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Efficacy of Membrane Sweeping in Primigravida and Effect on the Duration of Pregnancy

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ABSTRACT

Prolonged pregnancies, defined as those extending beyond 40 weeks of gestation pose increased risks to both maternal and fetal health, including higher rates of cesarean delivery, postpartum hemorrhage, and neonatal complications. Membrane sweeping is a non-pharmacological, mechanical method of labour induction that is often used to reduce the likelihood of post-term pregnancies and their associated risks. **Objectives:** To evaluate the efficacy of membrane sweeping in initiating spontaneous labour and its effect on the duration of pregnancy in women with term pregnancies. **Methods:** A Quasi-experimental study was conducted in the Department of Obstetrics and Gynecology, Lady Reading Hospital, Peshawar, from September 2023 to March 2024. One hundred and thirty-six primigravida women aged 40 to 42 weeks who underwent membrane sweeping for labour induction were selected. Effectiveness was assessed in terms of initiation of spontaneous labour. Other parameters considered were maternal and fetal outcomes. **Results:** Spontaneous labour was successfully initiated in 76.5% of patients and notably reduced the mean gestational age at delivery (40.49 ± 0.591 weeks) compared to those who did not achieve spontaneous labour (41.72 ± 0.581 weeks, p=0.0001). Most patients required one or two sweeps to achieve labour, demonstrating the effectiveness of membrane sweeping in reducing pregnancy duration. **Conclusions:** It was concluded that membrane sweeping is an effective and non-invasive method for initiating spontaneous labour and reducing pregnancy duration, minimizing the need for medical induction and preventing post-term pregnancies.

INTRODUCTION

Membrane sweeping is a procedure performed during vaginal examination in which the examiner inserts fingers into the cervical canal and rotates them to detach the amniotic membranes from the lower uterine wall [1, 2]. This process stimulates the release of prostaglandins, leading to cervical softening and the initiation of uterine contractions. Membrane sweeping is considered a minimally invasive technique for labour induction [3, 4]. A study recorded that membrane sweeping was effective in 87.06% for initiating the onset of labour, vaginal delivery in 83.53%, and cesarean observed in 16.47% [5]. Postdate pregnancies, defined as those extending beyond 40 weeks of gestation, pose risks to the fetus due to reduced placental function, which can lead to fetal mortality [6-8]. Early ultrasound for accurate pregnancy dating is recommended to reduce the incidence of postdate pregnancies, as relying solely on the last menstrual period is less precise [9, 10]. In a low-risk population, sweeping the membranes is a safe way to shorten a term pregnancy and lower the frequency of prolonged pregnancy [11]. Initiating labour before 42 weeks can reduce these risks, although it may impact the childbirth experience [12]. Membrane sweeping is a non-invasive procedure that involves separating the amniotic membranes from the cervix. It is suggested to be a safe and effective way to induce labour and reduce the risks associated with post-term pregnancies. However, the available evidence on its effectiveness and safety, particularly in first-time pregnant

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women, remains limited.

This study aims to assess the outcomes of membrane sweeping in primigravida with prolonged pregnancies.

METHODS

A quasi-experimental study was conducted at Lady Reading Hospital, Peshawar, from September 2023 to March 2024, after obtaining ethical approval from the hospital's ethical committee (REF: No.1/LRH/MTI). A total of 136 primigravida women aged 18 to 40 years, with a gestational age of 40-42 weeks, were included. Women with prior health issues, obstetrical complications, or those who declined participation were excluded. Each patient underwent membrane sweeping to initiate labour, membrane sweeping was performed by the researcher, a gloved finger was inserted in the cervix, and then the finger was moved around the inner cervical OS in a circular fashion separating the membranes from the lower uterine segment. If there was no response after 72 hours, the procedure was repeated, with up to four sweeps performed. Once uterine contractions began, no additional induction methods were used, and labour was managed accordingly. Data on the number of sweeps required, the interval from sweeping to delivery, mode of delivery, spontaneous delivery, maternal outcomes (including infection and postpartum hemorrhage), and fetal outcomes (birth weight, neonatal intensive care unit (NICU) admission, and APGAR score) were collected. Effectiveness was defined as the occurrence of spontaneous delivery, characterized by the initiation of labour naturally without medical induction and resulting in delivery before 42 weeks of gestation. Birth weight was measured using an analogue scale, birth weight of greater than or equal to 2.5 kg was considered normal. APGAR score was calculated at 1 minute and 5 minutes after birth, an APGAR score greater than or equal to 7 was considered normal. The sample size was calculated using Open-Epi, utilizing the previous frequency of spontaneous labour 88.3% [13], margin of error of 5.41% and a confidence interval of 95%. Patients were selected using a non-probability consecutive sampling technique. Data analysis was performed using SPSS version 23.0. Frequencies along with percentages were calculated for categorical variables such as spontaneous labour, comorbid condition, maternal and fetal outcome, means, and standard deviations were calculated for age, gestational age and time from membrane sweeping to the onset of labour. The consent form was taken Chi-Square test was applied to assess the association between spontaneous labour and frequency of membrane sweeping, while the independent samples T-test was used to assess the association between spontaneous delivery and gestational age. p-value <0.05 was considered significant.

RESULTS

The study included 136 patients with a mean age of 28.84 ± 4.83 years and a mean gestational age of 40.78 ± 0.78 weeks. The mean time from membrane sweeping to the onset of labour was 40.95 ± 19.14 hours. In our study, 41.9% of patients were literate, while 58.1% were illiterate (Figure 1).

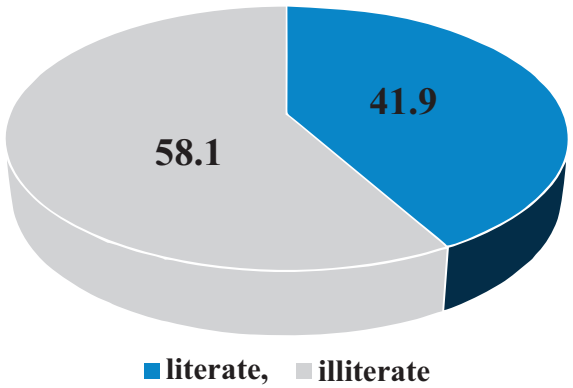

Figure 1: Age Distribution of selected Patients

Comorbid conditions included diabetes (8.1%), hypertension (13.2%), and obesity (10.3%) (Table 1).

Table 1: Comorbid Conditions among study participants

Comorbid Conditions	Frequency (%)
Diabetes	11 (8.1%)
Hypertension	18 (13.2%)
Obesity	14 (10.3%)

The frequency of membrane sweeps was performed (Table 2).

Table 2: Frequency of Membrane Sweeping among study participants

Membrane Sweeping	Frequency (%)
One Time	55 (40.4%)
Two Times	66 (48.5%)
>Two Times	15 (11.0%)
Total	136 (100%)

Results present the frequency of spontaneous delivery, which we considered effective in this study, we observed that 76.5% of patients achieved spontaneous delivery following membrane sweeping. This indicates that membrane sweeping effectively initiated labour naturally in a significant majority, reducing the dependency on medical induction methods. The observed spontaneous delivery rate suggests that the intervention helped avert post-term pregnancies by promoting timely labour onset (Figure 2).

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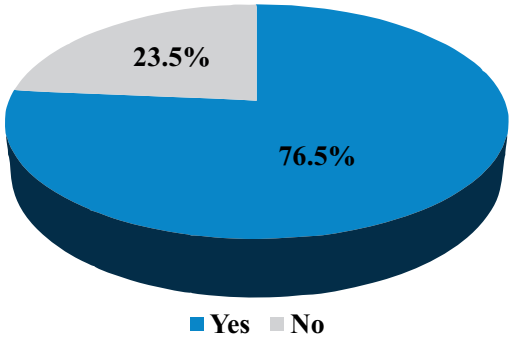

Figure 2: Spontaneous Delivery among study participants

In terms of maternal outcomes, normal vaginal delivery was achieved in 112 (82.4%) patients, while 24 (17.6%) underwent cesarean sections. Postpartum hemorrhage was observed in 6 (4.4%) patients, and infection in 2 (1.5%) (Table 3).

Table 3: Maternal Outcomes among study participants

Maternal Outcomes	Frequency (%)
Mode of Delivery	
Normal Vaginal Delivery	112 (82.4%)
Caesarean Section	24 (17.6%)
Postpartum Hemorrhage (PPH)	
Yes	6 (4.4%)
No	130 (95.6%)
Infection	
Yes	2 (1.5%)
No	134 (98.5%)

Fetal outcomes showed that 15 (11%) newborns required NICU admission. A birth weight ≥2.5 kg was observed in 119 (87.5%) newborns, and an APGAR score ≥ 7 was recorded in 129 (94.9%) newborns (Table 4).

Table 4: Fetal Outcomes among study participants

Fetal Outcomes	Frequency (%)
Admission to NICU	15 (11%)
Birth Weight ≥2.5 kg	119 (87.5%)
APGAR Score ≥7	129 (94.9%)

The effect of membrane sweeping on the duration of pregnancy is evident, as patients who experienced spontaneous labour had a mean gestational age of 40.49 ± 0.591 weeks, significantly lower than the 41.72 ± 0.581 weeks for those who did not achieve spontaneous labour (p=0.0001). This demonstrates that membrane sweeping effectively reduces the duration of pregnancy by promoting labour onset before post-term gestation (Table 5).

Table 5: Association of Spontaneous Delivery with Gestational Age

Maternal Outcomes	n	Mean ± S.D	p-value
Yes	104	40.49 + 0.591	0.0001
No	32	41.72 + 0.581	

Study shows the association of spontaneous labour with the frequency of membrane sweeping. Spontaneous labour was most common after a single membrane sweep, accounting for 50.0% of cases, followed by 40.4% after two sweeps, and only 9.6% after more than two sweeps. This association was statistically noteworthy (p=0.0001), suggesting that fewer sweeps are more effective in achieving spontaneous labour. These findings underscore the effectiveness of membrane sweeping in initiating spontaneous labour, particularly with fewer sweeps, and reducing the need for prolonged intervention (Table 6).

Table 6: Association of Spontaneous Delivery with Frequency of Membrane Sweeping

Spontaneous Labor	Membrane Sweeping			Total	p-value
	OneTime	Two Times	>Two Times		
Yes	52	52	52	104	0.0001
	50.0%	40.4%	9.6%	100.0%	
No	3	24	5	32	
	9.4%	75.0%	15.6%	100.0%	
Total	55	66	15	136	
	40.4%	48.5%	11.0%	100.0%	

DISCUSSION

Induction of labour (IOL) is a critical intervention in obstetrics, used to reduce risks associated with prolonged pregnancies. It is estimated that 20-30% of all pregnancies worldwide require IOL, particularly when the risks of continuing the pregnancy, such as fetal growth restriction, oligohydramnios, or preeclampsia, outweigh the benefits. The ARRIVE trial has further validated that IOL at 39 weeks in low-risk nulliparous women can be more beneficial than expectant management, leading to better maternal and fetal outcomes [14]. The success of IOL heavily depends on the cervical status, which is a significant determinant of whether labour induction will be effective. Prostaglandins play a pivotal role in the process of cervical ripening by promoting the softening, thinning, and dilatation of the cervix. This hormonal activity is crucial for initiating labour, and when cervical ripening does not occur naturally, prostaglandins can be used therapeutically. Mechanical methods such as membrane sweeping also facilitate labour induction by stimulating the local release of endogenous prostaglandins [15]. Previous studies have debated the effects and outcomes of starting membrane sweeping before 42 weeks of gestation. For instance, a randomized controlled trial (RCT) comparing the effects of membrane sweeping between 38-40 weeks versus only pelvic examination found that the median duration to delivery was significantly shorter in the membrane sweeping group. This result suggests that membrane sweeping is effective in reducing the time to delivery without compromising neonatal outcomes [16]. A similar outcome was observed in a trial that compared the initiation of membrane sweeping

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at 41 weeks of gestation with expectant management to prevent post-term pregnancy. The trial involved 742 cases considered to be at very low risk. Membrane sweeping performed sequentially at 41 weeks resulted in a reduced likelihood of post-date pregnancy without leading to any significant adverse neonatal outcomes [17]. In our study, we observed a high rate of successful vaginal deliveries (82.4%) among women who underwent membrane sweeping, with the majority requiring only one or two sweeps. This finding is consistent with previous research that has reported similar success rates with minimal adverse maternal outcomes [18]. In our study, the frequency of spontaneous delivery was 76.5%, indicating that membrane sweeping effectively initiated labour in a significant majority. This finding aligns closely with a study, where 88.3% of patients achieved spontaneous labour following membrane sweeping, demonstrating a similar efficacy in reducing the dependency on medical induction methods and preventing prolonged pregnancies [13]. Similarly, another study reported a spontaneous labour rate of 86.4%, further supporting the role of membrane sweeping in initiating natural labour and minimizing the need for additional interventions [19]. The effect of membrane sweeping on the duration of pregnancy in our study showed that patients who achieved spontaneous labour had a significantly lower mean gestational age (40.49 ± 0.591 weeks) compared to those who did not (41.72 ± 0.581 weeks, p=0.0001). This reduction in gestational duration mirrors the findings of a study, where membrane sweeping was associated with earlier labour onset in the majority of patients [19]. In the current study, it was found that spontaneous labour was most common after one sweep (50.0%), followed by two sweeps (40.4%) and more than two sweeps (9.6%), with a significant association (p=0.0001). This observation is supported by the aforementioned study, where most patients required only one or two sweeps to achieve labour, while only a minority needed more than two sweeps [19]. The maternal outcomes in our study were quite favourable, with only 4.4% of patients experiencing postpartum hemorrhage and just 1.5% developing infections. These findings are consistent with a study that reported no significant adverse outcomes associated with membrane sweeping [19]. Fetal outcomes in the present study were also favourable, with 94.9% of newborns achieving an APGAR score of ≥7, and only 11% requiring NICU admission. These results align with a study that reported low rates of neonatal complications associated with membrane sweeping [20]. However, despite the positive outcomes observed in our study, it is essential to acknowledge the limitations. Our study was conducted in a single tertiary care center with a specific population, which may limit the generalizability of the results. Additionally, the lack of a control group in our study design restricts our ability to make definitive conclusions about the efficacy of membrane sweeping compared to other labour induction methods. Further research with larger sample sizes and control groups across multiple centers is needed to confirm these findings and explore the broader implications of membrane sweeping in different populations and settings.

CONCLUSIONS

It was concluded that membrane sweeping effectively initiates spontaneous labour, with 76.5% achieving spontaneous labour, and notably reduces pregnancy duration by promoting timely labour onset. It is a practical, non-invasive intervention to prevent prolonged pregnancies and reduce reliance on medical induction. The minimal maternal and fetal risks observed in current study suggest that this procedure can be a valuable tool in obstetric practice, particularly in settings where more invasive or pharmacological methods may not be readily available.

Authors Contribution

Conceptualization: SS
Methodology: SS, S, NK
Formal analysis: QQ
Writing review and editing: SS

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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