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Maternal Morbidity Associated with Caesarean Delivery Without Labor Compared with Caesarean Delivery Following Induction of Labor at Term

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KEYWORDS
Induced labor; Cesarean section; Infant health and postpartum period

ABSTRACT

Introduction: The increasing use of elective interventions, such as elective caesarean birth and elective induction of labor, raises concerns about the potential maternal hazards in both present and future pregnancies. Over the past few decades, there has been a global surge in the prevalence of caesarean section procedures. The rates of Caesarean deliveries in developed nations are steadily increasing. The coordinates are and the reference code is R455. The prevalence of C-sections in India increased from 17.2% in 2016 to 21.5% in 2021.

Aims: To estimate the maternal morbidity associated with cesarean deliveries following Induction of labor.

Materials and Methods: It was a comparative study, this study was conducted from December 2021 to December 2022 at the department of Obstetrics and gynecology KPC medical college and Hospital. 600 patients were included in this study.

Result: We found no significant difference in peripartum blood transfusion rates between Groups A (Emergency LSCS Following Induction of Labor) (1%) and Group B (Elective LSCS) (0.75%) (P=0.7516). Group A had a 4.5% early postpartum hemorrhage (PPH) rate compared to Group B's 0.05% (P=0.0047). Group A's 3.5% wound infection rate was significantly greater than Group B's 1% (P=0.04). These findings emphasize the necessity for careful assessment and management of maternal morbidity due to its varied effects.

Conclusion: This study confirms the importance of making well-informed decisions in obstetric care and has the potential to improve clinical practices for providing the best possible maternal care in comparable situations. This study establishes the foundation for future investigations and practical recommendations focused on mitigating maternal morbidity linked to cesarean deliveries after unsuccessful induction

INTRODUCTION

As elective interventions such as elective caesarean delivery and elective induction of labour becomes more commonly performed the implications for maternal risks in the current and in future pregnancies gain importance. Past few decades have witnessed a worldwide increase in caesarean section rates. Caesarean delivery rates in industrialized countries continue to rise.(1,2,R455). The present data shows that in United States, 1.2 million or 29.1 percent of life births were by c-section delivery in

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the year 2004 (NIHS, 2006). Country like India there is an increasing trend of c-section delivery with increase in the institutional deliveries and growing access to gynaecological and obstetric care. A study by Indian Council of Medical Research (ICMR) in 33 tertiary care institutions noted that the average caesarean section rate increased from 21.8 percent in 1993-'94 to 25.4 percent in 1998-'99 (3,Kambo et al. 2002). Today the rates of caesarian section vary widely by country, health care facility and delivering physician, partly because of differing perceptions by health care providers as well as by pregnant women of its benefits and risks. (3-7R455).The relative safety of caesarian delivery and its perceived advantages related to vaginal delivery have resulted in a change in the perceived risk benefit ratio, which has accelerated acceptance.(1,4-12 455R). Indeed, a belief has become widespread that the risks caesarian delivery for healthy women are so low as to make it a reasonable elective option for childbirth.(1,4,12-19r 455). The increased rate of caesarian section has resulted from evidence based recommendations on how to handle certain conditions, such as anomalous foetal position, major placental abruption, placenta praevia and prolapsed cord, however it is mainly the consequence of a growing number of women presenting at labour with uterine scars, delivering at advanced ages, and also due to increased rate of elective caesarean section. Still the increased frequency of obstetrics interventions, such as induction of labour, appears to have contributed to the current trends in caesarian rates. (9,1756R)

Incidence of caesarian delivery for healthy women with no clear medical or obstetrical indications are raising dramatically. It is mainly due to the growing number of women demanding by her own choice to her physician to perform caesarean section to terminate the pregnancy. When a woman requests a CS because she has anxiety about childbirth. For women requesting a CS, if after discussion and offer of support (including perinatal mental health support for women with anxiety about childbirth), a vaginal birth is still not an acceptable option, offer a planned CS. Such phenomenon of women choosing to deliver by caesarean section in the absence of any medical indication is most popularly known as caesarean by choice. Caesarean delivery on maternal request (commonly known as CDMR) is a medically unnecessary indication for caesarean section. There is, therefore, a pressing need to assess the risks of maternal complications and death associated with elective cesarean delivery carried out in healthy women. Although the difference of absolute risk is small, the risks of severe maternal morbidity associated with planned cesarean delivery are higher than those associated with planned vaginal delivery. These risks should be considered by women contemplating an elective cesarean delivery and by their attending physicians.[1]

MATERIALS AND METHODS

Study Design:

It was a comparative study, this study was conducted from April 2021 to December 2022 at the department of Obstetrics and gynaecology KPC medical college and Hospital.

Sample size:

600 patients were included in this study.

Group-A: 200 Emergency LSCS Following Induction of Labor

Group-B: 400 Elective LSCS

Statistical Analysis:

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired testsA chi-squared test ($\chi 2$ test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate.

Explicit expressions that can be used to carry out various *t*-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a *t*-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test.

Once a *t* value is determined, a *p*-value can be found using a table of values from Student's t-distribution. If the calculated *p*-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01

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level), then the null hypothesis is rejected in favour of the alternative hypothesis.

P-value ≤ 0.05 was considered for statistically significant.

RESULTS

Table association between groups with all parameters

		Group- A(n=200)	Group- B(n=400)	P-Value
MATERNAL AGE IN YEARS	<25	179	301	0.7879
	26-30	21	72	
	31-35	0	25	
	>35	0	2	
	Mean ± SD	21.95±2.18	22.03±3.91	
WEIGHT IN KG	55-60	125	228	0.2761
	61-65	72	142	
	66-70	3	30	
	>70	0	0	
	Mean ± SD	60.74±1.84	60.96±2.54	
GESTATIONAL AGE (IN COMPLETED WEEKS)	37	2	7	0.0844
	38	13	52	
	39	63	189	
	40	55	109	
	41	53	43	
	>41	14	0	
	Mean ± SD	39.51 ± 1.0844	38.67 ± 0.8400	
Baby birth weight in grams	2000-2499	13	18	0.1180
	2500-2999	149	275	
	3000-3500	37	107	
	>3500	1	0	
	Mean ± SD	2779 ± 279.5	2814 ± 246.7483	

Table association crude comparison of maternal morbidity in women of both groups

MATERNAL MORBIDITY	Group- A(n=200)	Group- B(n=400)	RR	CI(95%)	P VALUE
Intraoperative complications	4(2%)	3(0.75%)	0.3000	0.06755-1.3284	0.1128
Blood transfusion	2(1%)	3(0.75%)	0.7516	0.1263-4.4525	0.7516
Early PPH	9(4.5%)	2(0.05%)			0.0047
Puerperal pyrexia	3(1.5%)	2(0.5%)	0.3333	0.0561-1.9789	0.2267
Wound infection	7(3.5%)	4(1%)	3.5	1.0367-11.8162	0.0436

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Evacuation of haematoma	1(0.5%)	1(0.25%)	0.5000	0.0314-7.9527	0.5000
Composite morbidity	3(1.5%)	1(0.25%)	0.1667	0.0175-1.5921	0.1667

This is a small study to compare maternal morbidity among 2 groups. In Group- Awe selected
200 women who undergone caesarian section due to failed induction. And in Group- B we selected 400 women on whom elective caesarian section was performed.
In both groups all the women are nulliparous and at term (between 37-42 completed weeks) with live born, singletone foetus and without major congenital anomaly. In both groups there was no medical or obstetrical complications among the women. All the subjects were carefully selected and included in this study only when they satisfied inclusion criteria and had no exclusion criterias of each of the group.
In Group- A total 200women were induced with cerviprime gel. Among 200 women 76(38%) women received single cerviprime gel and 124(62%) women received double cerviprime gel.
Among the 200 women most commonly induction performed for prelabor rupture
Membrane (60%), postdated pregnancy (31.5%), and elective induction (8.5%). In this group
Caesarian section most commonly performed due to foetal distress (44.5%), induction
Failure (25%), non-progress (23%) and obstructed labor. In Group- B among the 400 women elective caesarian section most commonly performed due
tocephalo pelvic disproportion(42.5%) ,breech(25.75%) presentation .other indication were elderly primi,high floating head and valuable baby. There were no caesarian delivery performed without a medical or obstetric reason Maternal and infant characteristics for women having a cesarean delivery with no labor and caesarian delivery following failed induction are summarized in Table below. The proportion of women receiving intrapartum antibiotics and choice of anesthesia were not significantly different in the 2 groups.
The above table showing the mean age of delivery in Group- AIS 21.95 years.and the mean age of delivery among Group- B is 22 years. The difference in mean value of maternal age among the two groups are clinically non-significant.

As we can see from above table that maximum number of women undergoing caesarian delivery in Group- A and Group- B comprising within55-60 kg. And the difference in mean value of maternal weight among the two groups show clinically nonsignificant. Table 3 shows gestational age wise frequency distribution of Group- A and Group- B.from the table we can see that in Group- A maximum number of induction took place after 39 completed weeks .and in Group- B maximum number of caesarian delivery took place after 39 completed weeks. And the average gestational age in both groups are 39 weeks. The difference of mean gestational age between the two groups are clinically non-significant.
The above table shows in Group- A among 200 newborn 149 weighing between 2500-2999.and maximum birth weights in Group- A is 3600grams. And minimum birth weight in Group- Ais2100grams and 275 out of 400 new in Group- B between 2500 upto2999.and the maximum foetal weight in Group- B is 3500grams and minimum foetal weight is .2000grams. There were no maternal deaths or maternal re-admissions in either the study group or the comparison group. No patients in the cesarean delivery of both group were transferred to a general hospital for intensive care unit or readmitted during the post-partum period. No venous thromembolism occurred nor any per partum hysterectomy performedon any of the 600 patients
In Group- A where caesaraian section done in cases of failed induction among 200patients only 26 patients (13%) had suffered from complications. And rest 174 patients had no complications. The most common complications in Group- A Iearly post-partum haemorrhage followed by wound infections and intraoperative complications. It is seen that multiple complications (like PPH, wound infection, h/o blood transfusion) occurred simultaneously in few patients.
From table 6 we can see among the 400 patients in Group- B that is on whom elective caesarian section performed only 1 patients had complications (3. 5%). Among them most common complications are wound infection (1%).

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In both groups intraoperative complications comprises of laceration or tear of uterine artery, severe extention of uterine angle, and injury to bladder, bowel and ureter. As we can see from above table in both group there is no injury occurred to bowel, bladder or ureter. In group-B in elective caesarian section group there was no extention of uterine angle. Among the 400 patients in Group- B only 3 patients (0.75%) had uterine artery laceration or tear. In Group- A among 200 patients only 1 patient had severe extention of uterine angle and 3 patients had laceration or tear of uterine artery.

The rates of peripartum blood transfusion, febrile morbidity, evacuation of hematoma and intraoperative trauma are comparatively low in both the groups Peripartum blood transfusion required in Group- A is 2 out of 200 (1%), whereas in Group- Bits 3 out of 400 (0.75%), though these values are not statistically significant.(P=0.7516) The incidence of early PPH is higher in Group A (4.5%) as compared to only 0.05% in Group- Band these values are statistically significant (P= 0.0047). The rate of wound infection is much lower in Group B(1%) as compared to 3.5% in Group- A and these values are statistically significant (P= 0.04)

DISCUSSION

Although a positive correlation between induction rates and caesarean rates at the hospital level has been reported, to the best of our knowledge no studies have addressed the differences between obstetric units for the risk of surgical delivery after induction, taking into account the potential differences in their case mixes.

In the present study, we examined outcomes of nulliparous women undergoing elective induction of labor and compared these outcomes to women arriving in spontaneous labor. We found the rates of cesarean delivery were higher in nulliparous women who underwent elective induction of labor.

In regard to patient preference and autonomy, Out et al [2] reported that up to 50% of women would choose elective induction based on psychological reasons and past obstetric complications. Knoche et al [3] reported that nearly 58% of women stated that “getting the pregnancy over with” was their motivation for the use of elective induction, while only 33% wanted to avoid medical induction. We would hope that no prudent practitioner or patient would go ahead with elective induction of labor with an unfavorable cervix unless sufficient time is to be allotted for cervical ripening.

To our knowledge, there has been no randomized study comparing mode of delivery in women undergoing elective induction of labor to women in spontaneous labor. In addition, the definition of failed induction remains undefined. Neither Gabbe Obstetrics, Williams’ Obstretrics, nor the American College of Obstetricians and Gynecologists (ACOG), has defined failed induction [4,5]. Rouse et al [6], proposed a criteria for failed induction in 2000. In 2011, the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) and Maternal-Fetal Medicine Units Network (MFMU) reported making failed induction an objective diagnosis, but they too acknowledge that causation could not be established due to labor management that was not standardized [7]. At the time of this writing, no standard definition for failed induction has been adopted. Despite several attempts at standardization, labor management has significant variation. We too caution the readers of this study and other studies that examine elective induction to avoid confusing association and cause. While elective induction of labor appears to increase rates of cesarean delivery, the exact mechanism to account for this increase remains unclear. A randomized trial is needed to confirm causation.

It is well recognised that labour induction increases the risk of surgical delivery [6], but it is unclear whether such risk is avoidable. Major indications for labour induction, such as chronic or gestational hypertension and diabetes are themselves risk factors for caesarean section among women with spontaneous labour onset. These conditions also increase the likelihood of caesarean section when labour is induced, and the same is true for foetal growth restriction. Furthermore, pregnancy duration beyond forty weeks increases the risk of longer labour, dystocia and foetal distress and, consequently, the risk of caesarean section as well [8]. Risks of cesarean delivery with induction of laborfor post mature pregnancy and other indications are well established Still, as maternal age and BMI [9] increase, the likelihood of caesarean delivery also increases.

Failed induction (e.g., the inability to achieve the active phase of labour) is a reason pointed to perform a caesarean section, but there are no standardized criteria to diagnose it. Instead, the definition of failed induction diverges across settings, regarding either the cervical status that marks the transition from the latent to the active phase of labour or the time-interval to consider

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that such transition failed, which variation is particularly evident, ranging between 8 and 48 hour [10,11]. When there was no medicalor obstetric indication for induction, Maslow et al(6 THESIS) found a 2-fold increased risk for cesarean delivery inelectively induced parous and nulliparous women compared with women with spontaneous onset oflabor and also showed increased pre delivery time and costs. Vahratian et al (5 TH) evaluated electively inducednulliparous women and determined that an unfavorable cervix was associated with a 3.5-fold increased risk of cesarean delivery compared with those women with spontaneous onset of labor.

In our study the patient included for induction are - Singleton pregnancies, Gestational age (37-42 week-as detected by 1st trimester ultrasonography), Vertex presentation, Normal fetal heart rate (140to 160), Cervix may be favorable or non-favorable .

According to the obstetric guidelines, when no clear indication for induction is identified, the selection of women undergoing induction of labour should be based on favourability ofcervix [7], and the use of cervical ripening agents should be considered when cervix is not favourable. As a determinant of successful induction, the Bishop score has been commonly used to evaluate cervical status before induction, but there is a wide variation across settings regarding the cut-off point of this score to define a favourable cervix [11]

Evidence for maternal and neonatal risks associated with elective cesarean delivery is mostly derived from evaluation of outcomes after elective repeat cesarean delivery compared with trial of labor or planned cesarean delivery for breech presentation compared with planned vaginal breech delivery at term, which have demonstrated no differences in serious maternal morbidity. Previous work using data from a low-risk population similar to the one in this study demonstrated a significant reduction in risk of maternal infectious, hemorrhagic, and traumatic morbidity when cesarean delivery without labor was compared with spontaneous onset of labor [12]

This study evaluated maternal morbidity and mortality in 2 groups of pregnant women at term, those undergoing either cesarean delivery without labor or cesarean delivery following induction of labor. No morbidity associated with cesarean delivery without labor was increased compared with induction of labor. The rates of adverse maternal outcomes are identified in this study are not significant and are consistent with other studies.

In our study the group consisting of cesarean delivery after induction of labour (Group A) showed that the intraoperative complications like extension of uterine angle and laceration of uterine artery were more than the second group that is cesarean delivery due to elective causes (Group B), although the results could not be substantiated statistically. The rate of blood transfusion and the febrile morbidity was less among the women where cesarean delivery without labour took place as compared to the cesarean after induction group (Group A). In particular the reduction in risk of composite maternal morbidity was again demonstrated for ceasarean delivery without labour when compared to cesarean delivery in labour and the results obtained were also substantiated statistically insignificant. A statistically significant difference was observed in cases of early PPH and wound infection when cesarean delivery without labour was compared with cesarean delivery following induction of labour, after adjusting for the potential confounders. Similar Study found by **Oladapo OT et al [13] (2007)** found that a total of 164 elective Caesarean sections were performed out of 6882 deliveries (2.4%). All morbidities were more frequents among women who had elective Caesarean section compared to those who had vaginal deliverys but only peripartum blood transfusion (11.6 vs 5.6%),

This study highlights the magnitude of the increased risks of adverse maternal outcomes associated with induction of labor and, in fact, any type of labor compared with cesarean delivery without labor, especially when operative delivery in labor becomes necessary. The long-term complications associated with occurrence of these adverse outcomes and implications for future reproductivity warrants further study.

This study was done with the help of history taking, clinical examination noting the bed head ticket findings. Some of data like Bishop's score and BMI of patients are not included in comparison.

This study does not include fetal neonatal and infant morbidity or mortality, the effects of multiparity, the effect of previous cesarean section on morbidiy, the costs of induction or long term maternal outcomes associated with induction of labor.

The morbidities in two groups of pregnant women at term are evaluated but the morbidities are not substantially different in the two groups.

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CONCLUSION

Group- A included women who had a cesarean section because induction failed, and Group- B included women who had a cesarean section because it was their choice. The study compared the two groups' rates of maternal morbidity. Group- A had a higher rate of maternal complications, such as intraoperative complications, wound infections, and early postpartum hemorrhage. Complication rates, especially those associated with wound infections, were lower in Group B. Significant differences in the rates of early postpartum hemorrhage and wound infections were found by the statistical analysis between the two groups.

In order to decrease maternal sickness and improve obstetric outcomes, our data highlight the importance of carefully evaluating the technique of delivery, especially in cases where induction fails. This study highlights the significance of making educated decisions in obstetric care and could lead to better clinical procedures in similar scenarios, allowing for the best possible maternal care. The findings of this study lay the groundwork for more research into the causes of maternal morbidity following unsuccessful induction attempts and for concrete suggestions on how to reduce this risk.

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