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Original Research Article

Unravelling the Enigma of Impacted Fetal Heads: Exploring Causes, Caesarean Section Techniques, and Maternal-Fetal Outcomes in a Comprehensive Labor Study

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Abstract:

Background and Objective: The deeply impacted foetal head refers to the situation in which the fetal head cannot be delivered by usual manoeuvres during caesarean delivery because the head impacted deep within maternal pelvis and it is associated with increased maternal and foetal morbidity. Therefore, the primary objective of this case study is to identify the causes and associated risks of the deeply impacted head during cesarean delivery.

Method: in this study, 200 pregnant females with a singleton foetus whose head was deeply impacted in the pelvis and underwent cesarean section at the Department of Obstetrics and Gynecology, Sultania Zanana Hospital & Gandhi Medical College, Bhopal were enrolled for a period of 1 year (1 January 2021 - January 2022) for observational studies.

Result: the most common risk factor associated with an impacted foetal head was primigravida followed by malposition of foetal head. Whereas the most common cause of the deeply impacted head which was observed was Deep transverse arrest of the head.

Conclusion: the current study found various types of feto-maternal complications associated with deeply impacted heads during labor and how those complications can be arrested in advance by incorporating different techniques for foetal delivery.

Introduction

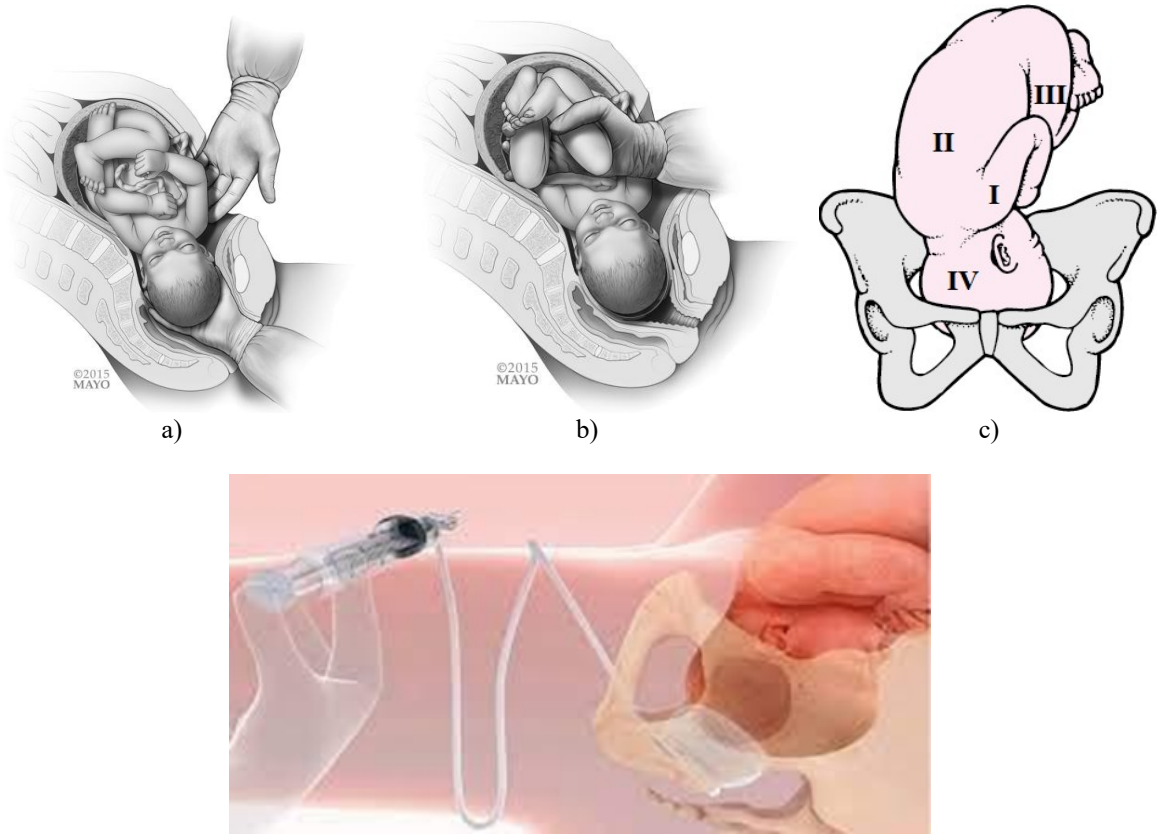
Cesarean birth rates have been increasing globally and currently, some regions have reported more than 40% of cesarean deliveries. Impaction of foetal head accounts for more than 1.5 % of all cesarean deliveries and it can be up to 25% in emergency cesarean deliveries in which the head cannot be delivered by usual maneuvers [1,2].

A deeply impacted foetal head typically results due to a prolonged second stage of labor. A deeply impacted head lacks space between the bony pelvis, pelvic muscle, and foetal head preventing the surgeon from putting a hand in to remove it from the pelvis [3]. To facilitate spontaneous vaginal birth without the aid of equipment or other procedures, the optimal management of the second stage of labor must be implemented. Tertiary care facilities are facing a surge in second-stage cesarean sections as a result of late referrals from primary and secondary health centers, practices of home delivery by traditional birth attendants, underuse of the available health services, and late referrals [4]. Due to the decline in instrumental births brought on by the rise in caesareans, more cases of previously manageable fetuses with deeply engaged heads in the pelvis undergoing cesarean procedures [5,6].

Delivering the foetus can be challenging during second-stage cesarean sections, which is typically caused by the head being severely engaged or even impacted. Various techniques have been described for delivery such as [4,7]:

A) conventional method: Delivering the deeply embedded foetal head by conventional method possess complications during second-stage cesarean operations, including the danger of incision extensions and potential harm to the foetal head, ureter, or uterine veins (3); B) push technique: The "push method" is a modification of the standard cesarean section in which the foetal head is delivered through the vagina with assistance from below, similar to the cephalic delivery method (2); C) Reverse breech extraction or pull technique: this involves gently pulling the foetus by grasping both feet through the uterine incision, to retrieve it in a cephalic presentation; D) The Patwardhan method: In occipital-anterior and transverse positions with a deeply impacted head, an incision is made in the

lower uterine segment at the level of the shoulders and foetus is delivered by hooking and bringing out the anterior shoulder first. E) Foetal Pillow: it is performed by Foetal Dis-impacting System which consists of a foldable base plate with a balloon attached to it which is inserted below the foetal head vaginally which elevates foetal head making it easier to deliver.



a) b) c)

d)

Figure 1: different delivery techniques a) The "push" disengagement technique technique in which an assistant's hand is inserted into the vagina and the fetal head is replaced superiorly using the palm of the hand; b) The "pull" disengagement technique, or reverse breech extraction, in which the surgeon reaches toward the upper uterine segment, grasps 1 or both fetal legs; c) The Patwardhan Manoeuvre -Shoulder first method. I-Both shoulders delivered first; II-Trunk delivered by flexion; III-Both legs delivered; IV-Delivery of Head; d) The 'Fetal Dis-impacting System' and 'Fetal Pillow'.

In a retrospective cohort study, Beeresh et al. [8] compared the maternal and newborn morbidities of the "Patwardhan" approach versus the "Push" method for extracting the deeply impacted head. This showed that in terms of uterine extension and other related problems, patients in the push group had statistically significantly higher rates of maternal morbidity. In another study by Manju Lal et al [9], they showed that there was significantly less uterine incision extension seen in Patwardhan group as compared to the Push method.

Attempts during assisted vaginal birth could lead to more severe foetal head impaction. Compared to forceps which is a traditional method, a vacuum extractor enables the pulling into the pelvis of larger head diameters. Additionally, a second-stage cesarean with a deeply wedged foetal head is not only technically challenging and distressing for the obstetrician, but it is also associated with a higher incidence of maternal and foetal problems [7,10,11].

Various complications associated with increased maternal morbidity are uterine incision extension, injury to surrounding structures, hematoma, hemorrhage, infection, tissue necrosis, fistula formation, and the need for a hysterectomy. The most distressing long-term complication is obstetrical fistulae, resulting from prolonged labor and impaction of the presenting part against the pubic symphysis. Whereas foetal complications include soft tissue damage, fractures, low APGAR scores, birth hypoxia, and admission to the newborn ICU unit [12]. Different anatomical changes take place in the second and third phases of labor that increase the likelihood of serious complications. Therefore, there is a pressing need to standardize the definition, guidance, and training for deeply impacted foetal head at cesarean section. Further

research should clarify the appropriate technique for IFH and establish consensus for the best practice.

Materials and Methodology

Data from prospective research were used for this analysis. This study was conducted at the Department of Obstetrics and Gynaecology, sultania zanana hospital & Gandhi medical college, Bhopal from January 2021 to January 2022.

Inclusion Criteria: The study includes all women who delivered by cesarean section and had foetal head deeply impacted in the pelvis.

Exclusion Criteria: all pregnant women with preterm deliveries, multiple gestations, previous cesarean section, malpresentation, and antepartum hemorrhage were excluded from this study.

Data collection was done after obtaining the ethics and intimating the patients with the relevant information related to this study for which informed written consent was obtained. For a total of 200 pregnant women enrolled in this study underwent cesarean section and faced difficulty in delivering foetal head. The demographic profile, detailed obstetric history, and risk factors for impaired foetal were noted for such patients.

During the intrapartum vaginal exam, details such as cervical dilatation, head station, position, and attitude of the head, as well as alcohol status, were noted and causes of foetal head were determined. Later, Intraoperative complications such as blood loss, Atonic PPH, the extension of uterine incision, bladder injury, and operative time were noted. Post-operative complications such as febrile illness, prolonged catheterization, UTI, and longer hospital stay were assessed according to Technique used to deliver IFH during LSCS. Indicators of the foetal outcome in terms of morbidity and death included the baby's condition at birth, Apgar scores, NICU admission, birth weight, neonatal issues, and mortality rate were noted.

For the data analysis, statistical software for social sciences (SPSS) version 23 was used to simultaneously collect, enter, and code the data. Charts and graphs were created and the analytical and inferential analysis was done where the significance was fixed at standard 0.05.

Table 1: distribution of patients according to socioeconomic status

Socio Economic Status	Frequency	Percentage (%)
Lower Class	73	36.5%
Upper Lower	60	30.0%
Lower Middle	44	22.0%
Upper Middle	15	14.5%
Upper Class	8	4.0%
Total	200	100%

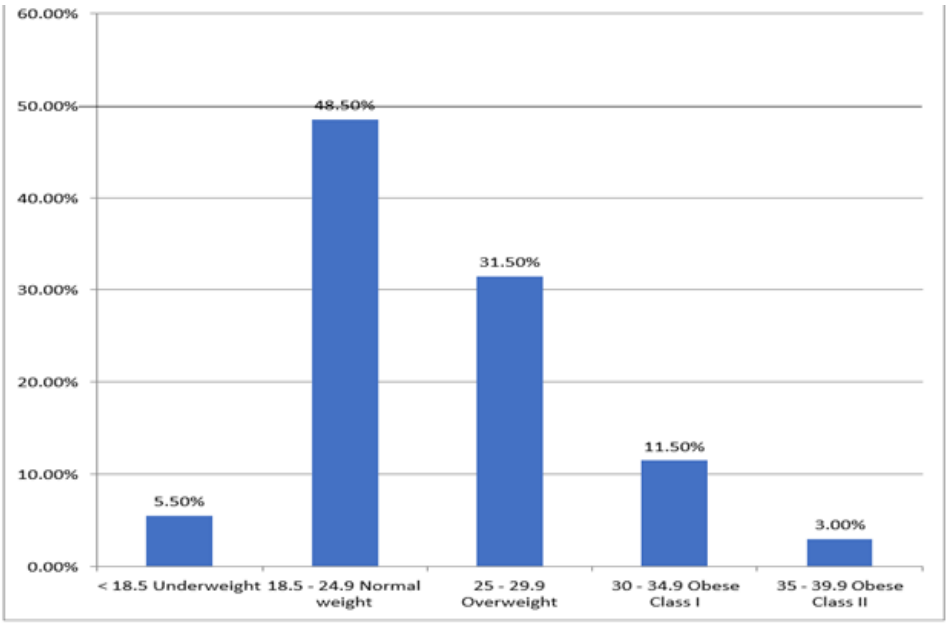


Figure 2: Distribution of patients according to BMI

In this study group of patients were divided according their obstetrics history, period of gestation, risk factor for impacted foetal head, per vaginal examination, labour progress, causes of impacted foetal head.

It was revealed that in impacted fetal head cases majority of women were primigravida that accounts for 66% of total patients as shown in table 2. The gestation age was significantly similar for both the groups i.e., 56% and 44% for 37 – 39^{+6} weeks and 40-42 weeks respectively.

Table 2: distribution of patients according to obstetrics history

Gravid state	Frequency	Percentage (%)
Primi Gravida	132	66%
Multi Gravida	62	31%
Grand Multi Gravida	6	3%
Total	200	100%

In our study we observed that out of 200 patients [132(66%)] were primigravida, [171/200(85.5%)] patients had malposition of foetal head as represented in fig 3. and per vaginal examination just before the delivery shows maximum number of patients [157/200(78.5%)] were in full dilatation, fetal head at +1 station in [104/200 (52%)] cases. According to the data shown in table 3, Deep transverse arrest of head was most common cause of impacted foetal head i.e., 39.5% followed by Direct occiput posterior position which accounts for 23.5% of the total patients.

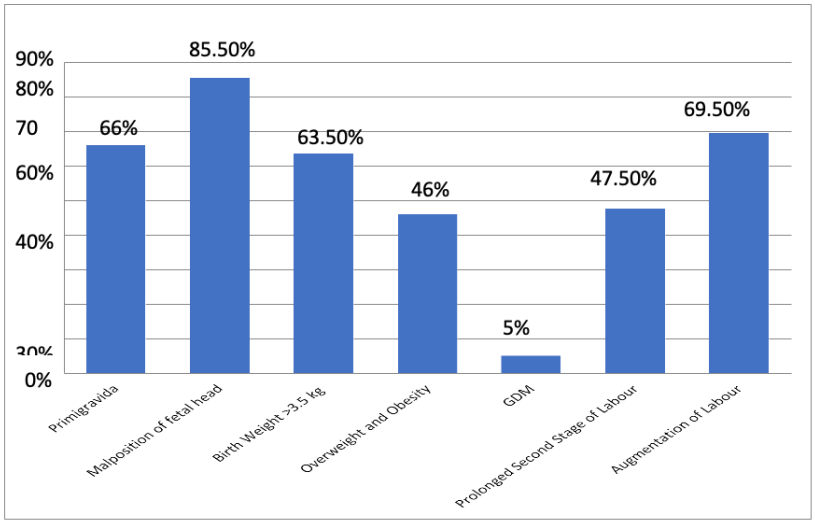


Figure 3: distribution of patients according to risk factor for impacted fetal head.

Table 3: distribution of patients according to causes of impacted fetal head.

Cause of Impacted Fetal Head	Frequency	Percentage
Cephalo-Pelvic Disproportion	29	23%
Deep Transverse Arrest	79	39.5 %
Direct Occiput-Posterior Position	47	23.5 %
Right occiput posterior	32	16%
Left occiput posterior	4	2%
Brow presentation	9	4.5%
Failed Assisted Vaginal Birth	4	2%

In lastly the patients were divided according to the technique used to deliver IFH during LSCS, intraoperative complications that were detected, postoperative complications, Apgar score and NICU admission in neonates

In majority of cases according to technique used to deliver the impacted head during caesarean section, it was found that Patwardhan technique was used most commonly [104/200 (52%)] as compared to other techniques such as push technique, foetal pillow etc as shown in table 4. The Intraoperative complications associated with caesarean pregnancies shows that [60/200(30%)] cases had extension of uterine incision, [40/200(20%)] cases had atonic PPH, [45/200(22.5%)] cases needed intraoperative blood transfusion, in [142/200(71%)] cases operative time was >1 hour, [8/200(4%)] cases had blood-stained urine (table 5).

Table 4: distribution of patients according to technique used to delivered ifh during lscs

Technique during LSCS	Frequency	Percentage (%)
Patwardhan	104	52%
Modified Patwardhan	22	11%
Reverse Breech Extraction	41	20.5%
Push Technique	33	16.5%
Fetal Pillow	00	0%
Murless head extractor	00	0%
Total	200	100%

Table 5: distribution of patients according to intraoperative complications

Complications	Frequency	Percentage(%)
Intraoperative Complications	105	52.5%
Blood Loss >1 Litre	45	22.5%
Blood Transfusion required	58	29 %
Atonic PPH	40	20%
Medical Management of PPH	40	20%
Surgical management of PPH	28	14 %
Extension and tear of uterine Incision	60	30.0%
Injury to bladder	1	0.5%
Blood-stained Urine	8	4.0%
Uterine Artery Laceration	22	11%
Upper segment Incision	9	4.5%
Operative time > 1 hour	142	71%

By comparing the distribution of intra-operative complications with different techniques used during LSCS. It was found that Intraoperative Complications were [54/104(51.9%)] during Patwardhan technique, Reverse breech [22/41(53.7%)], Push technique [18/33(54.5%)] and Modified Patwardhan technique [11/22 (50%)] as shown in fig 4. On comparing the intra operative complications with different techniques used during LSCS it was found that Blood loss, need of blood transfusion, Extension of uterine Incision, and Operative time > 1 hour was most seen with Push Technique (table 6). However, distribution of patients according to postoperative complications in 43.5% of patients suggested that [32/200(16%)] cases had febrile illness, [18/200(9%)] cases needed blood transfusion, [34/200(17%)] cases needed prolonged catheterization

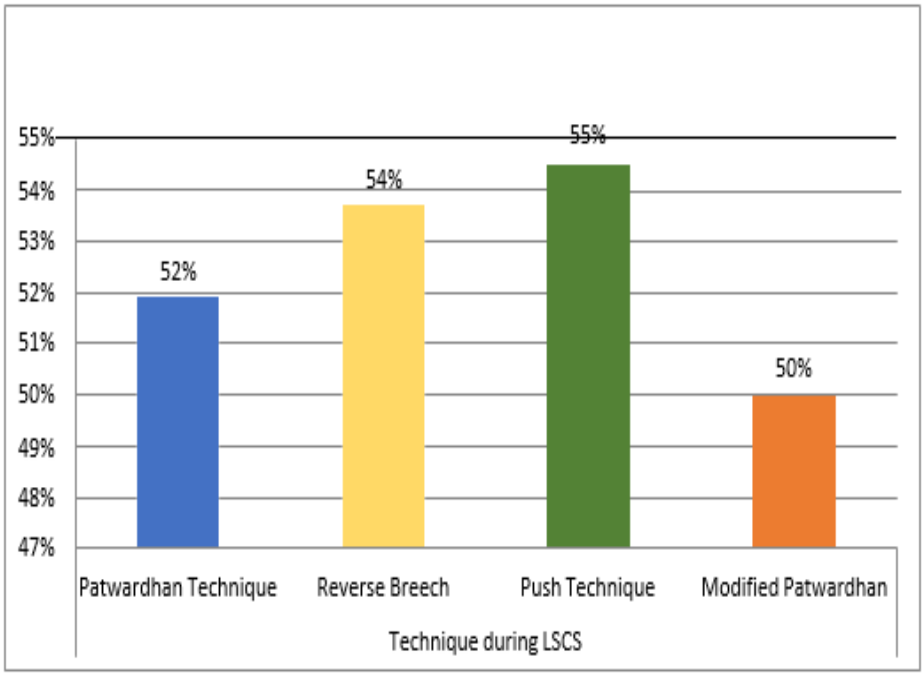


Figure 4 distribution of intra-operative complications and its comparison with different techniques used during LSCS

Table 6: distribution of intra-operative complications and its comparison with different techniques used during LSCS

	Technique during LSCS							
	Patwardhan Technique		Reverse Breech		Push Technique		Modified Patwardhan	
	frequency	Percentage	frequency	Percentage	frequency	Percentage	frequency	Percentage
Blood Loss >1 Litre	23	22.1%	9	22.0%	9	27.3%	4	18.2%
Blood Transfusion	30	28.8%	12	29.3%	10	30.3%	6	27.7%
Atonic PPH	22	21.2%	7	17.1%	6	18.2%	5	22.7%
Medical Management of PPH	22	21.2%	7	17.1%	6	18.2%	5	22.7%
Surgical management of PPH	15	14.4%	5	12.2%	4	12.1%	3	13.6%
Extension of uterine Incision	29	27.8%	13	31.7%	11	33.3%	7	31.8%
Injury to bladder	0	0%	0	0.0%	1	3.0%	0	0.0%
Blood-stained Urine	4	3.8%	2	4.9%	1	3.0%	1	4.5%
Uterine Artery Laceration	11	10.6%	4	9.8%	4	12.1%	3	13.6%
Upper segment Incision	0	0%	5	12.2%	3	9.1%	1	4.5%
Operative time > 1 hour	72	69.2%	29	70.7%	25	75.7%	16	72.7%

When distribution of neonates was done according to Apgar score and NICU admission it was revealed that (31.5%) cases needed NICU admission and Apgar score at both times i.e., at 1min and 5min 71% showed Apgar score at the range of 7-10 as shown in the table 7. Whereas Relationship between duration of second stage and APGAR Score at 1 min showed that amongst the mothers who had duration of second stage of labour more than 2 hours, [6/95(6.32%0] babies had severely depressed Apgar and [38/95(40%)] babies had moderately depressed Apgar.

Table 7: distribution according to apgar score and nicu admission in neonates

		Frequency	Percentage (%)
Baby Status at Birth	Alive	192	96%
	Still Born	8	4%
APGAR Score at 1 min	0 - 3	9	4.5%
	4 - 6	54	24%
	7 - 10	129	71%
APGAR Score at 5min	0 - 3	4	0%
	4 - 6	59	25%
	7 - 10	129	71%
NICU Admission	Yes	63	31.5%
	No	129	64.5%

Distribution of foetal and neonatal complications as depicted in fig 5 revealed that maximum percentage of newborn suffered with jaundice which accounts for 11% of total case studies.

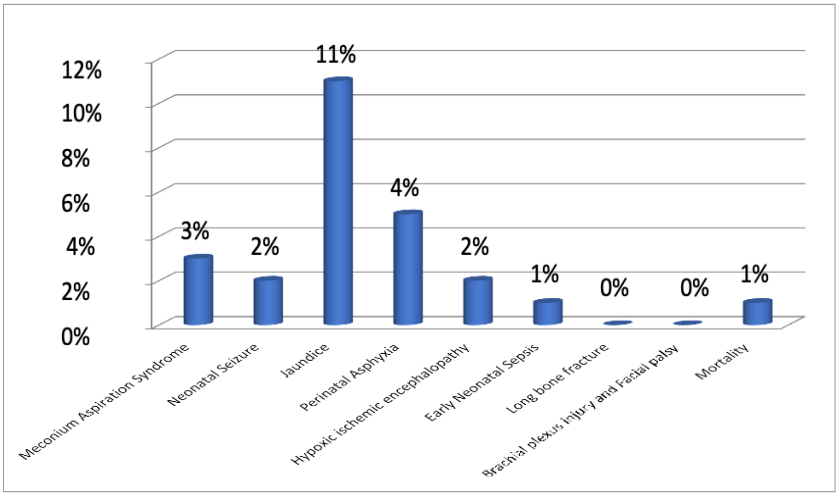


Figure 5: distribution of fetal and neonatal complications

Results

In this study, a group of patients was distributed according to various parameters which includes the division of patients initially based on their age group, residential area, and socioeconomic status.

The result showed the maximum frequency of patients under the age group of 18-24 years and out of 200 selected women 63% reside in the rural area. Table 1 and fig.2 represent the socioeconomic status and BMI of the patients respectively and it was observed in Table 1 that 36.5% of women were from lower economic status and 48.5% of patients had normal weight BMI whereas only 3.0% of the people fall under obese class II.

Statistical Analysis

The collected data was summarized by using frequency, percentage, mean & S.D. To compare the qualitative outcome measures Chi-square test or Fisher's exact test was used. To compare the quantitative outcome measures independent t test was used. If data was not following normal distribution, Mann Whitney U test was used. SPSS version 22 software was used to analyse the collected data. p value of <0.05 was considered to be statistically significant.

Discussion

The purpose of the current study was to examine the Foeto-maternal outcome in the case of a deeply impacted head during labor and the clinical manifestations associated with it. The statistical analysis was done with the study's goals and objectives in mind. The study's key findings are addressed below:

In the present study, the majority of the study participants (85/200, 42.5%) were in the age group of 18-24 years followed by 24-30 years [81/200(40.5%)] with a mean age was 25 ± 4 years which signifies that early marriage and lack of contraceptive devices are mainly responsible for early pregnancy and the data correlates with the studies that were performed earlier.

Socioeconomic status revealed that 36.5% (73 cases) and 30% (60 cases) of the patients belong to the lower and upper lower class respectively. Data for body mass index (BMI) showed that only 48% (97 cases) of the patient were in the normal BMI category whereas the rest of the patients fall under the overweight, underweight, and obese category.

Later on, the obstetric history of patients showed that the majority of the study participants were primi gravida (132, 66%), 62 i.e., 31% were multigravida and 3% (6 cases) were grand multi gravid. The increased frequency in primigravida could be due to cephalopelvic disproportion and lack of experience of previous labor. The risk factor which was commonly observed in the study was majorly due to the malposition of foetal head and it accounts for 79% of the total risk factor that was reported. The major cause of impacted foetal head in the current study was the deep transverse arrest of the head reported among 79 cases (39.5%) followed by the Right occiput posterior position (16%, 32 cases).

Cesarean section is difficult to perform when the head is deeply engaged as fetus is in a compromised state. Intraoperative disengagement of the foetal head continues to pose a challenge to obstetricians. In the current study pathwardhan technique was found to be commonly used in the patients (52%) followed by reverse breech extraction (20.5%). In cases with occiput anterior and transverse position Patwardhan technique was used commonly and in direct occiput posterior position reverse breech extraction was performed.

Long intervals between the skin incision and delivery also contribute to hemorrhage since difficult foetal extractions are frequently linked to an increased risk of bleeding. These challenging foetal extractions had adverse effects on the newborn such as an increment of neonatal umbilical arterial pH of 7.15. Alternative methods of delivering the fetus must be incorporated into standard obstetrical care for the benefit of both mother and child.

In the current study, it was shown that 22.5% (45 cases) required intraoperative blood transfusions, 30% (60 cases) had their uterine incisions extended, and 20% (40 cases) had atonic PPH. By analyzing combine data on the technique of delivery with that of complication rate it was shown that the push technique showed a higher complication rate whereas pathwardhan technique showed lower complications.

In the current study, when the LSCS technique was compared to intraoperative problems, intraoperative complications were most frequently seen with the push technique (54.5%), followed by the reverse breech technique (53.7%), Patwardhan technique (51.9%), and modified Patwardhan technique (50%). The most frequent complications of the push approach were blood loss, an extended requirement for blood transfusions, and incision site tears. With both the push technique and the reverse breech technique, blood-stained urine was seen.

Postoperative complications such as febrile illness (16%), blood transfusion (9%), and prolonged catheterization (17%) were commonly observed. The transmission of vaginal bacteria to the operative field may have contributed to higher rates of UTI and endometritis, as seen by postpartum fever.

Lastly, Data for fetal outcomes revealed that Stillbirth rate was 4% (8 babies). Profoundly depressed Nine (4.5%) newborns had an Apgar at one minute, and 63 (31.5%) needed to be admitted to the NICU. Babies with more than 3.5 kg weight

were 127 (63.5%), 30.5% weighted between 3-3.5 Kg, and 6% weighted between 2.5-2.9 Kg. However, (11%, 22) of the newborn had jaundice, (5%,8) had perinatal asphyxia, (2%,4) had hypoxic-ischemic encephalopathy. According to reports, neonatal morbidity is higher in terms of NICU admissions, foetal hypoxemia, and extended NICU stays. This is probably due to the increased foetal compromise brought on by lengthy labors.

Conclusion

The present study was conducted in a tertiary care center to evaluate various risk factors leading to deeply impacted head, different techniques used to deliver the baby along with feto-maternal outcomes in such pregnancies. The management of a deeply impacted foetal head during cesarean delivery possess challenging clinical scenario and poses a significant risk to both the mother and baby hence it is crucial to access and evaluate the women in labor for enabling appropriate obstetric intervention to minimize maternal and foetal complications. We can infer from the current study that no technique can be regarded as superior to another. Based on the patient's health and the specific obstetrician's knowledge of available treatments, the first line of treatment for an impacted foetal head at the time of cesarean delivery should be determined. Obstetricians should ideally be trained in various procedures and to provide safe intrapartum and neonatal care, it is important to integrate these techniques into day-to-day practice and training, especially for newly obstetrical professionals. For challenging cesarean surgeries, the education curriculum should incorporate training techniques such as case-based discussions, video analysis, and mini-clinical tests for improved results.

Declarations:

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Availability of data and material: Department of Obstetrics & Gynaecology Gandhi medical College Bhopal.

Code availability: Not applicable.

Consent to participate: Consent taken.

Ethical Consideration: There are no ethical conflicts related to this study.

Consent for publication: Consent taken.

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