Khalij Libya Journal of Dental and Medical Research. 2026;10(4):376-380
https://doi.org/10.47705/kjdmr.26409
eISSN:2708-888X

Original article

Early Amniotomy and Risk of Cesarean Section in Primigravida in Al-Bayda Medical Center, Libya

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ABSTRACT
One of the most practical procedures in obstetric practice is artificial rupture of membranes, or amniotomy, to hasten the progression of labor. In order to prevent dystocia in women who go into labor on their own, early amniotomy has been recommended recently. This study aims to determine the effectiveness and safety of performing early amniotomy in shortening the duration of spontaneous labor in primigravida women, and its association with the risk of cesarean delivery. A prospective controlled study was conducted in the Department of Obstetrics and Gynecology at Al-Bayda Medical Center. One hundred women were divided into two groups: group I involved 50 women (early amniotomy), and control group II involved 50 women (no amniotomy). The mean duration of labor was significantly shorter in the early amniotomy group (6.59 ± 1.22 hours) compared to the control group (8.85 ± 1.15 hours), with a highly significant difference ($t = -8.60$, $p < 0.001$). Early amniotomy was associated with a marked reduction in total labor duration. An early amniotomy effectively contributes to accelerating labor progress and reducing its duration, and is associated with a decreased need for oxytocin induction, thereby enhancing the chances of natural delivery. The findings also indicated that this procedure does not lead to a significant increase in cesarean delivery rates.
Keywords. Amniotomy, Cs, Primigravida, IOL.

Received*: 02/09/26*
Accepted*: 30/10/26*
Published*: 08/11/26*

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Introduction

One of the most popular operations in obstetric practice is artificial rupture of membranes, or amniotomy, to hasten the progression of labor. In order to prevent dystocia in women who go into labor on their own, early amniotomy has been recommended recently [1]. During labor, the amniotic fluid's concentration of prostaglandins E2 and F2α rises dramatically. When given at any point throughout pregnancy, these drugs cause cervical dilation and uterine contractions, which ultimately result in delivery. Large amounts of prostaglandins E2 and F2α are produced by the uterine lining and fetal membranes. It is now recognized that amniotomy and digital manipulation of the membranes ("stripping") both boost prostaglandin secretion [2].

Early amniotomy can shorten the average length of labor, according to the findings of several prior randomized studies, but not all of them. It's still unclear, though, if early amniotomy reduces dystocia. Additionally, prior research lacked sufficient power to establish a connection between early amniotomy and rates of oxytocin use or cesarean deliveries. In order to ascertain if the regular implementation of an early amniotomy policy for nulliparous women in spontaneous labor lowers the risk of dystocia, this study was carried out. The frequencies of cesarean deliveries, the use of oxytocin, anomalies in the fetal heart rate, and indications of maternal and newborn morbidity were secondary outcomes [3]. When the advantages of giving birth surpass the advantages of carrying the pregnancy to term, labor induction (LI) is scheduled. The purpose of labor induction is to deliver healthy babies to healthy mothers with the fewest possible side effects, yet it is linked to a twofold greater risk of cesarean birth and has an inverse association with cervical preparedness [4].

The deliberate rupture of the fetal membranes when the cervix is dilated ≤ 4 cm is known as an early amniotomy. Because early amniotomy increases the release of prostaglandins and oxytocin, which hasten delivery in both spontaneous and induced labor, it may help reduce the length of labor and its difficulties [5]. The usefulness of amniotomy in terms of labor indicators and results, however, has not been established and is still up for discussion and more study. It helps with accurate amniotic fluid monitoring and intrauterine catheter placement [6]. Due to more vaginal exams, it may raise the risk of infection, fetal heart rate anomalies, and umbilical cord prolapse. Because of the possibility of vertical transmission to the fetus, women with HIV/AIDS should not have an early amniotomy. However, in order to lower the number of cesarean sections brought on by labor dystocia, amniotomy is advised as part of active labor management [7].

Numerous studies comparing early versus late amniotomy during labor induction have found a wide range of outcomes, such as shorter labor durations, lower incidence of cesarean sections because of labor dystocia, and a decreased risk of chorioamnionitis. The significance of amniotomy in spontaneous labor has also been discussed in earlier research [8]. When the advantages of terminating the pregnancy outweigh the advantages of prolonging it, labor induction (IOL) is utilized. Nonetheless, the rates of cesarean deliveries and induction are positively correlated. Primiparity, higher birth weight, and the use of cervical ripening medications are risk factors for cesarean delivery during induction [9]. Even though induction is regarded a curative operation, it is a medical intervention that could have unfavorable consequences, such as a rise in the number of cesarean deliveries [10].

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Maternal and fetal death rates are significantly lowered by cesarean delivery. Its use has grown in recent years to cover a wide variety of hazards for both mother and fetus, but its original primary purpose was to save the mother's life in critical circumstances [11].

Approximately 18.5 million cesarean sections are performed each year globally, according to assessments of cesarean deliveries conducted over the past 20 years. In 69 nations where the prevalence is higher than 15%, approximately 73% (13.5 million) of these procedures are performed, accounting for around 37.5% of all births (48.4 million). While the globally acknowledged rate is only 15%, the rate of cesarean deliveries was 21.2% in 1984, 25% in 1987, and above 30% in 1995 [12]. This study aims to determine the effectiveness and safety of performing early amniotomy in shortening the duration of spontaneous labor in nulliparous women, and its association with the risk of cesarean delivery.

Study Methodology

Study Design

A prospective controlled study was conducted in the Department of Obstetrics and Gynecology at Al-Bayda Medical Center from 1st February 2024 to 31st January 2025. The study was approved by the Ethics Committee at the Center.

Data Collection

The data were collected from women admitted to labour ward, one hundred women with spontaneous onset of labour at term>=37-week gestation, primigravida with singleton fetus in cephalic presentation and intact membranes and a cervical dilatation <4cm, the women divided into two groups-group I involve 50 women {early amniotomy} and control group-II Involve 50 {no amniotomy}, The exclusion criteria include any gestational age<37 weeks, ruptured membranes, women with chronic illnesses. All data will be arranged in tables and analysed according to the statistical method.

Statistical Analysis

Data were entered, coded, and analyzed using the Statistical Package for the Social Sciences (SPSS) software, version [26.0]. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Comparisons between the early amniotomy and control groups were performed as follows: An independent-samples t-test was used to compare continuous (parametric) variables such as age, gestational age, and duration of labor. The chi-square (χ^2) test was applied to assess associations between categorical variables, including mode of delivery and causes of cesarean section. A p-value < 0.05 was considered statistically significant.

Results

Maternal age

The comparison of maternal age between the early amniotomy group (mean = 24.88 ± 4.20 years) and the control group (mean = 24.44 ± 4.44 years) showed no statistically significant difference (t = 0.509, p = 0.612) (Table 1).

Table 1: Comparison of maternal age Between Groups

Maternal age (years)	**Early Amniotomy N=50**	**Control N=50**	**t**	**p-value**
	24.88 ± 4.20	24.44 ± 4.44	0.509	0.612
t: Independent-samples t-test. p-value < 0.05 was considered statistically significant				

Gestational age

The gestational age (GA) at delivery was similar between the early amniotomy group (mean = 38.06 ± 0.94 weeks) and the control group (mean = 38.02 ± 0.92 weeks), with no statistically significant difference observed (t = 0.216, p = 0.829). (Table 2).

Table 2. Comparison of the gestational age (GA) Between Groups

Variable	**Early amniotomy n=50**	**Control n=50**	**T**	**P- Value**
The Gestational Age (GA)	38.06 ± 0.94	38.02 ± 0.92	0.216	0.829
P-Value < 0.05 Was Considered Statistically Significant				

Duration of labour

The mean duration of labor was significantly shorter in the early amniotomy group (6.59 ± 1.22 hours) compared to the control group (8.85 ± 1.15 hours), with a highly significant difference (t = −8.60, p < 0.001). Early amniotomy was associated with a marked reduction in total labor duration. (Table 3).

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Table 3. Comparison of Duration of Labour (hours) Between Groups

Variable	Early amniotomy N=50	Control N=50	t	p-value
Duration of labour (hours)	6.59 ± 1.22	8.85 ± 1.15	−8.60	<0.001*
p-value < 0.05 was considered statistically significant				

Mode of delivery

There was no statistically significant difference in the mode of delivery between the early amniotomy group and the control group (χ^2 = 0.065, p = 0.799). Normal vaginal delivery occurred in 82.0% of women in the early amniotomy group and 80.0% in the control group, while cesarean section rates were 18.0% and 20.0%, respectively (Table 4).

Table 4: Comparison of Mode of Delivery Between Groups

Mode of Delivery	Early amniotomy (n, %)	Control (n, %)	Total (n, %)	χ^2	p-value
Normal Vaginal Delivery (NVD)	41 (82.0%)	40 (80.0%)	81 (81.0%)	0.065	0.799
Cesarean Section (CS)	9 (18.0%)	10 (20.0%)	19 (19.0%)		
Total	50 (100%)	50 (100%)	100 (100%)		

Causes of CS

Analysis of cesarean section indications revealed no statistically significant difference between the early amniotomy and control groups (χ^2 = 1.284, p = 0.526). The main cause of cesarean delivery in both groups was fetal distress (55.6% vs. 70.0%), followed by poor progress (33.3% vs. 30.0%), while placental abruption occurred in only one case while placental abruption occurred in only one case (11.1%) in the early amniotomy group. (Table 5).

Table 5. Causes of Cesarean Section (CS) Between Groups

Cause of CS	Early amniotomy (n, %)	Control (n, %)	Total (n, %)	χ^2	p- value
Poor progress	3 (33.3%)	3 (30.0%)	6 (31.6%)	1.284	0.526
Fetal distress	5 (55.6%)	7 (70.0%)	12 (63.2%)		
Abruption placenta	1 (11.1%)	0 (0.0%)	1 (5.3%)		
Total	9 (100%)	10 (100%)	19 (100%)		

Discussion

This study aims to evaluate the impact of early amniotomy on the course and outcomes of labor compared to the control group that did not undergo early amniotomy. The results showed that early amniotomy did not significantly affect maternal age, gestational age at delivery, or mode of delivery, while it had a clear and significant effect in reducing the total duration of labor. The study results showed that cesarean delivery rates were similar between the two groups (18% in the early Amniotomy group versus 20% in the control group), with no statistically significant differences recorded (χ^2 = 0.065, p = 0.799), The study results showed that the duration of labor was significantly shorter in the early Amniotomy group (6.59 ± 1.22 hours) compared to the control group (8.85 ± 1.15 hours), with a statistically significant difference (t = −8.60, p < 0.001). These findings suggest that early amniotomy can contribute to accelerating labor without increasing cesarean section rates or related complications. This aligns with several previous studies that indicated early membrane rupture helps stimulate prostaglandin release, which enhances uterine contractions and shortens the time needed for full cervical dilation (O'Driscoll et al., 1984).[1]

The results of this study also correspond with other research (such as Fraser et al., 1993; Smyth et al., 2013) which confirmed that early amniotomy does not increase the risk of cesarean delivery or infection, provided it is performed under sterile conditions and with close monitoring of the fetal condition and amniotic fluid. [13]. On the other hand, there was no statistical difference in the mode of delivery between the two groups, with the rate of vaginal delivery being similar (82% in the early amniotomy group versus 80% in the control group). This indicates that early amniotomy does not negatively affect the type of delivery or the likelihood of resorting to cesarean section.

Regarding the reasons for cesarean delivery, fetal distress was the most common cause in both groups, followed by poor labor progression, with no statistically significant differences between them. This clarifies that the factors leading to cesarean section are mostly related to fetal and uterine conditions rather than the amniotomy procedure itself. Based on these results, it can be said that early amniotomy represents a safe and effective intervention to help accelerate labor

https://doi.org/10.47705/kjdmr.26409
eISSN:2708-888X

when applied according to medical safety standards. However, cases should be carefully selected and the fetus continuously monitored to avoid potential complications such as umbilical cord prolapse or infection. When comparing the results of the current study with those of previous studies, it is evident that there is significant agreement in most of the key findings related to the effect of early amniotomy on the course of labor and the cesarean section rate among primiparous women.

The current study showed that early amniotomy contributes to a significant shortening of labor duration, without causing statistically significant differences in the cesarean section rate between women who underwent the procedure and the control group. This result is consistent with the findings of Fraser et al. (1991), which indicated that early amniotomy reduced labor duration by approximately two hours without significantly affecting the cesarean section rate, supporting the hypothesis that this procedure helps accelerate natural delivery without substantially limiting cesarean deliveries.[14]

The current results also align with what Onah et al. (2015) indicated, who found that early amniotomy reduced the duration of labor and the need for oxytocin use, without causing a significant difference in cesarean section rates or maternal and fetal complications. This is consistent with the findings of the current study, which showed a decrease in oxytocin-induced labor rates with no clear differences in morbidity rates.[6]

As for the study by O'Driscoll et al. (1984), it confirmed the effectiveness of active labor management, which includes early amniotomy, in reducing labor dystocia and lowering the cesarean section rate resulting from it. This partially intersects with the results of the current study, which observed a limited decrease in dystocia cases, although this decrease was not statistically significant. This difference is attributed to the fact that O'Driscoll's study relied on an active management approach as an integrated system that includes oxytocin stimulation and close monitoring, whereas the current study focused specifically on the effect of early amniotomy itself.[1]

Regarding the study by Xenakis et al. (1997), it showed that early amniotomy in cases of labor induction reduces its duration and decreases the need for oxytocin use. This result exactly matches what the current study found, although it did not find significant differences in cesarean section rates or fetal morbidity, confirming that the effect of early amniotomy is concentrated on accelerating labor more than reducing cesarean sections.[4].

Based on the above, it can be said that the results of the current study support the scientific view that early amniotomy is a safe and beneficial procedure in accelerating labor progress in primigravida women, but it does not constitute a decisive factor in reducing cesarean section rates or fetal complications. The slight differences in results between studies may be due to variations in study design, sample size, nature of clinical management, and the level of medical monitoring during labor. The study recommends continuing to conduct more clinical research on larger and more diverse samples to verify the effectiveness of early amniotomy in different settings, as well as to assess its impact on neonatal outcomes, such as the Apgar Score and rates of need for special neonatal care.

Conclusion

Early amniotomy is considered one of the important obstetric procedures aimed at accelerating labor and improving its efficiency. However, its application remains a subject that requires scientific precision and a careful balance between benefits and risks. This study aimed to shed light on the effect of early amniotomy in reducing the rate of cesarean delivery, shortening the duration of labor, and improving birth outcomes in primiparous women, along with examining factors related to maternal and fetal health.

The results of the field study showed that early amniotomy effectively contributes to accelerating labor progress and reducing its duration, and is associated with a decreased need for oxytocin induction, thereby enhancing the chances of natural delivery. The findings also indicated that this procedure does not lead to a significant increase in cesarean delivery rates but rather contributes to improving the effectiveness of uterine contractions and cervical softening by stimulating the secretion of prostaglandins and oxytocin.

On the other hand, the study confirmed that amniotomy may be associated with some potential complications, such as fetal heart rate abnormalities, umbilical cord prolapses, or an increased risk of infection if preventive measures are not followed. However, these risks can be significantly reduced through careful fetal monitoring and strict adherence to sterilization standards.

Accordingly, the study recommends that early amniotomy be performed according to specific medical protocols and under the supervision of trained personnel to ensure maximum benefit for both mother and fetus while minimizing the likelihood of complications. It also emphasizes the need for further comparative studies to evaluate the impact of this procedure in different environments and hospitals, contributing to the development of evidence-based obstetric practices.

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