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INDICATIONS OF CAESAREAN SECTION IN PRIMIGRAVIDAS WITH INDUCED LABOUR

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ABSTRACT

Background: Induction of labour is a common obstetric practice, especially in post-term pregnancies. Primigravidas undergoing induction are at increased risk of operative delivery due to unfavourable cervical conditions and variable labour responses. Understanding the specific indications leading to Caesarean section in this population is crucial for improving obstetric decision-making and maternal–fetal outcomes.

Objective: To determine the frequency of Caesarean section among primigravidas undergoing induction of labour and to identify the major indications associated with operative delivery.

Methods: This descriptive case series was conducted over three months in the Department of Obstetrics and Gynaecology at a tertiary-care hospital. A total of 150 primigravida women aged 21–38 years, with gestational age between 40 and 40+6 weeks, were enrolled through consecutive sampling. Induction was performed using standard pharmacological and mechanical methods. Baseline demographics, Bishop scores, labour progression, mode of delivery, and primary indications for Caesarean section were recorded. Data were analyzed using SPSS version 21 and presented as means, frequencies, and percentages.

Results: Of the 150 induced primigravidas, 96 (64%) delivered vaginally and 54 (36%) underwent Caesarean section. The most common indications for Caesarean delivery were fetal distress (37%), cephalopelvic disproportion (26%), failure to progress (22%), failed induction (11%), and maternal request (4%). Vaginal deliveries were associated with earlier cervical ripening, whereas Caesarean cases showed slower progression and greater need for augmentation. Maternal and neonatal outcomes were largely favourable.

Conclusion: Caesarean section is relatively frequent among induced primigravidas, predominantly due to fetal distress, cephalopelvic disproportion, and labour arrest disorders. Optimizing cervical assessment and enhancing intrapartum monitoring may help reduce avoidable operative deliveries.

Keywords:
Induced labour, Primigravida, Caesarean section, Fetal distress, Cephalopelvic disproportion, Failed induction

INTRODUCTION

Induction of labour is one of the most commonly performed obstetric interventions worldwide, and its frequency continues to rise due to evolving maternal characteristics, increasing use of evidence-based obstetric protocols, and broader availability of induction methods [1]. The procedure is defined as the artificial initiation of uterine contractions before their spontaneous onset, with the intention of achieving a vaginal delivery when continuation of pregnancy poses potential risks to the mother or the fetus. Historically, the concept of inducing labour dates back to Hippocrates, who proposed rudimentary methods such as mechanical cervical stimulation, but modern induction practices have become highly standardised with the introduction of prostaglandins, oxytocin, and mechanical cervical ripening devices [2].

Over the last two decades, global rates of labour induction and Caesarean section (CS) have risen simultaneously. In the United Kingdom, for example, the prevalence of CS increased from 19.7% in 2000 to 26.2% in 2015 [3]. Similar trends have been reported across Europe, North America, and low- and middle-income countries, where induction is frequently undertaken for conditions such as gestational diabetes, hypertensive disorders of pregnancy, post-term gestation, premature rupture of membranes, suspected fetal compromise, and advanced maternal age. Although many of these indications are supported by strong evidence, others such as suspected macrosomia or maternal preference have more controversial clinical justification [4].

Primigravidas represent a particularly high-risk group within the population undergoing induction. Compared to multigravidas, they have a less favourable cervical profile, are more likely to exhibit poor labour progression, and are significantly more prone to intrapartum complications [5]. Numerous studies have demonstrated that induction of labour in nulliparous women leads to substantially higher rates of Caesarean delivery, especially when the cervix is unfavourable at the onset of induction. Reported CS indications in this context include fetal distress, failed induction, cephalopelvic disproportion (CPD), and failure to progress each contributing to variability in outcomes among hospitals and populations. In some cohorts, fetal distress alone accounts for up to 13% of CS cases, while failure to progress and CPD account for nearly one-third of cases combined [6].

The rising rates of Caesarean section remain a major public health concern. Compared with vaginal birth, CS is associated with increased maternal morbidity including greater blood loss, infection, thromboembolic events, and longer recovery periods and higher neonatal risks such as transient tachypnea and NICU admissions [7]. On a broader scale, unnecessary Caesarean deliveries burden health systems through increased cost, reduced resource availability, and potential long-term complications such as abnormal placentation in subsequent pregnancies. Each year, nearly one-third of the 18.5 million Caesarean sections performed globally are estimated to be non-medically indicated, highlighting the need for careful evaluation of interventions that may predispose to operative delivery [8].

In Pakistan, where the use of labour induction is common and CS rates continue to rise, there is a critical need to examine specific determinants of Caesarean delivery among primigravidas undergoing induction. This population often experiences longer labours, greater fetal monitoring challenges, and reduced cervical favourability, all of which may contribute to increased operative births. However, local data describing the exact indications for CS following induction in primigravidas remain limited [9].

Understanding these indications is essential for improving clinical decision-making, standardising induction protocols, counselling families, and reducing avoidable surgical intervention. Therefore, this study aims to determine the frequency and major indications of Caesarean section among primigravidas undergoing induction of labour at a tertiary-care hospital [10].

MATERIALS AND METHODS

Study Design

This study was conducted as a descriptive case series aimed at determining the major indications of Caesarean section among primigravidas undergoing induction of labour. The descriptive case-series design was selected because it allows detailed documentation of clinical characteristics and outcomes within a defined population without intervention or randomisation, making it appropriate for assessing real-world obstetric practices.

Study Setting

The study was carried out in the Department of Obstetrics and Gynaecology at Ittefaq Hospital (Trust), Lahore. This tertiary-care centre manages a high volume of obstetric cases and follows standardized labour induction protocols, which ensured uniformity in clinical management, monitoring, and data collection procedures throughout the study.

Study Duration

The total duration of the study was three months, beginning immediately after approval from the Institutional Ethical Review Committee. All eligible primigravida women admitted for induction of labour during this three-month period were consecutively enrolled and followed from induction to final mode of delivery.

Sample Size and Sampling Technique

A total of 150 primigravidas were included in the study. The sample size was selected based on expected proportions of Caesarean deliveries among induced primigravidas and ensured adequate statistical representation within the limited study duration. A non-probability consecutive sampling technique was used, meaning that all primigravida patients fulfilling the eligibility criteria and admitted for induction during the study period were included until the target number was reached. This method minimized selection bias and reflected the natural flow of patients in the labour ward.

Inclusion and Exclusion Criteria

The study included primigravida women aged between 21 and 38 years, at a gestational age of 40 weeks to 40+6 days, and planned for induction of labour based on medical or obstetric indications. Only those who consented and completed the induction process were included. Exclusion criteria were established to eliminate confounding conditions that could independently increase the likelihood of Caesarean delivery. These included multiple pregnancy, oligohydramnios with an amniotic fluid index of 5 or less, fetal malpresentation, and preterm premature rupture of membranes. Excluding these conditions ensured that the indications for Caesarean section were primarily associated with the induction process rather than pre-existing complications.

Data Collection Procedure

Data collection began with the identification of eligible primigravidas at the time of admission to the labour room. After providing study information, written informed consent was obtained. A structured proforma was used to record

patient demographics, socioeconomic status, obstetric history, gestational age, and cervical favourability assessed through the Bishop score.

Induction of labour was conducted according to hospital protocol and involved pharmacological agents such as prostaglandins (misoprostol or dinoprostone), mechanical methods such as Foley catheter insertion when indicated, and oxytocin augmentation in cases where cervical ripening or uterine activity was insufficient. Labour progression was monitored continuously through assessment of cervical dilation, effacement, uterine contraction patterns, maternal vital signs, and fetal heart rate tracings. Any intrapartum complications were documented promptly.

Once delivery occurred, the mode of delivery was recorded as either vaginal or Caesarean section. In cases where Caesarean section was performed, the primary indication was documented exactly as observed, including fetal distress, cephalopelvic disproportion, failure to progress, failed induction, or maternal preference. This systematic documentation enabled clear identification of patterns and determinants leading to operative delivery among induced primigravidas.

Data Analysis

Data were entered and analysed using SPSS version 21. Quantitative variables such as maternal age and gestational age were expressed as mean ± standard deviation, whereas categorical variables including mode of delivery and indications for Caesarean section were presented as frequencies and percentages. Stratification was carried out to control for potential effect modifiers such as maternal age, socioeconomic group, and Bishop score. The Chi-square test was applied to assess statistical associations, and a p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study received ethical approval from the institutional review committee of Ittefaq Hospital. All participants provided informed written consent prior to enrolment. Confidentiality and anonymity of patient information were strictly maintained, and no procedure beyond standard obstetric care was performed, ensuring compliance with ethical research practices.

RESULTS

Maternal and Baseline Characteristics

A total of 150 primigravida women induced for labour over the three-month study period were included in the final analysis. The mean maternal age was 26.4 ± 3.5 years, with the majority clustered between 23 and 30 years. All women fulfilled the clinical criteria for induction at or beyond 40 weeks, resulting in an overall mean gestational age of 40.5 ± 0.3 weeks at the time of induction. Socioeconomic assessment showed that 61% of patients belonged to the lower socioeconomic group, whereas 39% represented the middle socioeconomic class. Cervical assessment at the time of admission revealed that 59% of women had an unfavourable Bishop score, whereas 41% had a relatively favourable cervix. The predominance of unfavourable cervices at the time of induction played an important role in determining the direction of labour progression and ultimately influenced the mode of delivery. The detailed baseline characteristics are presented in Table 1.

Table 1. Baseline Characteristics of Study Participants

Variable	Mean ± SD / n (%)
Maternal Age (years)	26.4 ± 3.5
Gestational Age (weeks)	40.5 ± 0.3
Lower Socioeconomic Class	92 (61%)
Middle Socioeconomic Class	58 (39%)
Unfavourable Bishop Score	88 (59%)

Mode of Delivery:

Out of the total 150 primigravidas who underwent induction of labour, 96 women (64%) achieved vaginal delivery, while 54 women (36%) required Caesarean section. The Caesarean section rate observed reflects the expected operative delivery risk frequently associated with induction among nulliparous women, particularly when the cervix is initially unfavourable. Vaginal deliveries included both spontaneous and augmented labours, with augmentation typically requiring oxytocin infusion in women whose contractions were inadequate or irregular. In contrast, women who underwent Caesarean section frequently demonstrated delayed cervical change, prolonged latent phases, or clinical suspicion of fetal compromise. The distribution of the two delivery modes is displayed in Table 2.

Table 2. Mode of Delivery Among Induced Primigravidas

Mode of Delivery	Frequency	Percentage
Vaginal Delivery	96	64%
Caesarean Section	54	36%

Indications for Caesarean Section:

Detailed analysis of the 54 Caesarean section cases revealed fetal distress as the most common indication, accounting for 20 cases (37%). These patients developed non-reassuring fetal heart rate patterns including late decelerations, persistent bradycardia, or minimal variability, necessitating prompt operative delivery. Cephalopelvic disproportion (CPD) was the second most common indication, contributing to 14 cases (26%), where inadequate descent or non-engagement of the fetal head despite adequate contractions suggested disproportion between the maternal pelvis and fetal presenting part. Failure to progress, responsible for 12 cases (22%), typically manifested as arrest of dilation or descent in the active phase despite oxytocin augmentation. Failed induction occurred in 6 cases (11%), defined by failure to enter active labour after 24 hours of induction attempts. Finally, maternal request was documented in 2 cases (4%), often associated with anxiety or intolerance to prolonged labour. These findings are summarized in Table 3.

Table 3. Indications for Caesarean Section

Indication	Frequency	Percentage
Fetal Distress	20	37%
Cephalopelvic Disproportion (CPD)	14	26%
Failure to Progress	12	22%
Failed Induction	6	11%
Maternal Request	2	4%

Labour Progression and Induction Outcomes

Labour progression varied significantly between women who delivered vaginally and those who underwent Caesarean section. Women achieving vaginal delivery generally entered active labour earlier, demonstrated more progressive cervical changes, and required shorter induction-to-delivery intervals. In contrast, women who required Caesarean section often entered labour with markedly unfavourable Bishop scores, exhibited slow or stagnant cervical dilation despite augmentation, and experienced prolonged latent phases. Many Caesarean cases involved a greater need for oxytocin augmentation due to inefficient uterine contractions, and several experienced clinical episodes of fetal intolerance to labour.

A substantial proportion of fetal distress cases occurred in women whose induction was prolonged or complicated by tachysystole, commonly after prostaglandin administration. Fetal heart rate abnormalities, including recurrent late decelerations and decreased variability, were key determinants in decision-making, contributing significantly to the Caesarean section rate.

Maternal and Neonatal Outcomes:

Maternal outcomes across the study population were generally favourable. No severe surgical complications, such as uterine rupture, significant haemorrhage requiring transfusion, or intensive care admission, were reported. Postoperative recovery among Caesarean patients was uneventful, with minor discomfort and standard wound care requirements. Neonatal outcomes were similarly positive, with most infants achieving Apgar scores above 7 at one minute and above 8 at five minutes. A small subset of neonates born following Caesarean for fetal distress required short-term observation in the neonatal unit, but all recovered without complications. No cases of neonatal morbidity or mortality were observed.

This study demonstrates that more than one-third of primigravidas undergoing induction of labour ultimately required Caesarean section. The most prominent indications fetal distress, cephalopelvic disproportion, and failure to progress highlight the challenges commonly associated with induction in nulliparous women, particularly when cervical favourability is limited at admission. The results emphasise the importance of careful selection for induction, thorough assessment of cervical readiness, and vigilant intrapartum monitoring to optimize maternal and fetal outcomes and reduce unnecessary operative interventions.

DISCUSSION

The present study provides comprehensive insight into the indications leading to Caesarean section among primigravidas undergoing induction of labour [9]. The overall Caesarean rate of 36% observed in this study falls within the range frequently reported in both national and international literature for induced nulliparous women. This high operative rate reinforces the well-recognized clinical challenge associated with labour induction in first-time mothers, particularly when the cervix is initially unfavourable [10]. In the current study, nearly sixty percent of women presented with an unfavourable Bishop score at the time of admission, which played a significant role in predicting the eventual need for operative intervention. An unfavourable cervix remains one of the most consistent and strong predictors of failed induction, prolonged labour, and Caesarean section. The relationship between Bishop score and induction outcome has been extensively described in prior studies, and our findings reaffirm its clinical relevance [11]. Fetal distress emerged as the leading indication for Caesarean section, accounting for 37% of operative deliveries. This is consistent with clinical observations that nulliparous women undergoing induction tend to have longer labours,

increased exposure to uterotonic agents, and a higher likelihood of uterine tachysystole, all of which can compromise fetal oxygenation [12]. The presence of non-reassuring fetal heart rate patterns such as late decelerations, reduced variability, and persistent bradycardia frequently prompted urgent operative delivery in this study. These findings are similar to previously published data that highlight fetal intolerance of labour as a major contributor to Caesarean section in induced primigravidas. Moreover, prolonged induction attempts can increase the risk of fetal distress by extending the duration of labour stress on the fetus [13].

Cephalopelvic disproportion (CPD) was the second leading indication for Caesarean section, accounting for 26% of cases. CPD is more commonly encountered in primigravidas because their pelvic tissues have not undergone previous childbirth-related remodeling [14]. Additionally, the combination of an unripe cervix, slow engagement of the fetal head, and suboptimal uterine contractility may limit the progress of labour. In this study, several CPD cases were diagnosed when active labour failed to progress despite adequate contractions and oxytocin augmentation. The findings support the established understanding that true CPD or functional CPD often becomes clinically evident only during labour, particularly among induced nulliparous women [15].

Failure to progress contributed to 22% of Caesarean sections, reflecting challenges related to slow cervical dilation or arrest disorders. Induction of labour in primigravidas is known to produce variable responses to uterotonic agents, and failure of the cervix to dilate despite adequate contractions remains a frequently encountered obstacle. This outcome is also strongly associated with the initial Bishop score. The delayed cervical change observed in the operative group underscores the importance of careful pre-induction assessment and consideration of mechanical ripening methods in women with markedly unfavourable cervices [16].

Failed induction accounted for 11% of Caesarean deliveries, defined as failure to enter active labour after extended attempts at cervical ripening and uterine stimulation. This proportion is in line with other studies reporting failed induction rates ranging from 10% to 20% among primigravidas. The findings highlight the inherent biological variability in cervical responsiveness and the need for individualized induction strategies rather than uniform dosing or timing protocols [17].

Overall maternal and neonatal outcomes were satisfactory in this study. No major maternal complications such as severe haemorrhage, uterine rupture, or ICU admission occurred, and neonatal outcomes were similarly reassuring. A small proportion of neonates delivered for fetal distress required brief observation, but all demonstrated good recovery. These favourable outcomes suggest that although the Caesarean rate was relatively high, the operative decisions were timely and appropriate, preventing adverse maternal or fetal outcomes [18].

The findings of this study underscore several important clinical implications. First, assessment of cervical favourability remains crucial in determining the likelihood of successful induction [19]. Second, careful selection of induction methods such as combining mechanical and pharmacological Ripening may improve outcomes in unfavourable cases. Third, continuous fetal monitoring and judicious use of oxytocin are essential to prevent and promptly respond to fetal compromise. Finally, primigravidas should be counselled thoroughly regarding the increased possibility of operative delivery, particularly when the cervix is not favourable at the time of induction [20].

CONCLUSION

This study demonstrates that Caesarean section is relatively common among primigravidas undergoing induction of labour, with a rate of 36%. The most frequent indications for operative delivery were fetal distress, cephalopelvic disproportion, failure to progress, and failed induction. Unfavourable cervical status at admission played a significant role in determining these outcomes. Despite the elevated Caesarean rate, maternal and neonatal outcomes were generally favourable, indicating that operative interventions were made appropriately and at clinically justified times. Careful evaluation of cervical readiness, individualized induction strategies, vigilant intrapartum monitoring, and clear antenatal counselling are essential to optimizing outcomes in this high-risk group. Strengthening these components can significantly reduce unnecessary operative deliveries while ensuring the safety of both mother and child.

Availability of Data and Materials

All data supporting the findings of this study are available within the manuscript. Additional details can be provided on reasonable request.

Competing Interests

The authors declare no competing interests.

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Authors' Contributions

- **N. Iqbal:** Conceptualization, data collection, analysis, manuscript drafting, and final editing.
- **T. Imran:** Study supervision, methodological guidance, critical review of the manuscript, and approval of the final version.

Both authors read and approved the final manuscript.

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