Journal of Chemical Health Risks

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JCHR (2026) 16(1), 861-868 | ISSN:2251-6727

A Comparative Study of Cervical Cerclage and Vaginal Progesterone in the Prevention of Preterm Labour

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(Received: 25 November 2025 Revised: 27 December 2025 Accepted: 11 January 2026)

KEYWORDS

Preterm Birth, Cervical Cerclage, Vaginal Progesterone.

ABSTRACT:

Background: Preterm birth (PTB), defined as delivery occurring before 37 weeks of gestation, remains a major contributor to neonatal morbidity and mortality worldwide, particularly in high-risk pregnancies. The purpose of the study is to compare the efficacy of cervical cerclage and vaginal progesterone in preventing preterm labour in high-risk pregnancies.

Methods: This prospective comparative study was conducted at the Department of Fetomaternal Medicine, Bangladesh Medical University (BMU), and LAB AID Hospital, Dhaka, Bangladesh, from January 2024 to December 2025, including 50 high-risk pregnant women assigned to cervical cerclage (n=25) or vaginal progesterone (n=25). Baseline characteristics were recorded, and participants were followed until delivery to assess gestational age, latency, neonatal outcomes, and maternal complications. Data were analyzed using t-tests and chi-square/Fisher's exact tests, with $p < 0.05$ considered significant.

Results: In 50 high-risk pregnancies, baseline characteristics were similar between cervical cerclage (n = 25) and vaginal progesterone (n = 25). Cerclage was associated with higher mean gestational age at delivery (36.2 ± 2.1 vs 34.8 ± 2.5 weeks; p = 0.043), longer latency (10.4 ± 3.1 vs 8.2 ± 3.6 weeks; p = 0.025), and higher mean birth weight (2.6 ± 0.4 vs 2.3 ± 0.5 kg; p = 0.027). Maternal complications were low and comparable, and neonatal outcomes generally favored cerclage.

Conclusion: Cervical cerclage modestly prolongs pregnancy and improves neonatal outcomes compared with vaginal progesterone in high-risk pregnancies, without increasing maternal complications.

Introduction

Preterm birth (PTB), defined as delivery occurring before 37 weeks of gestation, represents a significant concern in perinatal health. It contributes to 75% of prenatal fatalities and accounts for over half of long-term neurological impairments, ranking as the second most common cause of death in children under five years of age [1]. The incidence of preterm births is increasing globally, posing a growing public health

Journal of Chemical Health Risks

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JCHR (2026) 16(1), 861-868 | ISSN:2251-6727

challenge that is expected to rise sharply in the coming decade [2]. Globally, approximately 11% of births are preterm, with regional variations ranging from 5% in parts of Europe to 18% in parts of Africa, resulting in roughly 15 million preterm deliveries each year [3,4]. The burden is particularly severe in low- and middle-income countries, where constrained healthcare resources intensify neonatal morbidity and mortality.

Preterm birth is the foremost direct cause of neonatal deaths within the first 28 days of life, accounting for 27% of all neonatal fatalities worldwide, translating to over a million deaths annually [5-8]. Reliable national data on preterm birth prevalence remain limited in many regions. Attempts to delay labor in women presenting with acute preterm symptoms have generally been unsuccessful, highlighting the importance of preventive approaches [9]. Consequently, substantial attention has been directed toward strategies aimed at reducing the risk of preterm birth, as prevention is key to improving both maternal and neonatal outcomes.

Certain pregnancies are at heightened risk for spontaneous preterm birth (sPTB), particularly when a short cervix (less than 25 mm) is detected on midtrimester transvaginal ultrasound (TVUS) from 14 weeks of gestation onward. Cervical insufficiency is a notable contributor to preterm delivery, although the underlying causes of most preterm births remain poorly understood [10]. Women with a prior history of preterm birth and a shortened cervical length have been observed to benefit from cervical cerclage [11]. Early identification of these high-risk pregnancies is essential to enable timely and targeted interventions aimed at preventing preterm labor.

Cervical cerclage, derived from the French term “hoop,” refers to a procedure in which a stitch or band is placed around the cervix to provide mechanical support [12]. This intervention has been widely applied in pregnancies considered at high risk due to cervical insufficiency. The cerclage serves to reinforce the cervix and may act as a barrier against infection. Nevertheless, its advantages have been questioned because it is invasive and carries potential complications [13,14]. Despite these concerns, cerclage continues to be recommended for carefully selected high-risk women, particularly those with a history of recurrent preterm birth or an exceptionally short cervix.

Progesterone is a hormone whose circulating levels increase throughout pregnancy and plays a critical role in sustaining gestation. One of its key functions is to inhibit myometrial contractions by exerting a relaxing effect on the uterine muscle. Vaginal administration of progesterone is increasingly favored in clinical practice because it is noninvasive, less costly than cerclage, and effective for the prevention of preterm labor [15]. Large analyses, including the EPPPIC meta-analysis, have shown that vaginal progesterone can significantly reduce the risk of spontaneous preterm birth before 34 weeks in women with a short cervix [16]. Accumulating evidence supports the use of vaginal progesterone as a safe, effective, and less invasive alternative to cerclage for high-risk pregnancies.

Despite the availability of both cervical cerclage and vaginal progesterone as preventive strategies, there remains considerable uncertainty regarding their comparative effectiveness in high-risk pregnancies. While cerclage provides mechanical support to the cervix and progesterone promotes uterine quiescence, existing studies show variability in outcomes, and few directly compare the two interventions within the same population. Moreover, most research has been conducted in high-income settings, limiting the generalizability of findings to low- and middle-income countries where the burden of preterm birth is greatest. This lack of consensus on the optimal preventive approach underscores the need for well-designed comparative studies in diverse populations. The purpose of the study is to compare the efficacy of cervical cerclage and vaginal progesterone in preventing preterm labour in high-risk pregnancies.

Objective

- To compare the efficacy of cervical cerclage and vaginal progesterone in preventing preterm labour in high-risk pregnancies.

Methodology & Materials

This prospective comparative study was conducted at the Department of Fetomaternal Medicine, Bangladesh Medical University (BMU), and LAB AID Hospital, Dhaka, Bangladesh, from January 2024 to December 2025. A total of 50 high-risk pregnant women were enrolled based on inclusion criteria, including a history of preterm labour or short cervical length. Participants were assigned to either the cervical cerclage or vaginal

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progesterone group, and data were collected throughout pregnancy to evaluate maternal and neonatal outcomes.

Inclusion Criteria:

- Singleton pregnancy
- High-risk for preterm labour (history of preterm birth or short cervical length)
- Gestational age between 14 and 20 weeks at the time of intervention

Exclusion Criteria:

- Multiple pregnancy
- Major fetal anomalies
- Maternal contraindications to cerclage or progesterone therapy
- Active vaginal infection or bleeding at the time of intervention

Participants in the cervical cerclage group (n=25) underwent a prophylactic cerclage procedure under aseptic conditions following standard surgical protocols, while those in the vaginal progesterone group (n=25) received daily vaginal progesterone until 36 weeks of gestation or delivery, whichever occurred first. Baseline demographic and obstetric characteristics—including maternal age, gravidity, prior history of preterm labour, cervical length, and gestational age at intervention—were recorded at enrollment. All participants were prospectively followed until delivery to assess primary outcomes, including gestational age at delivery, latency period (interval from intervention to delivery), and neonatal outcomes such as birth weight, low birth weight, NICU admission, and neonatal mortality. Secondary outcomes included maternal complications such as vaginal discharge, irritation, post-procedure discomfort, and serious adverse events. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequency and percentage, with differences between groups analyzed using independent t-tests for continuous data and chi-square or Fisher's exact tests for categorical data. A p-value < 0.05 was considered statistically significant.

Results

Table 1: Baseline Demographic and Obstetric Characteristics of the Study Participants (n = 50)

Variable	Cervical Cerclage (n=25)	Vaginal Progesterone (n=25)	p-value
Mean maternal age (years)	28.6 ± 4.2	27.9 ± 3.8	0.540
Primigravida	11 (44.0%)	12 (48.0%)	0.780
Multigravida	14 (56.0%)	13 (52.0%)	0.780
History of preterm labour	12 (48.0%)	11 (44.0%)	0.780
Mean cervical length (mm)	22.4 ± 2.6	22.9 ± 2.8	0.510
Gestational age at intervention (weeks)	16.8 ± 2.1	17.2 ± 2.3	0.550

The mean maternal age was 28.6 ± 4.2 years in the cervical cerclage group and 27.9 ± 3.8 years in the vaginal progesterone group. The proportion of primigravida patients was similar between groups (44.0% vs 48.0%), as was the proportion of multigravida (56.0% vs 52.0%). A prior history of preterm labour was present in 48.0% of the cerclage group and 44.0% of the progesterone group. Mean cervical length at recruitment was 22.4 ± 2.6 mm and 22.9 ± 2.8 mm, respectively, and mean gestational age at intervention was 16.8 ± 2.1 weeks for cerclage and 17.2 ± 2.3 weeks for progesterone. There were no statistically significant differences between groups ($p > 0.05$ for all parameters).

Table 2: Gestational Age at Delivery in the Study Participants (n = 50)

Gestational Age at Delivery	Cervical Cerclage (n=25)	Vaginal Progesterone (n=25)	p-value
Mean	36.2 ±	34.8 ± 2.5	0.043

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gestational age (weeks)	2.1		
≥ 37 weeks (Term)	17 (68.0%)	13 (52.0%)	0.250
< 37 weeks (Preterm)	8 (32.0%)	12 (48.0%)	0.250
< 34 weeks (Very preterm)	3 (12.0%)	6 (24.0%)	0.470

The mean gestational age at delivery was significantly higher in the cervical cerclage group (36.2 ± 2.1 weeks) compared with the vaginal progesterone group (34.8 ± 2.5 weeks, p = 0.043). Term deliveries (≥37 weeks) occurred in 68.0% of the cerclage group and 52.0% of the progesterone group. Preterm birth (<37 weeks) occurred in 32.0% and 48.0%, respectively, while very preterm birth (<34 weeks) occurred in 12.0% and 24.0%. The differences in term and preterm birth proportions were not statistically significant.

Table 3: Latency Period and Pregnancy Prolongation (n = 50)

Parameter	Cervical Cerclage (n=25)	Vaginal Progesterone (n=25)	p-value
Mean latency period (weeks)	10.4 ± 3.1	8.2 ± 3.6	0.025
Prolongation beyond 34 weeks	22 (88.0%)	19 (76.0%)	0.27
Prolongation beyond 37 weeks	17 (68.0%)	13 (52.0%)	0.25

The mean latency period, defined as the interval from intervention to delivery, was significantly longer in the cervical cerclage group (10.4 ± 3.1 weeks) than in the vaginal progesterone group (8.2 ± 3.6 weeks, p = 0.025). Pregnancy was prolonged beyond 34 weeks in 88.0% of the cerclage group compared with 76.0% in the progesterone group, and beyond 37 weeks in 68.0% and 52.0% of patients, respectively. Differences in prolongation rates were not statistically significant.

Table 4: Maternal Complications in the Study Participants (n = 50)

Maternal Complication	Cervical Cerclage (n=25)	Vaginal Progesterone (n=25)	p-value
Vaginal discharge/infection	2 (8.0%)	3 (12.0%)	0.640
Vaginal irritation	1 (4.0%)	4 (16.0%)	0.350
Post-procedure discomfort	3 (12.0%)	0 (0.0%)	0.230
Serious complications	0 (0.0%)	0 (0.0%)	—

Maternal complications were minor and comparable between groups. Vaginal discharge or infection occurred in 8.0% of the cerclage group and 12.0% of the progesterone group. Vaginal irritation was reported in 4.0% and 16.0%, respectively. Post-procedure discomfort was present in 12.0% of the cerclage group and none in the progesterone group. No serious complications occurred in either group, and all differences were not statistically significant (p > 0.05).

Table 5: Neonatal Outcomes in the Study Participants (n = 50)

Neonatal Outcome	Cervical Cerclage (n=25)	Vaginal Progesterone (n=25)	p-value
Mean birth weight (kg)	2.6 ± 0.4	2.3 ± 0.5	0.027
Low birth weight (<2.5 kg)	7 (28.0%)	11 (44.0%)	0.260
NICU admission	6 (24.0%)	9 (36.0%)	0.370
Neonatal mortality	0 (0.0%)	0 (0.0%)	—

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The mean birth weight was significantly higher in neonates of the cerclage group (2.6 ± 0.4 kg) compared with the progesterone group (2.3 ± 0.5 kg, p = 0.027). Low birth weight (<2.5 kg) occurred in 28.0% of the cerclage group and 44.0% of the progesterone group. NICU admissions were required for 24.0% versus 36.0% of neonates, respectively. No neonatal deaths occurred in either group.

Discussion

Preterm labour is a significant obstetric complication that poses serious risks to both maternal and neonatal health, particularly in high-risk pregnancies. Short cervical length and a history of preterm birth are important markers of susceptibility, reflecting underlying cervical insufficiency and the potential for early uterine activity. The findings of this study demonstrate that prophylactic cervical cerclage and vaginal progesterone can influence gestational outcomes, with cerclage associated with longer latency periods and higher mean gestational age at delivery. These results highlight the clinical importance of identifying high-risk pregnancies early and selecting appropriate preventive interventions to reduce the incidence of preterm birth and improve neonatal outcomes.

The baseline demographic and obstetric characteristics of the study participants were comparable between the cervical cerclage and vaginal progesterone groups, with mean maternal age of 28.6 ± 4.2 years and 27.9 ± 3.8 years, respectively (p = 0.540). The distribution of primigravida (44.0% vs 48.0%, p = 0.780) and multigravida patients (56.0% vs 52.0%, p = 0.780) was similar across the two groups, as was the proportion of women with a prior history of preterm labour (48.0% vs 44.0%, p = 0.780). Mean cervical length at enrollment was also comparable (22.4 ± 2.6 mm in the cerclage group versus 22.9 ± 2.8 mm in the progesterone group; p = 0.510), and the gestational age at the time of intervention did not differ between groups (16.8 ± 2.1 weeks vs 17.2 ± 2.3 weeks; p = 0.550). These findings closely mirror those reported by Ismael et al.[17], who observed similar baseline age, cervical length, and preterm birth risk profiles between treatment arms in their randomized trial of high-risk women with short cervix, as well as the meta-analysis by Conde-Agudelo et al.[18], which consistently demonstrated balanced maternal and obstetric characteristics across progesterone and cerclage groups prior to outcome assessment. This baseline equivalence strengthens the validity of comparing pregnancy and neonatal outcomes between the two interventions in the present study.

The gestational age at delivery observed in the present study indicates a tendency toward later delivery among patients managed with cervical cerclage compared with those receiving vaginal progesterone. The mean gestational age at delivery was 36.2 ± 2.1 weeks in the cerclage group versus 34.8 ± 2.5 weeks in the progesterone group (p = 0.043), with a higher proportion of term deliveries (68.0% vs 52.0%) and a lower proportion of preterm (<37 weeks) and very preterm (<34 weeks) births in the cerclage group, although these categorical differences did not reach statistical significance (p > 0.05). These findings are consistent with those reported by Fahmy et al.[19], who demonstrated a higher mean gestational age at delivery among women undergoing cervical cerclage compared with vaginal progesterone (36.32 ± 2.12 vs 35.76 ± 2.33 weeks). Similarly, Fahd et al.[20] observed a comparable pattern in a prospective cohort of high-risk women with a short cervix, reporting later delivery in the cerclage group (36.14 ± 2.11 weeks) relative to the progesterone group (35.68 ± 2.63 weeks). The concordance of these results across studies suggests that cervical cerclage may be associated with modest prolongation of pregnancy and a shift toward later gestational age at delivery when compared with vaginal progesterone in women at high risk of preterm labour.

The findings of the present study indicate that cervical cerclage was associated with a longer latency period and a trend toward greater pregnancy prolongation compared with vaginal progesterone. The mean latency period from intervention to delivery was significantly higher in the cerclage group (10.4 ± 3.1 weeks) than in the progesterone group (8.2 ± 3.6 weeks; p = 0.025), with higher proportions of pregnancies prolonged beyond 34 weeks (88.0% vs 76.0%, p = 0.27) and 37 weeks (68.0% vs 52.0%, p = 0.25), although these categorical differences did not reach statistical significance. These observations are in line with the retrospective cohort study by Martinez et al.[21], who compared cervical cerclage and vaginal progesterone in women with an incidental short cervix and reported comparable latency intervals between groups (100 vs

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92.7 days; p = 0.43), emphasizing that latency remains a key outcome variable in comparative preterm birth research, even when differences are modest. Furthermore, the prolonged latency observed in the cerclage group in the present study is supported by the findings of Enakpene et al.[22], who demonstrated a substantially longer pregnancy latency of approximately 14 weeks in women with an extremely short cervix (≤10 mm) undergoing cervical cerclage in combination with vaginal progesterone compared with progesterone alone. Taken together, these studies reinforce the concept that cervical cerclage, particularly in high-risk women with shortened cervical length, may contribute to prolongation of pregnancy and increased latency from intervention to delivery, consistent with the trends observed in the current analysis.

In the present study, maternal complications were overall low and comparable between the cervical cerclage and vaginal progesterone groups. Vaginal discharge or infection occurred in 8.0% of the cerclage group and 12.0% of the progesterone group, while vaginal irritation was reported in 4.0% versus 16.0%, respectively. Post-procedure discomfort was observed in 12.0% of patients undergoing cerclage and none in the progesterone group, and no serious complications occurred in either cohort. These findings are consistent with the SuPPoRT trial conducted by Hezelgrave et al.[23], in which women with a short cervix treated with cervical cerclage, cervical pessary, or vaginal progesterone demonstrated similar safety profiles, with minor maternal adverse events such as vaginal discharge or discomfort not differing significantly between intervention arms. This concordance supports the conclusion that both cervical cerclage and vaginal progesterone are generally safe, with low incidence of maternal morbidity, and that the choice of intervention can be guided primarily by efficacy and clinical indications rather than differences in maternal complication risk.

In the present study, neonatal outcomes were generally favorable in both groups, with a significantly higher mean birth weight in the cervical cerclage group (2.6 ± 0.4 kg) compared with the vaginal progesterone group (2.3 ± 0.5 kg; p = 0.027). The proportions of low birth weight (<2.5 kg) neonates were 28.0% in the cerclage group versus 44.0% in the progesterone group, and NICU admissions occurred in 24.0% versus 36.0%, respectively, while no neonatal deaths were observed in either group. These findings are consistent with the retrospective study by Al-Rifaie et al.[24], which reported that women receiving cervical cerclage had significantly higher mean birth weights (2850 ± 420 g) and lower neonatal mortality compared with control groups, suggesting a neonatal benefit associated with cerclage in high-risk pregnancies. Similarly, Boelig et al.[25] demonstrated in a randomized controlled trial that interventions with cerclage, with or without adjunctive progesterone, reduced preterm birth and were associated with lower rates of neonatal morbidity and mortality, supporting the trend observed in the current study. Collectively, these results reinforce that cervical cerclage, particularly in women at high risk for preterm labor, may confer advantages in neonatal outcomes, including improved birth weight and reduced early neonatal complications, while vaginal progesterone also maintains a generally favorable safety profile.

Limitations of the study

The study had a few limitations:

- The sample size was relatively small, which may limit the ability to detect less common outcomes or differences between groups.
- The study was conducted at only two centers in Dhaka, potentially limiting the generalizability of the findings to other populations or regions.

Conclusion

Preterm labour remains a major cause of neonatal morbidity and mortality, particularly in high-risk pregnancies, necessitating effective preventive strategies. In this study, cervical cerclage was associated with a significantly higher mean gestational age at delivery and longer latency period compared with vaginal progesterone, while the distribution of term, preterm, and very preterm births, as well as pregnancies prolonged beyond 34 and 37 weeks, did not differ significantly. Maternal complications were minor and comparable between groups, with no serious adverse events. Neonatal outcomes favored the cerclage group, with significantly higher mean birth weight and lower rates of low birth weight and NICU admission, although these differences were not statistically significant. Overall, cervical cerclage appears to offer modest

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advantages over vaginal progesterone in prolonging pregnancy and improving neonatal outcomes in high-risk pregnancies without increasing maternal morbidity.

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