



Early Amniotomy Versus Expectant Management Of Membrane Rupture In Term Primigravida: A Comparative Study Of Labor Progression And Maternal - Neonatal Outcome.

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Abstract

Background: Amniotomy is a commonly performed obstetric procedure intended to accelerate labor, facilitate fetal monitoring, and, in some cases, augment uterine contractions. However, the efficacy of amniotomy compared with expectant management of spontaneous rupture of membranes (SRM) in term primigravida patients has not been extensively studied in our local setting. This study aimed to compare the effect of amniotomy versus SRM on labor progress, labor duration, and maternal and neonatal outcomes in primigravida women. **Objectives:** The primary objective was to compare the duration of labor between the amniotomy and SRM groups in term primigravida women. Secondary outcomes included mode of delivery, maternal and neonatal complications, and Apgar scores. **Methods:** This randomized controlled trial was conducted at the Department of Obstetrics and Gynecology, Khalifa Gul Nawaz (KGN) Teaching Hospital, Bannu, Pakistan, after approval by the Institutional Ethical Review Committee (ERC) of Bannu Medical College (Approval Reference No. 20/Dir&MJ/BMC/2025, dated 05/11/2025); following ethical approval, the study was commenced and conducted from 1st December 2025 to 1st March 2026. A total of 160 primigravida women with singleton pregnancies and gestational age ≥ 36 weeks were recruited and randomly allocated into two equal groups: Group A (Amniotomy, $n = 80$) and Group B (Spontaneous Rupture of Membranes, $n = 80$). The sample size was calculated based on the mean labor duration 6.66 ± 1.4 hours in the amniotomy group and 7.66 ± 1.75 hours in the SRM group — using a 95% confidence level, 80% power, and a 5% margin of error. Data were collected on labor duration, mode of delivery, maternal complications, neonatal complications, and Apgar scores. Statistical analysis was performed using SPSS version 22. Continuous variables were analyzed using independent samples t-tests, and categorical variables were examined using chi-square tests. A p-value < 0.05 was considered statistically significant. **Results:** Amniotomy was associated with a significantly shorter labor duration compared with spontaneous rupture of membranes (SRM). The mean labor duration was 5.725 ± 0.59 hours for Group A (Amniotomy) and 7.150 ± 0.48 hours for Group B (SRM) ($p = 0.000$). This difference persisted across all age, gestational age, and weight subgroups. In both age groups (18–30 years and > 30 years) and weight groups (≤ 70 kg and > 70 kg), Group A had significantly shorter labor durations than Group B. Both groups did not differ significantly with respect to mode of delivery or Apgar scores. The groups were adequately matched for age, gestational age, and weight, supporting the validity of the results. **Conclusion:** Amniotomy significantly shortens labor compared with spontaneous rupture of membranes (SRM) in term primigravida women. There was no significant difference in maternal and neonatal outcomes (mode of delivery and Apgar scores); however, the findings support amniotomy as part of management to augment labor. Further research is required to assess long-term neonatal outcomes and to determine the safety profile of amniotomy in various at-risk populations.

Keywords: Amniotomy, spontaneous rupture of membranes, primigravida, labor duration, obstetrics, maternal outcomes, neonatal outcomes.



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INTRODUCTION

Amniotomy (also abbreviated as AROM, or more frequently called "breaking the water") is the intentional rupture of the amniotic sac by an obstetric care provider [1]. This is the most straightforward and commonly performed procedure for managing labor, and it has been used by obstetric providers for many years [2]. The amniotic cavity is a sac enclosed in

the uterus where the fetus grows and is protected during the antepartum period [3]. This cavity consists of a two-layer membrane: the innermost amnion and the outermost chorion [4]. The potential cavity is present early in gestation and is filled with serous fluid during the first few weeks [5]. As the fetus begins to produce urine, the volume of body fluid increases as a result of growth of the urinary tract [6]. In reality, the amniotic fluid consists primarily of fetal urine [7]. The amniotic membranes are usually intact until towards the end of most pregnancies but break spontaneously in the hours leading up to impending spontaneous labor, or sometimes after labor has actually begun [8]. The reasons for using artificial interruption of membranes from the obstetrician's side can be to (1) stimulate or attempt to fasten the delivery process, or (2) facilitate internal fetal monitoring installation to directly check the state of the fetus [9].

The fetal heart rate and uterine activity are recordable with external systems, but in some cases, more direct monitoring during labor is required [10]. In such evaluations, the amniotic membrane is a barrier, and in this scenario, the amniotic membrane must be perforated to install a fetal scalp electrode or intrauterine pressure catheter to perform adequate measurements [11]. A study by Abdullah et al. (2010) reported that the mean labor duration in the amniotomy group was 6.66 ± 1.4 hours and for spontaneous rupture of membranes it was 7.66 ± 1.75 hours among primigravida patients [12]. Currently, almost no data exist in the modern obstetric literature on the effect of amniotomy and spontaneous rupture of membranes (ROM), especially tailored to the local context.

The study about a decade old, being the only one carried out in Karachi, is more or less an insight but not enough to help with current decision-making [13]. In order to fill this gap as well as gather local evidence, we planned to perform a study comparing the outcomes of amniotomy versus spontaneous rupture of membranes in early labor between term primigravida patients. This study not only provides valuable population-level data but also will help inform the selection of the best-suited intervention for our population [14].

MATERIALS AND METHODS

This randomized controlled trial was conducted in the Department of Obstetrics and Gynecology, Khalifa Gul Nawaz (KGN) Teaching Hospital, Bannu, Pakistan, after approval by the Institutional Ethical Review Committee (ERC) of Bannu Medical College (Approval Reference No. 20/DiR&MJ/BMC/2025, dated 05/11/2025), and written informed consent was obtained from all participants; following ethical approval, the study was commenced and conducted from 1st December 2025 to 1st March 2026. A total of 160 primigravida women with singleton pregnancies and gestational age ≥ 36 weeks were recruited and randomly allocated into two equal groups: Group A (Amniotomy, $n = 80$) and Group B (Spontaneous Rupture of Membranes, $n = 80$). The sample size was calculated based on the mean labor duration reported by Abdullah et al. (2010) — 6.66 ± 1.4 hours in the amniotomy group and 7.66 ± 1.75 hours in the SROM group — using a 95% confidence level, 80% power, and a 5% margin of error. Women with multifetal pregnancy, malpresentation, placenta previa, placental abruption, previous uterine surgery, known fetal congenital anomalies, maternal medical complications, intrauterine fetal demise, active genital herpes infection, or cord prolapse at presentation were excluded. In Group A, amniotomy was performed under aseptic conditions with prophylactic antibiotics and continuous monitoring for complications such as cord prolapse and placental abruption, while Group B was managed expectantly with membranes left intact until spontaneous rupture, with intervention undertaken only if fetal distress or other obstetric indications arose. The primary outcome was duration of labor (in hours), and secondary outcomes included mode of delivery, maternal complications, neonatal complications, and Apgar scores at 1 and 5 minutes. Data were collected using a structured proforma and analyzed with SPSS version 22; continuous variables were expressed as mean $\pm$ SD and compared using independent samples t-tests, categorical variables were expressed as frequencies and percentages and compared using chi-square tests, stratified analysis was performed by age, gestational age, and weight, and a p-value < 0.05 was considered statistically significant.

RESULTS

The study included 160 primigravida women randomly allocated into Group A (Amniotomy, $n = 80$) and Group B (Spontaneous Rupture of Membranes, $n = 80$); the groups were comparable at baseline, with mean age 27.175 ± 2.39 years vs. 26.275 ± 2.57 years, mean gestational age 38.500 ± 1.08 weeks vs. 38.400 ± 1.15 weeks, and mean weight 67.025 ± 3.58 kg vs. 67.900 ± 3.01 kg, respectively ($p > 0.05$ for all), and age distribution showed that 90% (72/80) of Group A and 92.5% (74/80) of Group B were aged 18–30 years while 10% (8/80) and 7.5% (6/80) were above 30 years, respectively. The overall mean labor duration was significantly shorter in Group A (5.725 ± 0.59 hours) compared with Group B (7.150 ± 0.48 hours) ($p = 0.000$), and this difference persisted across all subgroups: by age group, 18–30 years (5.750 ± 0.60 vs. 7.162 ± 0.50 hours) and > 30 years (5.500 ± 0.57 vs. 7.000 ± 0.00 hours); by gestational age, 37–39 weeks (5.794 ± 0.59 vs. 7.151 ± 0.50 hours) and > 39 weeks (5.333 ± 0.51 vs. 7.142 ± 0.37 hours); and by maternal weight, ≤ 70 kg (5.771 ± 0.59 vs. 7.162 ± 0.50 hours) and > 70 kg (5.400 ± 0.54 vs. 7.000 ± 0.00 hours), all with $p < 0.05$. There was no statistically significant difference in mode of delivery, maternal complications, or neonatal outcomes including Apgar scores at 1 and 5 minutes between the two groups ($p > 0.05$). These findings are presented in Table 1 (comparison of demographic variables and labor duration between groups) and illustrated in Figure 1 (bar chart of overall mean labor duration), Figure 2 (bar chart by age group), Figure 3 (bar chart by gestational age), Figure 4 (bar chart by maternal weight), Figure 5 (pie charts

of age distribution), Figure 6 (bar chart of mode of delivery), and Figure 7 (bar chart of Apgar scores). The results are consistent with Abdullah et al. (2010) , who reported mean labor durations of 6.66 ± 1.4 hours (amniotomy) and 7.66 ± 1.75 hours (SROM), and with Fraser et al. (1999) and Smyth et al. (2006) , who demonstrated that amniotomy accelerates labor by enhancing uterine contraction efficiency; the findings also align with Goh et al. (2009) and Pasko et al. (2019) , who reported consistent benefits across gestational age and maternal weight subgroups. The study was limited by its single-center design, relatively small sample size ($n = 160$) , and lack of long-term neonatal follow-up, though its strengths included a randomized controlled trial design, adequate matching of groups, and stratified analysis across multiple subgroups. In conclusion, amniotomy significantly shortens the duration of labor compared with spontaneous rupture of membranes in term primigravida women, without increasing maternal or neonatal complications or altering the mode of delivery, supporting its use as an effective intervention for labor augmentation; further research is required to assess long-term neonatal outcomes and determine the safety profile of amniotomy in various at-risk populations..

Table 1: Demographic Characteristics of Study Participants

Variable	Group A (Amniotomy) n = 80	Group B (SROM) n = 80
Age (years)	27.175 ± 2.39	26.275 ± 2.57
Gestational Age (weeks)	38.500 ± 1.08	38.400 ± 1.15
Weight (kg)	67.025 ± 3.58	67.900 ± 3.01
Age Distribution		
18–30 years	72 (90%)	74 (92.5%)
>30 years	8 (10%)	6 (7.5%)

Both groups were adequately matched for age, gestational age, and weight. The majority of participants in both groups were aged 18–30 years (90% in Group A and 92.5% in Group B).

Table 2: Duration of Labor — Overall and by Age Group

Category	Group A (Amniotomy) n = 80	Group B (SROM) n = 80
Overall Labor Duration (hours)	5.725 ± 0.59	7.150 ± 0.48
Age Group 18–30 years	5.750 ± 0.60	7.162 ± 0.50
Age Group >30 years	5.500 ± 0.57	7.000 ± 0.00

Amniotomy was associated with a significantly shorter labor duration compared with SROM overall ($p = 0.000$). This difference persisted across both age groups (18–30 years and >30 years).

Table 3: Duration of Labor — by Gestational Age and Maternal Weight

Category	Group A (Amniotomy) n = 80	Group B (SROM) n = 80
Gestational Age 37–39 weeks	5.794 ± 0.59	7.151 ± 0.50
Gestational Age >39 weeks	5.333 ± 0.51	7.142 ± 0.37
Weight ≤ 70 kg	5.771 ± 0.59	7.162 ± 0.50
Weight >70 kg	5.400 ± 0.54	7.000 ± 0.00

Group A consistently demonstrated shorter labor durations across both gestational age subgroups (37–39 weeks and >39 weeks) and both maternal weight subgroups (≤ 70 kg and >70 kg), with all differences being statistically significant.

Table 4: Secondary Outcomes — Mode of Delivery, Maternal Complications, and Neonatal Outcomes

Outcome	Group A (Amniotomy) n = 80	Group B (SROM) n = 80	p-value
Mode of Delivery			
Spontaneous Vaginal Delivery	62 (77.5%)	58 (72.5%)	>0.05
Instrumental Delivery	10 (12.5%)	12 (15.0%)	>0.05
Cesarean Section	8 (10.0%)	10 (12.5%)	>0.05
Maternal Complications			
Postpartum Hemorrhage	3 (3.75%)	4 (5.0%)	>0.05
Genital Tract Trauma	5 (6.25%)	6 (7.5%)	>0.05
Chorioamnionitis	1 (1.25%)	2 (2.5%)	>0.05
Neonatal Outcomes			
Apgar Score at 1 minute	7.85 ± 0.72	7.78 ± 0.81	>0.05
Apgar Score at 5 minutes	9.12 ± 0.54	9.05 ± 0.62	>0.05
NICU Admission	2 (2.5%)	3 (3.75%)	>0.05

There was no statistically significant difference in mode of delivery, maternal complications, or neonatal outcomes (including Apgar scores at 1 and 5 minutes) between the two groups ($p > 0.05$ for all).

DISCUSSION

The findings of this study enhance our understanding of the effect of amniotomy on the timing of labor in primigravida women compared with spontaneous rupture of membranes (SROM). We have demonstrated that amniotomy has a significant labor-shortening effect, and this finding is consistent with extensive literature supporting such an intervention. The mean labor duration in Group A (Amniotomy) was only 5.725 ± 0.59 hours compared with 7.150 ± 0.48 hours in Group B (SROM), with a statistically significant difference ($p = 0.000$) [14]. This supports the hypothesis that amniotomy accelerates labor through improved uterine contraction efficiency [15,16].

There was no significant effect of age on labor duration in either group. In Group A, both age groups (18–30 years and >30 years) had significantly shorter labor periods [17]. This indicates that amniotomy is effective across a wide age range; however, caution may be warranted in older women or those with additional risk factors such as obesity. These results were further reaffirmed by the comparison of two gestational age groups (37–39 weeks and >39 weeks). Regardless of whether the gestational age at the onset of labor was lower or higher, Group A consistently had shorter mean labor durations than Group B. This finding is consistent with previous reports [18].

Our results were also consistent with the effect of maternal weight on labor duration. In Group A, for women weighing ≤ 70 kg, the duration of labor was shorter (5.771 ± 0.59 hours) than in Group B (7.162 ± 0.50 hours), and this difference was also present in women weighing >70 kg. This result is in line with previous findings [19], which concluded that while maternal obesity may significantly affect labor progress, amniotomy appears to lessen this effect. In both groups, age, gestational age, and weight were comparable, supporting the validity of the observed differences in labor duration. The mean age and gestational age were comparable across all groups, and the slight difference in weight did not appear to have any significant effect on outcomes. This further strengthens the conclusion that the discrepancy in labor duration is attributable more to the procedure (amniotomy) itself than to any confounding demographic factors.

CONCLUSION

In conclusion, amniotomy shortens the duration of labor more than SROM among women in their first pregnancy as shown by this paper. These results are corroborated in literature and contribute to the goal of controlling labor progression using one of the good intervention amniotomy. Although useful in the labor duration, amniotomy did not differ in fetus mode of delivery and fetal Apgar outcomes, as per Cochrane reviews and Fraser et al. (2000) 8.

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