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Foley catheter for induction of labor after cesarean section: A cohort study

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Abstract---Induction of labor may be necessary in around twenty-five to thirty percent of a woman's subsequent pregnancies when she has already given birth through cesarean section. During our research, the objective had been to ascertain the rate of spontaneous vaginal birth, rate of cesarean section, and rate of complications that followed the induction of labor with transcervical foley catheter in females who had previously had 1cesarean section. This retrospective cohort trial was performed in the largest city in Palestine at a tertiary teaching hospital. In subsequent pregnancy, pregnant cases with a history of a prior CS delivery (n = 306) underwent labor induction at term with a Foley catheter. Women who underwent labor induction with transcervical foley catheter at Al-Ahli Hospital in Hebron, Palestine. From April 2017 until March 2020. Our research revealed that 46.7 percent of women had spontaneous vaginal births, 14.4 percent had assisted vaginal births, and one woman experienced uterine rupture. The frequency of postpartum hemorrhage is 30 percent, the most prevalent complication. 10 percent and 5 percent of mothers experienced intrapartum and postpartum infections, correspondingly. 5% of newborns had a confirmed infection, and there was one perinatal fatality related to uterine rupture. In females who have previously given birth via C-section, transcervical foley catheters can instigate labor and result in a vaginal delivery. This research had minimal maternal and newborn infection & and uterine rupture risks.

Keywords---vaginal delivery, uterine rupture, cesarean section, maternal & neonatal morbidity.

Introduction

Caesarian section is a medical operation used to help women deliver the baby through an abdominal incision. In ideal circumstances, it is advised when vaginal delivery may put mother, baby, or both in danger. With the so-called "caesarian on maternal request" & fast-rising prevalence of CS that have not been medically needed, nevertheless, not all CS is currently performed for medical reasons. significant increase in CS rates has been attributed to several non-medical factors. reasons for higher CS rates in private hospitals than in public hospitals include increased maternal requests because of presumable anxiety or fear of pain from VD or desire to give birth on a specific day, physician preference or convenience, & financial incentives for physicians or hospitals with higher CS rates compared with VD ^[1].

With the worldwide rise in cesarean section, rates have significantly increased from about seven percent in 1990 to twenty-one percent today surpassing the ideal acceptable CS rate which is around ten percent–fifteen percent according to WHO ^[2-4]. There was also a rise in the number of females who needed labor to be induced after a previous cesarean delivery ^[5-7]. Inducing labor occurs in around twenty-five to thirty percent of all pregnancies ^[5-9]. Ten percent of pregnant women with their labor induced had previously given birth through cesarean surgery. Even though VBAC is successful in 60-85% of women who have already had a cesarean, there is a worry that labor in women who have already had CS rises ^[9-11].

Numerous factors are considered as potential implications of increased caesarean rates in recent years. growth in caesarean births is frequently attributed to altering risk profiles of primiparae who are becoming older. Another factor is the rise in maternal requests for caesarean sections. However, societal changes should not be seen in isolation from growth in caesarean section rates. On the other hand, it appears that factors related to money, society, & culture are significant. These elements could be contributing to the rise in the number of caesarean sections performed, together with the public belief that one is an almost risk-free treatment ^[12].

Yet, this viewpoint ignores the fact that caesarean section is a medical treatment with a host of potential risks for both mother & baby. In addition to intraoperative dangers, there are a variety of postpartum side effects that might happen, like thromboembolic problems. Particular attention must be paid to problems associated with subsequent pregnancies, including uterine rupture, infertility, and even placental malformations including placenta previa, increta, or accreta. range of hazards, including the onset of bronchial asthma, type 1 diabetes, or allergic rhinitis, is recently mentioned for newborns delivered via elective caesarean section ^[13].

Yet, the data that are currently available are inadequate & the subject of ongoing debate. Based on research on maternal & foetal complications conducted in 2004 & 2008 in twenty-four countries, WHO declared that caesarean deliveries are related to higher risks for both mother & child than vaginal deliveries & must only be carried out when the significant benefit is anticipated ^[14].

Common obstetric interventions include inducing labour. Delivery is induced in about twenty to thirty percent of all pregnancies. ten percent of women who need induction have been thought to have had a cesarean birth in the past. the number of women who will require induction of labour in subsequent pregnancy will rise as the frequency of cesarean deliveries increases globally. If given a chance to try labor naturally, studies have found that sixty to eighty percent of women who have previously had cesarean delivery will deliver safely vaginally [11].

Yet, there is the worry that labor, especially when it is induced, increases maternal & newborn morbidity & mortality in women with scarred uterus as compared to repeat cesarean section. Lydon-Rochelle et al. observed in 2001 that women whose labor had been induced with prostaglandins following prior cesarean delivery experienced noticeably higher uterine ruptures. Since then, additional cervical ripening methods have attracted interest, & prostaglandins' safety for use in women who have previously had cesarean deliveries is called into question [15].

In contrast to ERCS (elective repeated CS), there is a rise in maternal & neonatal mortality & morbidity, involving (in the case of neonate, hypoxic-ischemic encephalopathy (in the case of the mother, severe postpartum hemorrhage and the need for a hysterectomy) [16-18] risk of uterine rupture throughout TOLAC (trial of labor after CS) is unknown & may be different depending on the induction agent used [19, 20] Since then, alternative techniques of cervical ripening have received more attention than prostaglandins for induction of labor in women who have had prior CS birth. insertion of a transcervical foley catheter to induce cervical ripening has been one such technique [7].

It is recommended to try vaginal delivery after cesarean section, known as Trial of Labor After Cesarean, for selected women to reduce the need for repeat cesarean sections. However, there is a concern for scar dehiscence throughout labor and it is reported to be around 0.1 to 2.4%. Therefore, prostaglandins are not recommended for inducing labor because of the high risk of rupture. the safest option for a successful vaginal birth in women with scarred uterus is to wait for spontaneous labor. Yet, induction of labor may be necessary for maternal or fetal reasons. In such cases, mechanical methods like balloon catheters may be used [8].

It has been determined that the success rate of inducing labor utilizing intravaginal prostaglandins has a success rate that is equivalent to that of employing a transcervical foley catheter for cervical ripening [21-23]. When contrasted with the use of prostaglandins, utilization of a Foley catheter has not been only less costly but also related to fewer anomalies of contraction pattern and fewer negative effects on the mother [8, 9]. Foley catheters for labor induction may elevate maternal & and newborn infection risk due to foreign bodies entering the uterus through the cervix [24].

Because of the passage of foreign bodies through the cervix, there have been worries that using a Foley catheter to induce labor can raise the risk of infection in both mother & newborn. Heineman et al. [19] found in their systematic analysis

that, in women without a history of cesarean delivery, the use of Foley catheters had been significantly related to an increase in maternal infectious morbidity when compared to the use of pharmacologic drugs.

foley catheter had not been linked with an increase in significant maternal morbidity in most current Cochrane research on mechanical techniques for induction [25]. This cohort study examined spontaneous vaginal delivery and maternal & newborn problems in women with 1 cesarean section after transcervical Foley catheter induction.

Patient, Material, Method

Al-Ahli Tertiary Teaching Hospital was the site of this retrospective cohort research. From April 2017 to March 2020, women having a history of one prior cesarean section were discovered utilizing the obstetrics & gynecology department's electronic database. During this time, women who had already had one cesarean delivery without a ruptured membrane were induced into labor utilizing Foley catheters.

The labor induction was induced by inserting an 18F 3-way foley catheter transcervically using a vaginal speculum or by blind per vaginal application. To inflate the catheter balloon, 80 ml of sterile saline or water was utilized. also, the patient pulled the balloon every 30 minutes till the balloon got and cervical ripening had been advanced to a Bishop score > six, amniotomy had been performed, & the augmentation by oxytocin was continuously according to local protocol. If an individual did not progress into labor spontaneously. After 12 hours, if the Foley catheter had been still in place, another Bishop score was taken. If Bishop was still a 6, the Foley catheter stayed in.

After 12 hours, if the cervix had been still unfavorable, a fresh catheter had been inserted in case the foley had detached. If the cervix wasn't mature after 24 hours, the induction was stopped, and cervical ripening with a Foley catheter was done for another 24 hours. After 24 hours of trying to induce labor, if the cervix were still unfavorable, a cesarean section would be done. All women had been treated through a period of induction by foley catheter for ripening of the cervix, and fetal condition was monitored every 8 hours.

Ruptured membranes for at least twenty-four hours without any clinical symptoms of labor were considered premature. According to the Dutch Association of Obstetrics & Gynecology's guidelines, labor had been induced in these women twenty-four hours after rupture of their membranes, & if they tested positive for group B streptococcus or had unknown status, they received penicillin-G prophylaxis. Patients with antepartum intrauterine fetal demise, multiple gestations, lethal congenital anomalies, & breech presentation were excluded. All data had been verified in the medical record.

Statistical analysis

Utilizing the chi-squared test, researchers contrasted pregnant women who had previously given birth vaginally to those who had never given birth vaginally. To

establish the significance of past vaginal deliveries in the development of the risk for a second Cesarean birth following induction, a multivariate analysis employing binary logistic regression analysis was employed.

Using modeling, we were able to adjust odds ratios or 95% confidence intervals for possible confounding factors like gestational age at the time of induction, the reason for induction, & the years old of the mother. For the statistical research, IBM Corp.'s SPSS Statistics for Windows, Version 27 (located in Armonk, New York, USA) was utilized. p-value of below 0.05 indicated statistical significance.

Results

During the trial period, 306 cases with unfavorable cervix & previous CS had labor induced via a Foley catheter. The characteristics of these women at baseline, involving the reasons for their prior CS, are described, and summarized in Table 1.

Fetal distress (42.5%), first-stage arrest (29.5%), and primary cesarean (11.7%) were the most prevalent reasons for a prior CS. Breech presentation, placenta previa, & severe intrauterine development retardation are all primary indications of CS. In Table 1, we also see the most frequent reasons for inducing labor in the index pregnancy, which involves post-term pregnancy & and hypertensive problems. meconium-stained amniotic fluid, Oligohydramnios & intrauterine growth retardation were cited as possible causes for inducing labor in the fetus. The results of the intrapartum period are shown in Table 2.

There were 61.1% vaginal births. Vacuum extraction was employed in delivering 14.4% of women, with 31.8% of those births being triggered by a protracted second stage. First-stage labor arrest was the most prevalent reason for a subsequent CS (42%). Inducing labor failed in 16.8% of all women who gave birth utilizing CS. Twenty-eight women (74.5%) in the sample had never given birth by a vaginal route. The rate of vaginal birth was lower amongst these females (73%) compared to the rate among women (78) who had already given birth vaginally (84.5%; $p < 0.005$) (Table 2).

An earlier vaginal birth lowered the likelihood of a subsequent cesarean by 73% (odds ratio 0.43, 95%CI: 0.20-0.95), by the multivariate research. The probability of a cesarean section following induction was not significantly affected by the other obstetrical factors included in the model. The most frequent consequence for mothers (30%) was bleeding after giving birth. Only 10% of mothers developed intrapartum infections and 5% developed postpartum infections. In 5% of instances, a neonatal infection was either suspected or confirmed. There was a single prenatal death. Uterine rupture was documented in this case. The woman's postdate status necessitated the decision to induce childbirth. She had reached phase 4 of her fifth trimester. After two successful vaginal births, she underwent a CS for fetal distress during her third pregnancy. She had a vaginal birth after four pregnancies. In the index pregnancy, low-dose oxytocin had been given for augmentation following artificial rupture of membranes 24 hours after the implantation of the Foley catheter. This method of inducing labor is thought to be safe. An emergency CS was done at 7 cm of dilation three hours later due to

severe fetal discomfort with fetal bradycardia. A laparotomy revealed the uterus had ruptured, and the fetus had been expelled into the abdomen. A child weighing 3690 g and with an Apgar score of 1/3/4 had been delivered. The newborn had been sent to the NICU for treatment of severe perinatal hypoxia, but she passed away from neurological problems after 24 hours. Vasa previa rupture led to the second fetal death. Table 3 provides further information on neonates.

Table (1) Women who have already had a cesarean and are subsequently induced with a Foley catheter have unique baseline characteristics.

Age (years)	25 (+/- 5.0)
Parity	1.3 (+/- 1.2)
Number of women with prior vaginal delivery	78 (+/- 37.1)
Gestational age in days	283 (260-300)

	Number	%
Indication for prior cesarean delivery		
1st stage arrest	90	29.5
2nd stage arrest	20	6.5
Fetal distress	130	42.5
Primary cesarean section	36	11.7
Other	30	9.8
Indication for induction of labor		
Post-term pregnancy	139	45.4
Hypertensive disorders	40	13
Diabetes mellites	38	12.6
Fetal indications	29	9.5
Maternal indication	37	12
Other	23	7.5

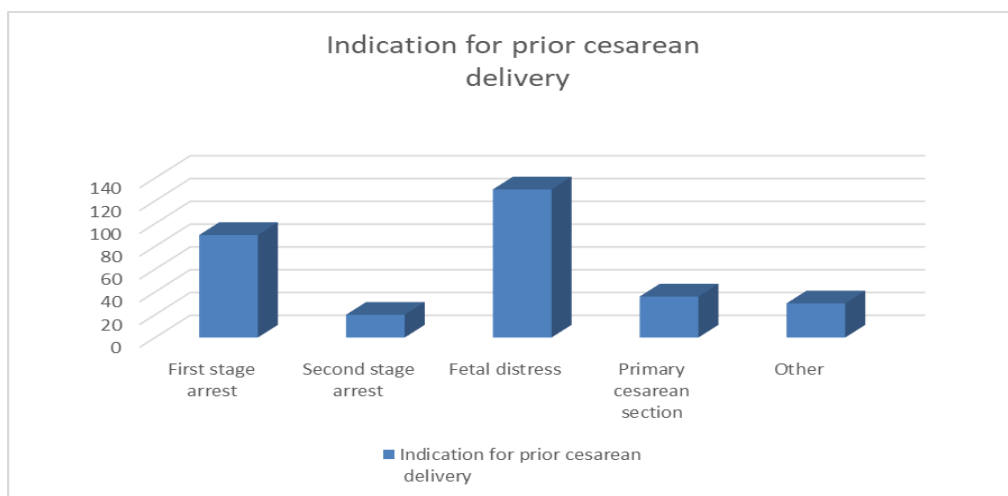


Figure (1): Indication for prior cesarean delivery

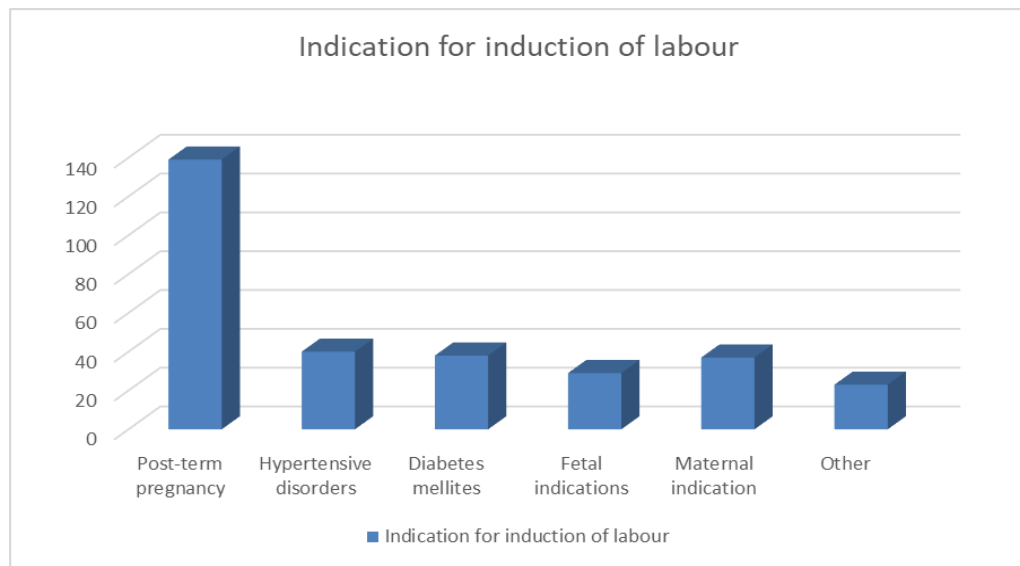


Figure (2): Indication for induction of labour

Table (2) Women who have already had cesarean delivery should consider their delivery options after labor induction via a Foley catheter.

	Number	%
Spontaneous vaginal	143	6.7
Assisted delivery	44	14.4
-Secondary stage arrest	14	31.8
- Fetal distress	30	68.2%
Secondary cesarean section	119	38.8
-1st stage arrest	50	24
-2nd stage arrest	10	8.4
-Fetal distress	32	26.8
-Failed induction	20	16.8
-Maternal refused to continue induction	7	5.9
Without prior vaginal delivery	228	
-Vaginal	130	57
-Caesarean section	98	43
With a prior vaginal delivery	78	
-Vaginal	57	73
-Caesarean section	21	27

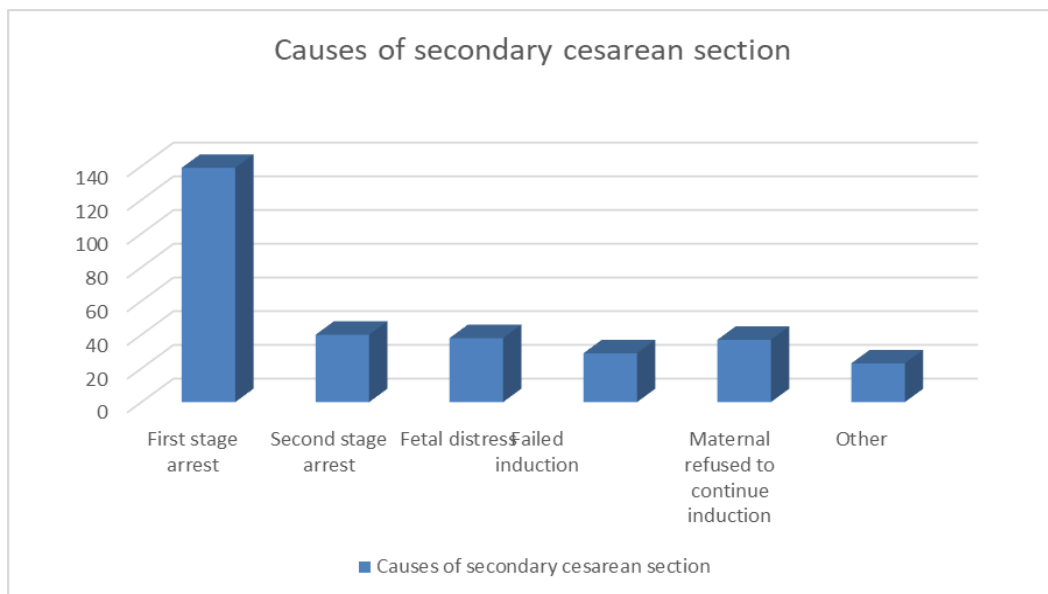


Figure (2): Causes of secondary cesarean section

Table (3) Outcome of transcervical Foley catheter labor induction in females with a history of cesarean birth

	Number	%
Neonatal variables		
Birth weight (g)	3400 (+/- 543)	
Apgar score < seven (1 minute)	16	6.3
Apgar score < seven (5 minutes)	7	4.1
Perinatal death	1	.8
Neonatal admission		
Neonatal intensive care unit	2	1.3
Neonatal ward	42	20.2
- Infection	13	5
- Suspected infection	10	4.8
- Respiratory insufficiency	7	3.4
- Asphyxia	6	2.9
- Premature	14	6.7
- Hyperbilirubinemia	2	1
- Other	10	4.8

Discussion

Most guidelines support labor induction for appropriately chosen women eligible for TOLAC as a strategy to lower the rate of repeat cesarean sections [26]. Among the people whose data were examined for this analysis, 119 (38.8%) had a subsequent cesarean section, and 187 (60.2%) gave birth vaginally. The benefit of this research has been that it displays an extremely large cohort of women with a history of CS who gave birth after a Foley catheter ripening because of an

unfavorable cervix. This is an important aspect of the research. During the duration of the experiment, the women were cared for by a technique that allowed the attending physician to wait for ripening before conducting an amniotomy & administering oxytocin to each of the participants. In addition to that, each one of these details was obtained from a centralized perinatal database. For the reason of ensuring that all the information contained within the individual's files is accurate, a comparison was performed on each file against the patient's medical history.

There are some limitations to our study. We describe a large group of women who have had CS, but we were unable to directly compare this strategy to others, such as the use of vaginal prostaglandins to facilitate cervical ripening. Pharmacological approaches for inducing labor in women who have already had cesarean were almost totally abandoned in Palestine after the publication of research by Lydon-Rochelle et al. [15] research's retrospective design is a shortcoming, as several individuals lacked necessary baseline information such as their exact Bishop Score before to induction and their BMI. As a result of employing a standardized perinatal database and double-checking our results against the medical records, we are confident in the accuracy of our findings. In prior research on labor induction following CS, rates of 40–49% were reported; our research's CS rate was significantly reduced [21-23].

The rate of spontaneous labor in our research was much higher than the rate of spontaneous labor in the previous investigations amongst women [21, 22]. Even while prior investigations utilized the Foley catheter for a maximum of 24 hours, the practice in our hospital allowed for a period of cervical ripening with a Foley catheter of over Two days, which may represent a unique obstetric tradition in Palestine [21, 22]. This may have increased the number of women whose cervix was mature enough before amniotomy and, consequently, the rate of vaginal births. Women with and without prior vaginal birth participated in the current research. likelihood of vaginal delivery in a subsequent pregnancy appears to be significantly influenced by the mother's history of vaginal birth. results of the study [22] confirmed this.

Women who have vaginal birth following CS are at an increased risk of uterine rupture, with the largest risk occurring after administration of prostaglandins (0.5–2.9%) [15, 17, 18, 21, 22]. Unfortunately, there were no females whose labor had been induced utilizing a Foley catheter in the largest research to date on this topic [21]. One uterine rupture was recorded in the current trial, yielding a rate of 0.32%; this is in line with the 0%-1.6% range described in previous studies looking at the use of a Foley catheter for induction in women who had already had cesarean. [14, 16] This rate is so high that it is even equivalent to the rate that was documented when labor began on its own in cases of CS in the past [15, 21, 22].

Nevertheless, the sample size has been still too small to draw conclusive findings about the safety of this technique about risk of uterine rupture. uterine rupture rate in this cohort had been like that of other investigations on induction of labor after CS, in addition to being like uterine rupture rates in the research after the spontaneous onset of labor. There was a low frequency of infectious morbidity in the research population since only 6% of the women got infections during or after

delivery. We found a similar rate of proven infection in neonates after Foley catheter implantation to the larger PROBAAT trial, and the one carried out by Heinemann et al. [19] We validate that induction with a Foley catheter does not result in more infectious morbidity than induction with prostaglandins, as was seen in the PROBAAT research [20, 24].

Due to the small sample sizes of both investigations, firm conclusions about infectious morbidity after Foley catheter-assisted labor induction cannot yet be drawn. Foley catheter induction of labor appears to be a successful method of initiating labor and achieving a vaginal delivery in women who have had a prior cesarean birth. It has been important to consider possible maternal & fetal hazards of repeat CS if the necessity arises in these women for a speedy delivery. Risks for future pregnancies include placenta previa and accrete and postpartum complications like hemorrhage and bladder & bowel lesions in the mother [23].

In addition, the risk of newborn respiratory distress syndrome, as well as other baby respiratory morbidities, is raised after a cesarean delivery [25]. As number of women throughout the world who have had CS at some point in their obstetrical history rises, so does demand for induction procedures that are both safe and successful for these women. There is a need for additional high-quality study in this area, given the significance of safety in labor induction, particularly for these women.

A research study conducted by Jozwiak et al. [27] aimed to assess rates of spontaneous vaginal delivery & complications in women who had undergone cesarean delivery previously and were induced for labor using a transcervical Foley catheter. The research was retrospective and conducted at a secondary teaching hospital in 2nd largest city of the Netherlands, focusing on 208 women who had a history of cesarean delivery and underwent labor induction with a Foley catheter in subsequent pregnancy. the study identified women who underwent labor induction with transcervical Foley catheter at Ikazia Hospital, Rotterdam, between January2003 & January2012 through a computerized database. The accuracy of the patient's records was verified. main result measures had been rates of spontaneous vaginal delivery & complications.

Jozwiak et al. [27] conducted a study on the rates of vaginal delivery, cesarean section, uterine rupture, & maternal & neonatal morbidity. Out of all women, sixty percent had spontaneous vaginal delivery, & eleven percent had been delivered by vacuum extraction. Only one woman experienced uterine rupture. The most common maternal complication had been postpartum hemorrhage at 12%. Intrapartum & postpartum infections were experienced by five percent & one percent of the women, respectively. Neonatal infection had been proven in three percent of cases, and there were 2 perinatal deaths (1%), with one of them being related to uterine rupture. The study concluded that inducing labor with a transcervical Foley catheter is effective in achieving vaginal delivery in women who had a previous cesarean delivery. Additionally, the study shows that there is a low risk of uterine rupture & maternal & neonatal morbidity in this cohort.

Hemalatha et al. [28] thirty women who had prior cesarean sections were reported to have been induced using a Foley catheter for twenty-four hours. If Bishop's

score did not rise after twelve hours had passed since the Foley catheter had been removed, they reinserted it. 9 pregnancies had been induced for intrauterine foetal death, leaving just twenty-one women with live births. They discovered a fifty percent VBAC rate. There had been no incidences of burst uteruses, but 3 out of 30 women had been sent in for emergency cesarean section because they may have had scar dehiscence.

At Medical College Vellore in India, a randomized study was conducted, by Manish et al.,^[29] At 19.5 percent in the eighty ml inflation group & 23.4percent in the thirty ml inflation group, VBAC rates had been low. In the eighty ml group, they noticed a high rate of scar dehiscence of 9.1 percent. Only 1 insertion & 12hours of balloon use were completed. Soni et al. [30] conducted research in a remote region of Himachal Pradesh, India. They looked at TOLAC in 482 women who had undergone c-sections in the past. Only fourteen of thirty-four women who had their babies vaginally (forty-one percent success rate for VBAC in the induced group) had labor induced. They noticed that four percent of cesarean section patients experienced scar dehiscence.

In a research conducted by Meetei et al.,^[31] the effectiveness of Foley & oxytocin for labor induction in women who had previously undergone 1 cesarean section was compared. the study contained thirty women in each group & reported a success rate of 66.7percent in the Foley group. The authors administered oxytocin up to thirty-fourmiu/min. In retrospective cohort research conducted by Gonsalves et al.,^[32] sixty eight women from Muscat Oman were included. Similar our research, most common reason for induction in their research had been oligohydramnios. They found that the overall success rate was sixty-nine%. About one-third of the research group consisted of multiparous women. In addition, they examined that the successful VBAC group had higher preinduction Bishop scores & higher proportion of women with previous vaginal delivery. However, details of the oxytocin dose & period used were not provided in the research. Previous vaginal delivery is found to be a crucial predictor of successful VBAC by other studies as well.

Our study concluded that for women who have previously delivered by C-section, transcervical foley catheters can be used to induce labor and achieve vaginal delivery with minimal risks of maternal and neonatal infection and uterine rupture.

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