section. *Pak. J. Inten. Care Med. 5(2), **2025**: 154*. doi: https://doi.org/10.54112/pjicm.v5i02.154]