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Effectiveness of Prophylactic Transvaginal Cervical Cerclage in Improving Clinical Outcomes among Pregnant Women with Cervical Insufficiency: Meta-Analysis

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Abstract

Background: Cervical insufficiency is one of the major causes of preterm birth among pregnant women that leads to severe mortality and morbidity issues among newborns. Prophylactic cervical cerclage is a surgical procedure performed between 11 and 14 weeks of gestation upon diagnosis of cervix insufficiency among pregnant women. **Aims & Objectives:** In this study, we aimed to evaluate the effectiveness of prophylactic cervical cerclage in comparison to other interventions to treat cervical insufficiency among pregnant women using a meta-analysis approach. **Methods:** We searched the three databases (Coachrane Library, PubMed, and MEDLINE) that were used for articles related to research aims by using MeSH keywords. The timeline of research was set from January 2015 to January 2024. The methodological quality assessment of included studies was performed by the Risk of Bias in Non-randomized Studies—of Interventions (ROBINS-I). A recent meta-analysis was conducted by using Review Manager 5.4.0 software. **Results:** About 441 research articles were extracted from three electronic databases and only 125 articles were assessed for eligibility criteria. Finally, 8 studies were included in the analysis for a recent meta-analysis. Six out of eight included retrospective or pilot studies were graded as having a moderate risk of bias, and two studies had low risk on the basis of owning bias. About 1008 pregnant women with cervical insufficiency were analyzed in a recent meta-analysis. By pooled analysis, it was evaluated that significant difference found in prolongation of delivery weeks (Mean difference = 1.05; Cl: 0.81 to 1.29: $p > 0.00001$), number of deliveries > 37 weeks (OR = 0.59; Cl: 0.19 to 1.84: $p > 0.006$), and preterm birth (OR = 0.73; Cl: 0.42 to 1.28: $p > 0.50$) among pregnant women receiving

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prophylactic cervical cerclage as compared to other treatment strategies. **Conclusion:** Recent meta-analysis suggested the prophylactic cervical cerclage reduces the rates of preterm birth, abortion rates, number of deliveries > 37 weeks, and other complications as compared to the other cervical cerclage types and conservative treatments.

Keywords

Prophylactic Transvaginal Cervical Cerclage, Cervical Insufficiency, Pregnant Women

1. Introduction

Among perinatal health issues, preterm birth is still the leading cause of disability and perinatal death [1] [2]. Preterm or premature birth is defined as a baby born alive, having a gestation period of less than 37 weeks, according to World Health Organization (WHO) [3]. In 2020, about 13.4 million preterm babies were born and the incidence rates of preterm birth are still increasing globally [4]. About 10.6% of infants are born with preterm birth globally, and the incidence rates vary from 8.7% to 13.4% across different regions [5]. In other words, about 12.9 million preterm deliveries are reported annually, leading to severe perinatal morbidity and mortality [6]. Prematurity is increasing globally, with 5-18% incidence rates in Western countries and 60% in South Asian and African countries [7] [8]. The major risk factors associated with preterm birth (PTB) are smoking, use of alcohol, use of illegal drugs, environmental factors, age of the mother and lack of care during pregnancy [9]. Several mechanisms initiate preterm labour syndromes such as uterine overdistension, infection or inflammation, stress, haemorrhage or ischemia, and immunologically mediated processes [10]. Preterm infants are at higher risk of developmental problems, health complications, and related mortality rather than healthy infants. Priorconization, other risk factors associated with preterm birth in patients are cervical length, and specimen volume. Preterm infants are at higher risk of getting complications such as poor body temperature regulation, impaired respiration, various infections, and difficulty in feeding [11].

Over the past two decades, perinatal care has been improved, but still rates of preterm birth are increasing. Preterm infants are at higher risk of developmental problems, health complications, and related mortality rather than healthy infants The increasing prevalence rates of preterm births (PTM) and related complications emphasize the importance of diagnosis and suggest early treatment strategy for women at risk [12]. Various diagnostic and therapeutic interventions exist for optimal management of PTB, including reduction of physical activity, smoking cessation [13], antibiotic treatment of bacterial vaginosis and screening of periodontal disease [14]. Transvaginal ultrasound measurement (TVS) of cer-

vical length is considered as one of the most accurate techniques for prediction and management of women at PTB risk [15].

Cervical insufficiency is defined as the dilation of the cervix prematurely in pregnancy. In other words, cervical insufficiency is the inability of the uterine cervix in the absence of symptoms or signs related to uterine contraction which causes an issue of retaining a pregnancy [16]. The common symptoms of cervical insufficiency are placenta abruption, premature rupture of membranes (PROM) and chorioamnionitis in the second trimester. Moreover, the risk factors linked with cervical insufficiency are obstetric lacerations, deficiencies in cervical elastin and collagen, conization, congenital mullerian and mechanical dilation of the cervix. It is reported that a structural deficiency in the cervix causes cervical insufficiency of the cervix. Preterm opening of the cervix raises a woman's chance of preterm delivery significantly [17].

There are two main types of treatment for cervical insufficiency (CI); conservative and surgery. Cervical cerclage is a surgical treatment of cervical insufficiency, done by sewing the cervix opening temporarily with stitches [18]. The cerclage is performed in the second trimester of pregnancy to enhance the capacity of the cervix for holding pregnancy that prevents preterm birth. Cervical cerclage (CC) treatments are of two types: emergency CC (ECC) and prophylactic CC (PCC) [19]. The methods commonly used for cervical cerclage are performed trans-vaginally or trans-abdominally. The point of consideration is that all treatment strategies are recommended after the diagnosis or previous history of painless cervical dilation in the second trimester of pregnancy. However, cervical insufficiency among women with no previous history can be diagnosed through ultrasonographical results of amniotic membrane bulging or short cervical length in the mid-second trimester [20].

When the cervix has not yet been obliterated or dilated, the cerclage procedure is referred to as prophylactic cerclage. Prophylactic cerclage cervix is performed between 12 to 14 weeks (about 3 months) of pregnancy due to indication of cervix insufficiency from medical history and ultrasonography [21]. In patients who have had cervical insufficiency in the past, prophylactic cerclage may be recommended. In comparison to earlier, the emergency CC is performed after effacement and dilation [22]. While the conservative treatment strategies for cervical cerclage (CC) include pessary treatment, and expectant treatment. Additionally, Arabian cervical pessary and vaginal progesterone are effective preventive treatment strategies for women at PTB risk [23].

Other studies showed positive outcomes by conservative management strategies such as progesterone therapy to treat short cervical length. Due to safety and efficacy, the conservative management is prioritized over emergency cerclage to treat amniotic membrane bulging among pregnant women to prevent severe complications [24]. On the other hand, severe complications are associated with emergency cerclage, having bulged amniotic membrane and these are PROM, cervical bleeding, and chorioamnionitis, even can lead to more foetal loss as

compared to prophylactic cerclage. Moreover, there are still controversies related to the efficacy of emergency cerclage as compared to other treatment strategies for cervical insufficiencies among pregnant women [25].

Several studies reported that prophylactic cervical cerclage decreases the prevalence of preterm birth as well as linked severe complications and increases the length of pregnancy effectively. The effective clinical outcomes of prophylactic cervical cerclage are reported in gestational age at delivery, length of hospital stay after surgery, live births, operative time, and preterm birth. One surgical procedure that works well to stop late foetal loss or recurrent abortion is cervical prophylactic cervical cerclage [11]-[16].

Since several studies have reported the efficacy of cervical cerclage either by prophylactic or emergency procedure. But very few studies have been conducted on the efficacy and safety of prophylactic cervical cerclage in pregnant women with cervical incompetency. Therefore, the recent meta-analysis aimed to evaluate the effectiveness of prophylactic cervical cerclage in improving outcomes among pregnant women with cervical insufficiency.

2. Methods

The "Reporting Items for Systematic Review and Meta-Analysis (PRISMA)" guidelines were followed for conducting a recent meta-analysis according to research aims [26]-[28].

2.1. Search Strategy

The research papers related to the study's aims "effectiveness of Prophylactic transvaginal cervical cerclage in improving clinical outcomes among pregnant women with cervical insufficiency" were extracted. We searched the three databases (Coachrane Library, PubMed, and MEDLINE) that were used for articles related to research aims. The timeline of research was set from January 2015 to January 2024. We used English language databases by using MeSH terms (Cervical Insufficiency [mh]) OR (Incompetence, Uterine Cervical) OR (Cervical Incompetence, Uterine) OR (Incompetent OR (Cervices, Incompetent) OR (Cervix, Incompetent) AND ((prophylactic cervical cerclage [mh]) OR (Uterine Cervix Cerclage) OR (Cervical Cerclage) OR (Cerclage of Cervix)).

2.2. Inclusion Criteria

In recent meta-analysis, the eligibility criteria applied after searching of research articles from above mentioned databases that assisted in screening of research article. We included only those articles in the recent meta-analysis that met the following criteria: 1) Research studies discussing the prophylactic cervical cerclage for cervical insufficiency; 2) Studies involved population of pregnant women with cervical insufficiency; 3) Studies involving the outcomes related to efficacy, and pregnancy outcomes; 4) Studies based on randomized controlled trials, pilot studies and cohort studies.

2.3. Exclusion Criteria

The studies excluded have the following features as: 1) Studies discussing other types of therapeutic strategies; 2) Studies involving the population of pregnant women without cervical insufficiency, or patients complicated with other diseases; 3) Studies involving that included outcomes for twins, or higher-order multiple births; 4) Systematic reviews, Meta-analysis, literature reviews, observational studies, scoping reviews, conferences, and letters.

2.4. Data Extraction and PICO Model

For analysis, we extracted the information related to authors, year of study, country, study follow-up, sample size, type of intervention for cervical insufficiency, and primary outcomes from selected articles after the selection and screening of research articles. The research question was designed using the PICO model. It provided a PICO according to the above-mentioned research aims of the recent systematic review. For recent meta-analysis, the PICO question of was as follows:

P—population of pregnant women with cervical insufficiency;

I—Prophylactic cervical cerclage;

C—Comparison of prophylactic cervical cerclage versus conservative methods;

O—Outcomes (prolonged pregnancy duration, number of live births, number of preterm births and abortion).

2.5. Primary Outcomes

The primary outcomes of recent meta-analysis were prolonged pregnancy duration, number of live births, number preterm births, number of deliveries > 34 weeks, and number of miscarriage rates.

2.6. Risk of Bias Assessment

The methodological quality assessment of included studies in recent meta-analysis was evaluated by the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) for retrospective cohort studies. All these non-randomized studies were examined on bias due to confounding, selection, categorization of treatment strategies, variation from intended treatment, missing data, measurement of efficacy or effects and reporting [29].

2.7. Statistical Analysis

Recent meta-analysis was conducted by using Review Manager 5.4.0 software. Our meta-analysis used both fixed effects and random effects depending on the heterogeneity. The chi-squared test, which can be represented as an I2 index or p-value, was used to evaluate the statistical heterogeneity of the results of included studies. When $p > 0.10$ or $I2 \leq 50\%$, we concluded that there was no obvious heterogeneity in the included studies, and the fixed-effect model was applied. A random-effects model was applied otherwise. Odds risks (ORs) are used

to represent variables, and 95% confidence intervals (95 CI's) serve as the basis for all interval estimates. When $p < 0.05$, differences were deemed statistically significant [30] [31].

3. Results

3.1. Included Studies

The selection and screening of research articles related to the study aim "Effectiveness of Prophylactic transvaginal cervical cerclage in improving clinical outcomes among pregnant women with cervical insufficiency" was performed by following the PRISMA guidelines in the recent meta-analysis. About 441 research articles were extracted from three electronic databases (PubMed: 398, Cochrane library: 11 and MEDLINE: 32) after applying the above-mentioned search strategy. Only 223 papers were screened, and 218 articles were excluded before on basis of duplication, unavailability of full text, and removal by automation) of screening. Among those, only 125 articles were assessed for eligibility criteria. Only 8 studies met the inclusion criteria and were included in the analysis for a recent meta-analysis as mentioned in Figure 1.

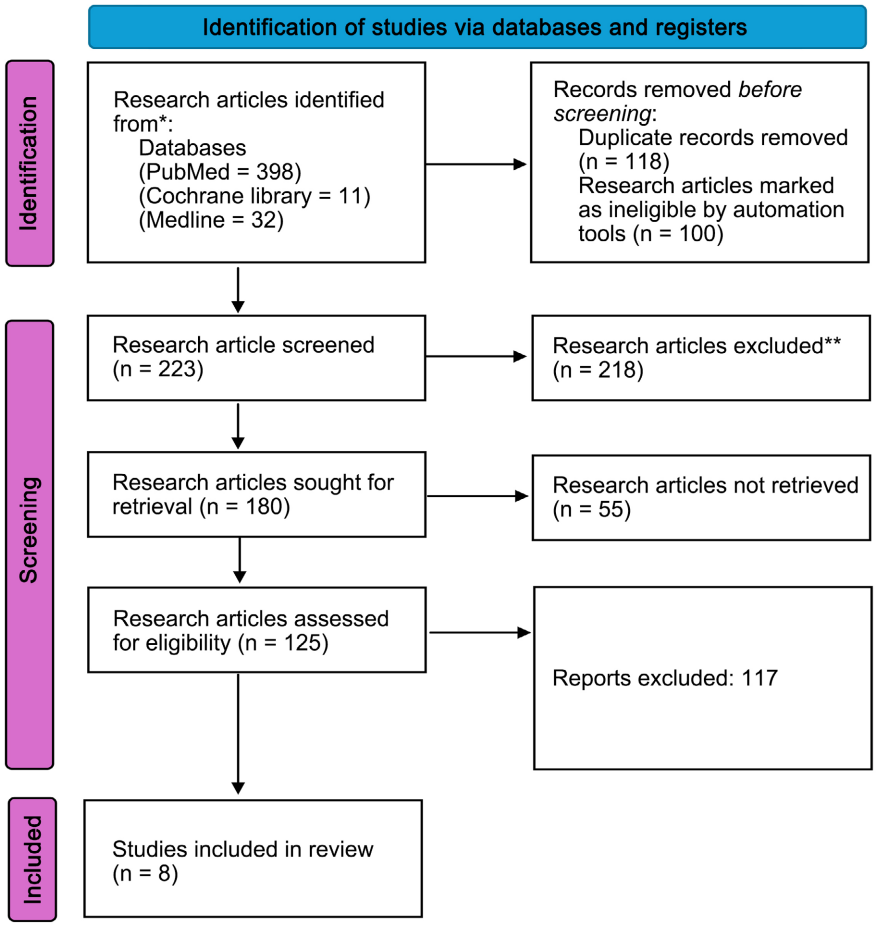

Figure 1. Flow chart of Screening and selection of included studies by using PRISMA Guidelines.

3.2. Methodological Quality Assessment

Six [32]-[38] out of eight included retrospective or pilot studies were graded as moderate risk of bias on basis of owning bias as given in Table 1 and bias of historical controls which are major confounding factors. Two studies [32] [39] have low risk of bias, as authors chose lower age range in intervention group as compared to control.

Table 1. The ROBINS-I checklist for quality assessment of included studies.

Author & year	Type of study	Bias due to confounding	Bias selection of participant	Bias in categorization of intervention	Bias due to deviation of intervention	Bias due to missing data	Bias in measurement of outcomes
Cimilli Şenocak *et al.*, 2022 [33]	Retrospective study design	Moderate	Moderate	low	Moderate	High	Moderate
Liu *et al.*, 2018 [34]	Retrospective study	Moderate	Low	Low	Moderate	Moderate	Low
He *et al.*, 2022 [35]	Retrospective design	Moderate	Moderate	High	High	Low	Moderate
Korb *et al.*, 2017 [36]	Retrospective cohort study	Moderate	Moderate	Low	Low	High	Low
Bartolo *et al.*, 2017 [37]	Retrospective cohort study	Moderate	Low	Moderate	Moderate	Moderate	High
Okuhara *et al.*, 2022 [38]	Pilot study	Low	Low	Moderate	Moderate	Moderate	Moderate
Şimşek *et al.*, 2021 [32]	Retrospective study	Moderate	High	low	Moderate	Low	low
Ikechebelu *et al.*, 2023 [39]	Pilot study	Moderate	low	low	Moderate	Moderate	moderate

3.3. Characteristics of Included Studies

The included articles for recent meta-analysis were published between 2015 and 2024. All studies were either retrospective cohort studies or pilot studies, as data was collected between intervals of time by medical or healthcare centres. About 1008 pregnant women with cervical insufficiency were analysed in a recent meta-analysis to fulfill research aims. To produce heterogeneity of results, the trials belong to 5 different countries: 2 in China [34] [35], 2 in France [36]-[38], 2 in Türkiye [32] [33], 1 in Nigeria [39] and 1 in Japan [38]. The strategies used to treat cervical insufficiency against prophylactic cervical cerclage were emergency cervical cerclage, therapeutic cervical cerclage, and conservative treatment (Table 2).

Table 2. The ROBINS-I checklist for quality characteristics of included students.

Author, year	Country	Population	Sample size	Mean age	Type of methodology	Type of intervention for cervical insufficiency	Primary findings			
							Birth week or abortion rate	Number of deliveries < 37	Prolongation of pregnancy (weeks)	Preterm infants and Live births
CİMİLLİ ŞENOCAK *et al.*, 2022 [33]	Turkey	160 pregnant women with cervical insufficiency	Prophylactic cerclage: 113 Therapeutic cerclage: 47	(31 ± 4)	Retrospective study design	Prophylactic cervical cerclage therapeutic cervical cerclage	PCC: (33 - 50) 22.5 ± 5.56 TCC: (30 - 43) 15.50 ± 2.76		PCC: (18 - 4) TCC: (11 - 2)	
Liu *et al.*, 2018 [34]	China	69 pregnant women with cervical insufficiency	Prophylactic cerclage group: 30 Therapeutic cerclage group: 39	(29.8 ± 6)	Retrospective study	Prophylactic cervical cerclage therapeutic cervical cerclage	Prolongation in delivery 19.5 ± 5.0 vs 12.0 ± 8.2	12 (30) 27 (39)	PCC: 35.2 ± 5.5 and TCC: 31.7 ± 6.5 weeks	Preterm infants 9 (30) 15 (39) Live births 28 (30) 27 (39)
He *et al.*, 2022 [35]	China	160 pregnant women with cervical insufficiency	Early cervical cerclage: 71 Emergency cerclage: 89	30.78 ± 4	Retrospective design	Prophylactic cervical cerclage therapeutic cervical cerclage	Abortion rates 11 out of 71 And 55 out of 89 Prolongation 6.44 ± 1.37 vs 6.82 ± 1.70			Preterm birth 7 and 10 Live birth 52 out of 71 and 22 out of 89
Korb *et al.*, 2017 [36]	France	205 pregnant women	Prophylactic Cervical cerclage: 97 Emergency: 109	29.8 ± 4	Retrospective cohort study	Prophylactic cervical cerclage emergency cervical cerclage		23 out of 97 51 out of 109		
Bartolo *et al.*, 2017 [37]	France	38 pregnant women	Prophylactic cervical cerclage: 24 Shirodkar cerclage group: 14	28.78 ± 6	Retrospective cohort study	Prophylactic cervical cerclage Shirodkar cervical cerclage				Preterm birth: 6 out of 24 1 out of 14
Okuhara *et al.*, 2022 [38]	Japan	281 pregnant women	Prophylactic cervical cerclage: 71 Conservative treatment: 210	29.8 ± 4	Pilot study	Prophylactic cervical cerclage Conservative Treatment	Prolongation 3.75 ± 1.22 vs 2.55 ± 0.27			
Şimşek *et al.*, 2021 [32]	Turkey	75 pregnant women with cervical insufficiency	Prophylactic cervical cerclage: 48 Emergency cervical cerclage: 27	29.4 ± 6	Retrospective study	Prophylactic cervical cerclage, Emergency cervical cerclage	Mean gestational age 35.6 ± 4.5 in prophylactic cervical cerclage and 33.6 ± 5.9 in emergency group	38 out of 48 17 out of 27		Preterm birth 9 out of 48 9 out of 27
Ikechebelu *et al.*, 2023 [39]	Nigeria	20 pregnant women	McDonald or prophylactic cervical cerclage: 10 Triangular 3 bite: 10	ages of 18 and 45 years	Pilot study	McDonald or prophylactic cervical cerclage, Triangular 3 bite	Abortion 1 out of 10 1 out of 10			Preterm birth 2 out of 10 3 out of 10

3.4. Primary Outcomes

3.4.1. Prolongation of Pregnancy after Cervical Cerclage

Among 8 included studies, about 5 studies discussed the prophylactic cervical cerclage and its effects on prolongation of pregnancy after cervical cerclage treatment among pregnant women in recent meta-analysis [32]-[35] [38]. There was significant difference prolongation of delivery weeks among pregnant women receiving prophylactic cervical cerclage as compared to other treatment strategies (Mean difference = 1.05; Cl: 0.81 to 1.29: p > 0.00001) and heterogeneity was found (df = 4; I2 = 97%), as shown in Figure 2.

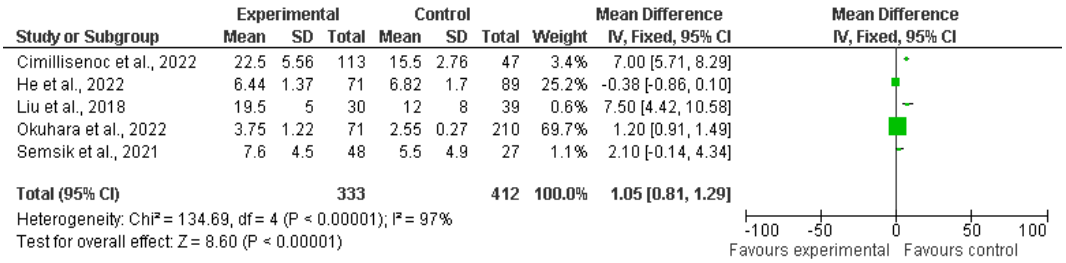

Figure 2. Forest plot of prolongation of delivery weeks among pregnant women receiving prophylactic cervical cerclage and other treatment.

3.4.2. Number of Deliveries > 37

Among 8 included studies, about 3 studies discussed the prophylactic cervical cerclage and its effects on number of deliveries > 37 weeks among pregnant women in recent meta-analysis [32] [34] [36]. There was a slight difference in number of deliveries > 37 weeks among prophylactic cervical cerclage and other interventions (OR = 0.59; Cl: 0.19 to 1.84: p > 0.006,) and heterogeneity was found (df = 2; I2 = 80%), as shown in Figure 3 and Figure 4.

3.4.3. Preterm Birth

Among 8 included studies, about 5 studies discussed the prophylactic cervical cerclage and its effects on number of preterm births among pregnant women in recent meta-analysis [32] [34] [37]-[39]. There was significant reduction in number of preterm births among prophylactic cervical cerclage group as compared to other interventions (OR = 0.73; Cl: 0.42 to 1.28: p > 0.50,) and heterogeneity was found (df = 4; I2 = 0%), as shown in Figure 5 and Figure 6.

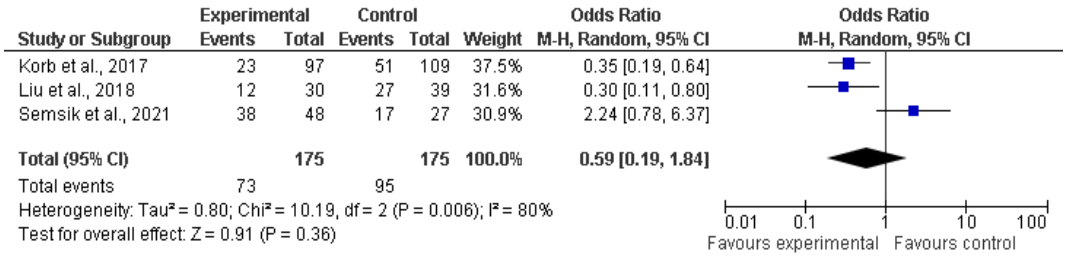

Figure 3. Forest plot of number of deliveries > 37 weeks among pregnant women receiving prophylactic cervical cerclage and other treatment.

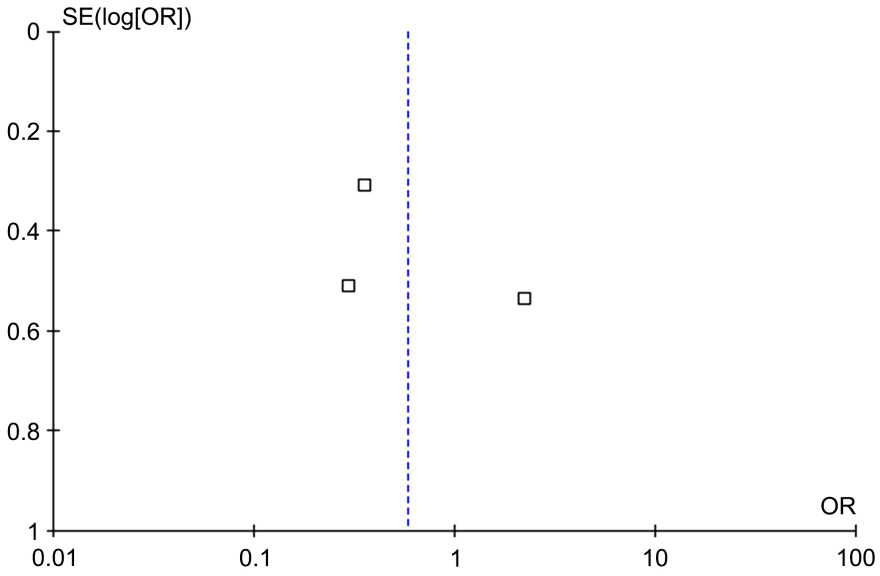

Figure 4. Funnel plot of number of deliveries > 37 weeks among pregnant women receiving prophylactic cervical cerclage and other treatment.

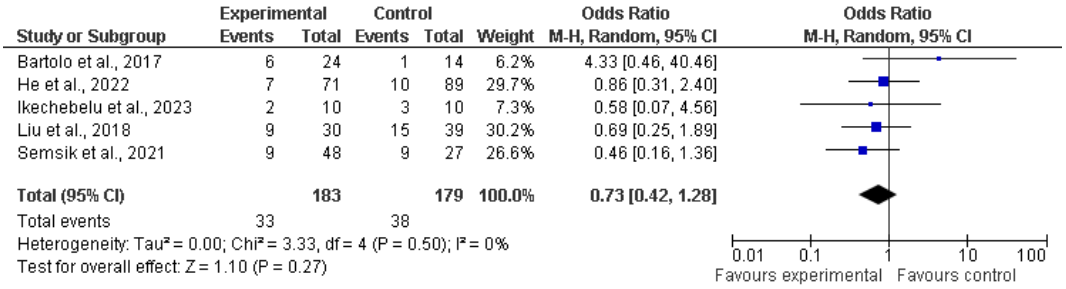

Figure 5. Forest plot of number of preterm births among pregnant women receiving prophylactic cervical cerclage and other treatment.

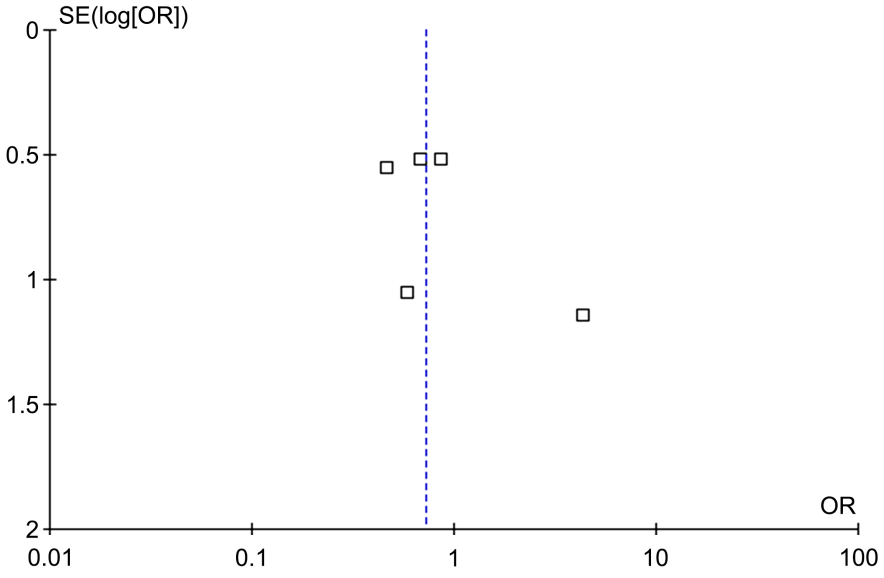

Figure 6. Funnel plot of number of preterm births among pregnant women receiving prophylactic cervical cerclage and other treatment.

3.4.4. Live Birth

Among 8 included studies, about 2 studies discussed the prophylactic cervical cerclage and its effects on number of live births among pregnant women in recent meta-analysis [34] [35]. There was significant improvement in number of live births among prophylactic cervical cerclage group as compared to other interventions (OR = 7.94; Cl: 4.42 to 15.28: p > 0.74,) and heterogeneity was found (df = 1; I2 = 0%), as shown in Figure 7 and Figure 8.

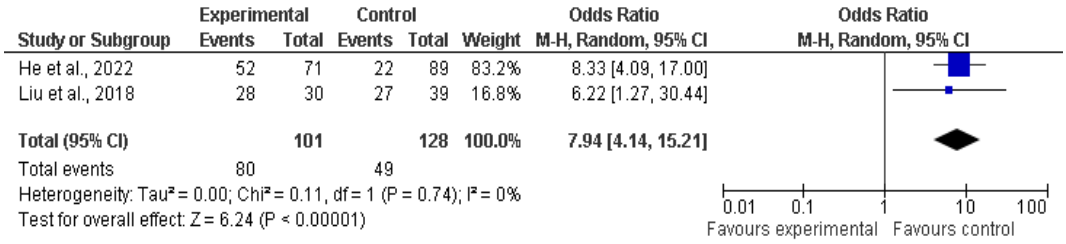

Figure 7. Forest plot of number of live births among pregnant women receiving prophylactic cervical cerclage and other treatment.

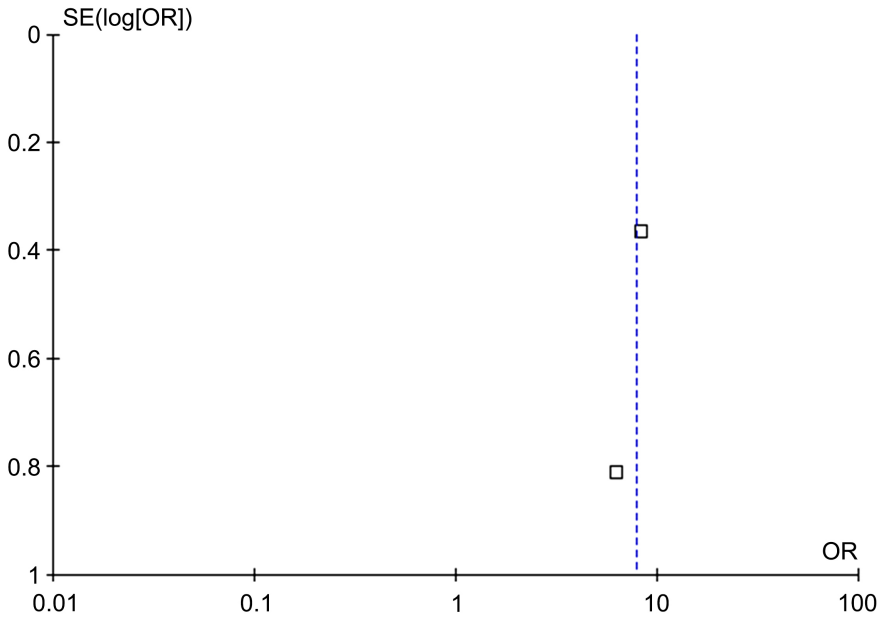

Figure 8. Funnel plot of number of live births among pregnant women receiving prophylactic cervical cerclage and other treatment.

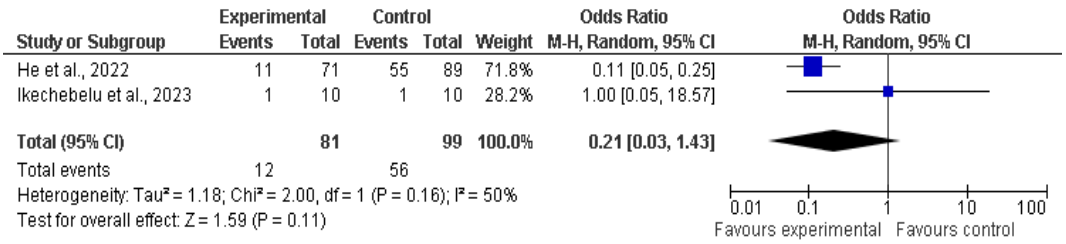

Figure 9. Forest plot of number of abortions among pregnant women receiving prophylactic cervical cerclage and other treatment.

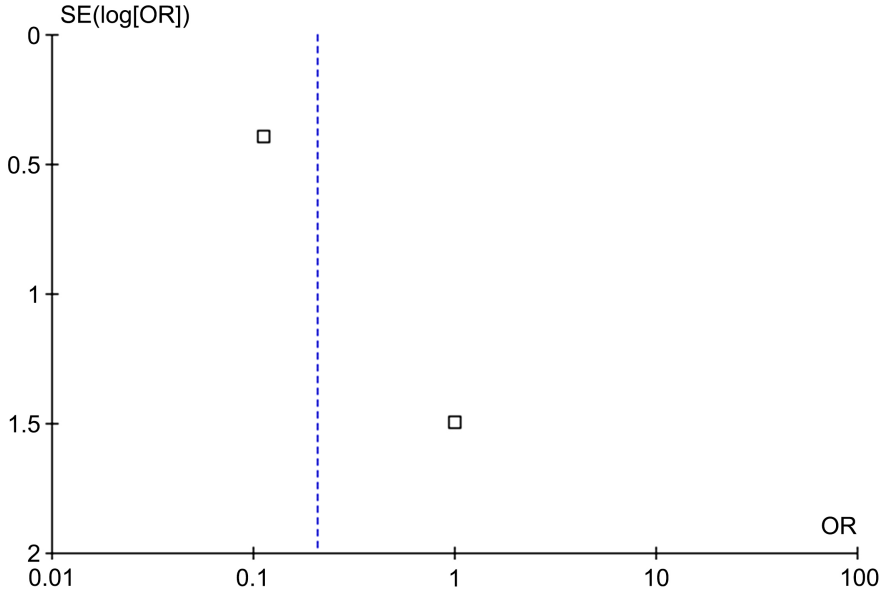

Figure 10. Funnel plot of number of abortions among pregnant women receiving prophylactic cervical cerclage and other treatment.

3.4.5. Abortion

Among 8 included studies, about 2 studies discussed the prophylactic cervical cerclage and its effects on number of abortions among pregnant women in recent meta-analysis [35] [39]. There was slight reduction in number of abortions among prophylactic cervical cerclage group as compared to other interventions (OR = 0.21; Cl: 0.42 to 1.28: p > 0.16) and heterogeneity was found (df = 1; I2 = 50%), as shown in **Figure 9** and **Figure 10**.

4. Discussion

The recent meta-analysis was performed to evaluate the effectiveness of Prophylactic or early or elective cervical cerclage in comparison to other treatments for cervical insufficiency among the pregnant women. Other standard therapeutic strategies against prophylactic cervical cerclage were conservative treatment, and emergency or therapeutic cervical cerclage to treat cervical incompetence. The findings reported that prophylactic cervical cerclage resulted in prolonged pregnancy duration after delivery in weeks as compared to emergency or therapeutic cervical cerclage, as evaluated by mean difference among intervention and placebo groups. Other outcomes such as low rates of preterm births [32] [34] [35] [37] [39], number of deliveries > 37 weeks [32] [34] [36] and abortion rates [35] [39] among those pregnant women receiving prophylactic cervical cerclage as compared to conservative treatments or emergency cervical cerclage. Furthermore, the mean difference in prolongation of delivery weeks (Mean difference = 1.05; Cl: 0.81 to 1.29: p > 0.00001), number of deliveries > 37 weeks (OR = 0.59; Cl: 0.19 to 1.84: p > 0.006), number of preterm births (OR = 0.73; Cl: 0.42 to 1.28: p > 0.50) number of live births (OR = 7.94; Cl: 4.42 to 15.28: p > 0.74) in number of abortions (OR = 0.21; Cl: 0.42 to 1.28: p > 0.16) among pregnant

women receiving prophylactic cervical cerclage as compared to other treatment strategies. Additionally, the rates of live births among prophylactic cervical cerclage were higher than other interventions. Overall, recent meta-analysis evaluated higher success rates by implementation of prophylactic cervical intervention due to earlier indications of cervical insufficiency and its diagnosis to prevent poor pregnancy related outcomes. The prophylactic cervical cerclage is recommended also on basis of previous abortion history or painless dilation, leading to preterm births or abortions among pregnant women [22].

Up to 1% of maternal populations may have cervical insufficiency, consequently it's a condition that occurs frequently enough that it is advised to address that the issues with its management were beyond due. Cervical cerclage has been a part of obstetric practice for more than a century, but its purpose and appropriate uses are still unclear and up for debate, with significant variances in application across various clinical contexts [40]. The uncertainty around the identification of individuals who will genuinely benefit from cerclage (*i.e.*, those with actual elevated risk of preterm delivery or cervical insufficiency) contributes to the lack of clarity surrounding the procedure. Cervical directing, shortening, for and overt dilatation are signs in the first trimester of pregnancy that may point to probable cervical insufficiency [41]. Even without it, A cervical length measured by ultrasonography that is less than 25 mm before 27 weeks of pregnancy is known as funnelling, and it raises the risk of miscarriage or preterm delivery. Cervical insufficiency must be screened for, or its likelihood predicted in the absence of a valid diagnostic test. The foundation of this procedure is the determination and acknowledgement of significant risk factors in the woman's medical history and the index pregnancy. Preterm births or losses in the second trimester of pregnancies are the most common indicators in the patient's medical history that point to a possible danger. Yet it should be highlighted that there may occasionally be a range among preterm and cervical insufficiency [24].

In others, birth and labour are two separate and unconnected procedures. Cervical insufficiency risk is not always indicated by previous experience of preterm labour or a determination of risk factors for preterm birth. Alfirevic [42] reported the study to evaluate the risk of cervical insufficiency and recommendation of cervical insufficiency or other conservative treatments such as progesterone to avoid preterm birth. The results of this investigation are a little contradictory, showing that while cerclage reduces the rates of preterm births statistically significantly, it does not influence maternal death or morbidity. Additionally, cerclage was linked to higher rates of maternal illness and Caesarean sections, the latter of which may potentially be responsible for a non-significant rise in respiratory morbidity among babies born to women who had cerclages.

Liu *et al.*, [43] conducted an update meta-analysis and systematic review to evaluate efficacy of prophylactic cervical cerclage in twin pregnancies by comparing 8578 non cerclage and 726 patients with earlier cervical cerclage. The

findings reported that prophylactic cervical cerclage was linked to a significant decrease in PTB, nevertheless, only in twin pregnancies with a cervical length less than 15 mm. In twin pregnancies, there is still conflicting evidence about the safety and efficacy of cervical cerclage on mother and newborn outcomes. Another study by Belej-Rak [44] evaluated effectiveness of prophylactic cervical cerclage on the basis of sonographic results of cervix shortness through 6 studies. Cerclage had no statistically significant impact on the incidence of preterm labour, newborn mortality or complications, gestational age at birth, or length of labour. Preterm delivery was defined as those occurring at 37, 34, 32, and 28 weeks of gestation. With cerclage, birth weight was substantially higher than without. Cervical cerclage is not recommended for a short cervix identified sonographically, according to the current data. It will take a randomized controlled trial to ascertain whether this technique would lessen unfavourable outcomes for newborns. Li *et al.*, [45] estimated the efficacy of prophylactic cervical cerclage in extending the prolongation of pregnancy and reducing risk preterm births or abortion. The findings of meta-analysis showed that in doublets with a cervical length of less than 15 mm or a dilated cervix larger than 10 mm, cerclage implantation prolongs pregnancy and reduces the risk of premature birth. According to recent research, the advantages of two pregnancies with normal cervical length and history- or twins alone-indicated cerclage are less definite. Drakeley *et al.*, [26] conducted the research on evaluation of efficacy of prophylactic cervical cerclage in improving outcomes among pregnant women with cervical insufficiency. About 2175 pregnant women from six trials were analysed through pooled analysis. The findings reported that prophylactic cerclage is not beneficial in avoiding premature delivery in women who are at low or medium risk of miscarrying a second child. Moreover, the use of cerclage in women whose ultrasounds show a short cervix is still unclear, nevertheless. Another meta-analysis conducted by Wei and Wang [27] reported the efficacy of emergency cervical cerclage in terms of improvements in neonatal survival rates and gestational period among pregnant women with cervical insufficiency as compared to expectant treatment. The underlying principle accounting for clinical role of prophylactic cervical cerclage among pregnant women in comparison to other treatment strategies for cervical insufficiency was conducted for the first time. Several previous studies reported combined effects of prophylactic cervical cerclage and emergency cervical cerclage against conservative methods [42] [43]. Now, it is need of hour to manage the cervical insufficiency before 28 weeks of pregnancy by proper diagnosis and studying underlying pathophysiology of cervical insufficiency among pregnant women. Growing knowledge of pathophysiology offers an additional rationale for investigating into cerclage's potential application in the treatment of cervical insufficiency [46].

The recent meta-analysis has used more recent research to evaluate the efficacy of prophylactic cervical cerclage, as it is done on basis of diagnosis of dilation and shorter cervical length, not after 28th week of gestation. We used ROBINS-I

to evaluate the methodological risk of bias to ensure quality of including studies. The publication bias of included studies was robust which ensured quality of recent meta-analysis. We conducted pooled analysis of rates of preterm births, live births, number of deliveries > 37 weeks. However, there are few limitations in recent meta-analysis which should be considered. Firstly, a limited number of studies were available on comparison of prophylactic's efficacy with other treatment strategies. Secondly all studies were retrospective studies or non-randomized controlled trials, as it should include randomized controlled trial to produce heterogeneity. Even though we used stringent inclusion and exclusion standards, it's probable that we overlooked some additional biological elements that might have impacted conception result. Fourth, we limited the scope of our analysis to publications that were composed in English.

5. Conclusion

In conclusion, a recent meta-analysis suggested that prophylactic cervical cerclage reduces the rates of preterm birth, abortion rates, number of deliveries > 37 weeks and other complications as compared to the other cervical cerclage types and conservative treatments. Additionally, the rates of live births and prolongation in gestational weeks were increased after prophylactic cervical cerclage as compared to other strategies among pregnant women with cervical incompetence. Further studies should be conducted with a larger sample size to evaluate other clinical outcomes after the implication of prophylactic cerclage as compared to other treatment strategies to treat cervical insufficiency.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] World Health Organization (2022) Preterm Birth. https://www.who.int/news-room/fact-sheets/detail/preterm-birth

[2] Beck, S., Wojdyla, D., Say, L., Pilar Bertran, A., Meraldi, M., Harris Requejo, J., *et al.* (2010) The Worldwide Incidence of Preterm Birth: A Systematic Review of Maternal Mortality and Morbidity. *Bulletin of the World Health Organization*, **88**, 31-38. https://doi.org/10.2471/blt.08.062554

[3] Saigal, S. and Doyle, L.W. (2008) An Overview of Mortality and Sequelae of Preterm Birth from Infancy to Adulthood. *The Lancet*, **371**, 261-269. https://doi.org/10.1016/s0140-6736(08)60136-1

[4] Ohuma, E.O., Moller, A., Bradley, E., Chakwera, S., Hussain-Alkhateeb, L., Lewin, A., *et al.* (2023) National, Regional, and Global Estimates of Preterm Birth in 2020, with Trends from 2010: A Systematic Analysis. *The Lancet*, **402**, 1261-1271. https://doi.org/10.1016/s0140-6736(23)00878-4

[5] Christianson, A., Howson, C.P. and Modell, B. (2006) March of Dimes Global Report on Birth Defects March of Dimes Birth Defects Foundation 2006.

[6] Govindaswami, B., Jegatheesan, P., Nudelman, M. and Narasimhan, S.R. (2018)

Prevention of Prematurity. *Clinics in Perinatology*, **45**, 579-595. https://doi.org/10.1016/j.clp.2018.05.013

[7] Goldenberg, R.L., Culhane, J.F., Iams, J.D. and Romero, R. (2008) Epidemiology and Causes of Preterm Birth. *The Lancet*, **371**, 75-84. https://doi.org/10.1016/s0140-6736(08)60074-4

[8] Blencowe, H., Cousens, S., Oestergaard, M.Z., Chou, D., Moller, A., Narwal, R., *et al.* (2012) National, Regional, and Worldwide Estimates of Preterm Birth Rates in the Year 2010 with Time Trends since 1990 for Selected Countries: A Systematic Analysis and Implications. *The Lancet*, **379**, 2162-2172. https://doi.org/10.1016/s0140-6736(12)60820-4

[9] World Health Organization (2015) WHO Recommendations on Interventions to Improve Preterm Birth Outcomes. https://www.who.int/publications/i/item/9789241508988

[10] Romero, R., Espinoza, J., Kusanovic, J., Gotsch, F., Hassan, S., Erez, O., *et al.* (2006) The Preterm Parturition Syndrome. *BJOG: An International Journal of Obstetrics & Gynaecology*, **113**, 17-42. https://doi.org/10.1111/j.1471-0528.2006.01120.x

[11] Celik, E., To, M., Gajewska, K., Smith, G.C.S. and Nicolaides, K.H. (2008) Cervical Length and Obstetric History Predict Spontaneous Preterm Birth: Development and Validation of a Model to Provide Individualized Risk Assessment. *Ultrasound in Obstetrics & Gynecology*, **31**, 549-554. https://doi.org/10.1002/uog.5333

[12] Owen, J. (2001) Mid-trimester Endovaginal Sonography in Women at High Risk for Spontaneous Preterm Birth. *JAMA*, **286**, 1340-1348. https://doi.org/10.1001/jama.286.11.1340

[13] Dodd, J.M., Jones, L., Flenady, V., Cincotta, R. and Crowther, C.A. (2013) Prenatal Administration of Progesterone for Preventing Preterm Birth in Women Considered to Be at Risk of Preterm Birth. *Cochrane Database of Systematic Reviews*, No. 7, CD004947. https://doi.org/10.1002/14651858.cd004947.pub3

[14] Romero, R., Nicolaides, K., Conde-Agudelo, A., Tabor, A., O'Brien, J.M., Cetingoz, E., *et al.* (2012) Vaginal Progesterone in Women with an Asymptomatic Sonographic Short Cervix in the Midtrimester Decreases Preterm Delivery and Neonatal Morbidity: A Systematic Review and Metaanalysis of Individual Patient Data. *American Journal of Obstetrics and Gynecology*, **206**, 124.E1-124.E19. https://doi.org/10.1016/j.ajog.2011.12.003

[15] Brown, R., Gagnon, R. and Delisle, M. (2019) No. 373-Cervical Insufficiency and Cervical Cerclage. *Journal of Obstetrics and Gynaecology Canada*, **41**, 233-247. https://doi.org/10.1016/j.jogc.2018.08.009

[16] Sun, W., Zhang, L. and Li, Y. (2019) Operative Timing of Cervical Cerclage in Patients with Cervical Insufficiency during Pregnancy and Its Effect on Pregnancy Outcome. *Maternal & Child Health Care of China*, **34**, 2707-2709.

[17] Hassan, S.S., Romero, R., Vidyadhari, D., Fusey, S., Baxter, J.K., Khandelwal, M., *et al.* (2011) Vaginal Progesterone Reduces the Rate of Preterm Birth in Women with a Sonographic Short Cervix: A Multicenter, Randomized, Double-Blind, Placebo-Controlled Trial. *Ultrasound in Obstetrics & Gynecology*, **38**, 18-31. https://doi.org/10.1002/uog.9017

[18] Romero, R., Conde-Agudelo, A., Da Fonseca, E., O'Brien, J.M., Cetingoz, E., Creasy, G.W., *et al.* (2018) Vaginal Progesterone for Preventing Preterm Birth and Adverse Perinatal Outcomes in Singleton Gestations with a Short Cervix: A Meta-Analysis of Individual Patient Data. *American Journal of Obstetrics and Gynecology*, **218**, 161-180. https://doi.org/10.1016/j.ajog.2017.11.576

[19] Aoki, S., Ohnuma, E., Kurasawa, K., Okuda, M., Takahashi, T. and Hirahara, F. (2013) Emergency Cerclage versus Expectant Management for Prolapsed Fetal Membranes: A Retrospective, Comparative Study. *Journal of Obstetrics and Gynaecology Research*, **40**, 381-386. https://doi.org/10.1111/jog.12207

[20] Ragab, A. and Mesbah, Y. (2015) To Do or Not to Do Emergency Cervical Cerclage (A Rescue Stitch) at 24-28 Weeks Gestation in Addition to Progesterone for Patients Coming Early in Labor? A Prospective Randomized Trial for Efficacy and Safety. *Archives of Gynecology and Obstetrics*, **292**, 1255-1260. https://doi.org/10.1007/s00404-015-3772-4

[21] Romero, R., Yeo, L., Miranda, J., Hassan, S.S., Conde-Agudelo, A. and Chaiworapongsa, T. (2013) A Blueprint for the Prevention of Preterm Birth: Vaginal Progesterone in Women with a Short Cervix. *Journal of Perinatal Medicine*, **41**, 27-44. https://doi.org/10.1515/jpm-2012-0272

[22] Odibo, A., Berghella, V., To, M., Rust, O., Althuisius, S. and Nicolaides, K. (2007) Shirodkar versus Mcdonald Cerclage for the Prevention of Preterm Birth in Women with Short Cervical Length. *American Journal of Perinatology*, **24**, 055-060. https://doi.org/10.1055/s-2006-958165

[23] Brown, J.A., Pearson, A.W., Veillon, E.W., Rust, O.A., Chauhan, S.P., Magann, E.F. and Morrison, J.C. (2011) History- or Ultrasound-Based Cerclage Placement and Adverse Perinatal Outcomes. *The Journal of Reproductive Medicine*, **56**, 385-392.

[24] Conde-Agudelo, A., Romero, R., Nicolaides, K., Chaiworapongsa, T., O'Brien, J.M., Cetingoz, E., *et al.* (2013) Vaginal Progesterone vs Cervical Cerclage for the Prevention of Preterm Birth in Women with a Sonographic Short Cervix, Previous Preterm Birth, and Singleton Gestation: A Systematic Review and Indirect Comparison Metaanalysis. *American Journal of Obstetrics and Gynecology*, **208**, 42.E1-42.E18. https://doi.org/10.1016/j.ajog.2012.10.877

[25] Gundabattula, S.R., Marakani, L.R., Dasari, S., Surampudi, K., Pochiraju, M. and Nirmalan, P.K. (2013) Outcomes of Pregnancy in Women Who Had Rescue Cerclage for Cervical Insufficiency: A Single-Center Retrospective Study. *Journal of Obstetrics and Gynaecology Research*, **39**, 1293-1300. https://doi.org/10.1111/jog.12059

[26] Drakeley, A.J., Roberts, D. and Alfirevic, Z. (2003) Cervical Cerclage for Prevention of Preterm Delivery. *Obstetrics & Gynecology*, **102**, 621-627. https://doi.org/10.1097/00006250-200309000-00035

[27] Wei, Y. and Wang, S. (2023) Comparison of Emergency Cervical Cerclage and Expectant Treatment in Cervical Insufficiency in Singleton Pregnancy: A Meta-Analysis. *PLOS ONE*, **18**, e0278342. https://doi.org/10.1371/journal.pone.0278342

[28] Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., *et al.* (2021) The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews. *International Journal of Surgery*, **88**, Article ID: 105906. https://doi.org/10.1016/j.ijsu.2021.105906

[29] Sterne, J.A., Hernán, M.A., Reeves, B.C., Savović, J., Berkman, N.D., Viswanathan, M., *et al.* (2016) ROBINS-I: A Tool for Assessing Risk of Bias in Non-Randomised Studies of Interventions. *BMJ*, **355**, i4919. https://doi.org/10.1136/bmj.i4919

[30] Sarkis-Onofre, R., Catalá-López, F., Aromataris, E. and Lockwood, C. (2021) How to Properly Use the PRISMA Statement. *Systematic Reviews*, **10**, Article No. 117. https://doi.org/10.1186/s13643-021-01671-z

[31] Campbell, M., McKenzie, J.E., Sowden, A., Katikireddi, S.V., Brennan, S.E., Ellis, S., *et al.* (2020) Synthesis without Meta-Analysis (SWiM) in Systematic Reviews: Re-

porting Guideline. *BMJ*, **368**, L6890. https://doi.org/10.1136/bmj.l6890

[32] Yüksel Şimşek, S., Şimşek, E., Doğan Durdağ, G., Alemdaroğlu, S., Baran, Ş.Y. and Kalaycı, H. (2021) Prevention of Preterm Delivery by Cervical Cerclage; A Comparison of Prophylactic and Emergency Procedures. *Journal of the Turkish-German Gynecological Association*, **22**, 22-28. https://doi.org/10.4274/jtgga.galenos.2020.2019.0183

[33] Cimilli Senocak, G.N. (2022) Comparison of Therapeutic and Prophylactic Cervical Cerclages and Their Results. *Eastern Journal of Medicine*, **27**, 591-595. https://doi.org/10.5505/ejm.2022.67045

[34] Liu, Y., Ke, Z., Liao, W., Chen, H., Wei, S., Lai, X., *et al.* (2018) Pregnancy Outcomes and Superiorities of Prophylactic Cervical Cerclage and Therapeutic Cervical Cerclage in Cervical Insufficiency Pregnant Women. *Archives of Gynecology and Obstetrics*, **297**, 1503-1508. https://doi.org/10.1007/s00404-018-4766-9

[35] He, D. and Zhao, D. (2022) Analysis of the Timing of Cervical Cerclage Treatment in Pregnant Women with Cervical Insufficiency and the Effect on Pregnancy Outcome. *Emergency Medicine International*, **2022**, Article ID: 8340009. https://doi.org/10.1155/2022/8340009

[36] Korb, D., Marzouk, P., Deu, J., Oury, J.F. and Sibony, O. (2017) Effectiveness of Elective Cervical Cerclage According to Obstetric History. *Journal of Gynecology Obstetrics and Human Reproduction*, **46**, 53-59. https://doi.org/10.1016/j.jgyn.2016.09.006

[37] Bartolo, S., Garabedian, C., Deruelle, P., Debarge, V., Ducloy-Bouthors, A. and Subtil, D. (2017) Evaluation of a New Technique of Prophylactic Cervical Cerclage Simplified from the Shirodkar Cerclage: A Pilot Study. *Journal of Gynecology Obstetrics and Human Reproduction*, **46**, 343-347. https://doi.org/10.1016/j.jogoh.2017.02.003

[38] Okuhara, M., Tsuda, H., Nishiko, Y., Fuma, K., Kuribayashi, M., Tezuka, A., *et al.* (2021) The Efficacy of Therapeutic Cervical Cerclage in Singleton Pregnancies: A Retrospective Study. *The Journal of Maternal-Fetal & Neonatal Medicine*, **35**, 6267-6271. https://doi.org/10.1080/14767058.2021.1910663

[39] Ikechebelu, J., Dim, C., Okpala, B., Eleje, G., Joe-Ikechebelu, N., Echezona, D., *et al.* (2023) Comparison of Pregnancy Outcomes of Triangular 3-Bites and Mcdonald Techniques of Cervical Cerclage in Women with Cervical Insufficiency: A Pilot Study. *Nigerian Journal of Clinical Practice*, **26**, 630-635. https://doi.org/10.4103/njcp.njcp_830_22

[40] Althuisius, S.M., Dekker, G.A., Hummel, P. and van Geijn, H.P. (2003) Cervical Incompetence Prevention Randomized Cerclage Trial: Emergency Cerclage with Bed Rest versus Bed Rest Alone. *American Journal of Obstetrics and Gynecology*, **189**, 907-910. https://doi.org/10.1067/s0002-9378(03)00718-x

[41] Wang, S., Ma, L., Huang, S., Liang, L. and Zhang, J. (2016) Role of Cervical Cerclage and Vaginal Progesterone in the Treatment of Cervical Incompetence with/without Preterm Birth History. *Chinese Medical Journal*, **129**, 2670-2675. https://doi.org/10.4103/0366-6999.193451

[42] Shim, E.J., Kim, H.J., Kim, I.Y., Oh, K.Y., Yang, Y.S. and Jin, C.H. (2020) Outcomes of Prophylactic and Emergency Cerclage versus Expectant Management for Cervical Insufficiency: A Single-Center Retrospective, Comparative Study. *Clinical and Experimental Obstetrics & Gynecology*, **47**, 262-267. https://doi.org/10.31083/j.ceog.2020.02.5200

[43] Belej-Rak, T., Okun, N., Windrim, R., Ross, S. and Hannah, M.E. (2003) Effective-

ness of Cervical Cerclage for a Sonographically Shortened Cervix: A Systematic Review and Meta-Analysis. *American Journal of Obstetrics and Gynecology*, **189**, 1679-1687. https://doi.org/10.1016/s0002-9378(03)00871-8

[44] Alfirevic, Z., Stampalija, T., Roberts, D. and Jorgensen, A.L. (2012) Cervical Stitch (Cerclage) for Preventing Preterm Birth in Singleton Pregnancy. *Cochrane Database of Systematic Reviews*, **6**, CD008991. https://doi.org/10.1002/14651858.CD008991.pub2

[45] Odibo, A.O., Farrell, C., Macones, G.A. and Berghella, V. (2003) Development of a Scoring System for Predicting the Risk of Preterm Birth in Women Receiving Cervical Cerclage. *Journal of Perinatology*, **23**, 664-667. https://doi.org/10.1038/sj.jp.7211004

[46] Abdel-Aleem, H., Shaaban, O.M. and Abdel-Aleem, M.A. (2010) Cervical Pessary for Preventing Preterm Birth. *Cochrane Database of Systematic Reviews*, No. 5, CD007873. https://doi.org/10.1002/14651858.CD007873.pub2