Risk Factors in Women Undergoing Cervical Cerclage at Imam Khomeini Hospital in Ahvaz (2011-2021)

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Article Type	ABSTRACT
Research Paper	**Background and Objective:** Cervical insufficiency is a risk factor for late miscarriage and spontaneous preterm birth. Cervical cerclage is used to manage women with ultrasound diagnosis of cervical insufficiency and at risk of complications. Since multiple factors are involved in cervical insufficiency, the aim of this study was to investigate risk factors in in women undergoing cervical cerclage in Ahvaz. **Methods:** This cross-sectional study was conducted on pregnant women with cervical insufficiency undergoing cervical cerclage at Imam Khomeini Hospital, Ahvaz, from 2011-2021. Patient information including demographic characteristics and pregnancy-related risk factors including history of a previous pregnancy, type of previous delivery, history of preterm birth, history of multiple pregnancy, history of curettage and abortion, family history of cervical insufficiency, and history of infertility were collected and analyzed. **Findings:** The mean gestational age at the time of cervical insufficiency diagnosis was 16.51 ± 2.91 weeks (between 11 and 28 weeks of pregnancy). Moreover, 214 (77%) patients had a history of previous pregnancy and 166 (59.7%) had a history of previous childbirth. There was a history of preterm birth in 141 patients (50.7%), a history of abortion in 120 patients (43.2%), a family history of cervical insufficiency in 68 patients (24.5%), a history of infertility in 48 patients (17.3%), a history of curettage in 42 patients (15.1%), a history of multiple pregnancy in 23 patients (8.3%), and menstrual disorders in 18 patients (6.5%). The results showed that there was a direct and significant relationship between cervical length before cerclage and the age of the pregnant mothers ($r=0.123$, $p=0.041$). **Conclusion:** The results of the study showed that the greatest risk factors for cervical insufficiency are history of preterm birth, miscarriage, and family history of cervical insufficiency. **Keywords:** *Cervical Cerclage, Cervical Insufficiency, Preterm Birth.*

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Introduction

Preterm birth is a leading cause of neonatal mortality worldwide, and one of the causes of preterm birth is cervical insufficiency (1). Cervical insufficiency is a clinical diagnosis characterized by painless dilatation of the cervix and prolapse and protrusion of the fetal membranes into the vagina in the absence of uterine contractions or vaginal bleeding during the second or third trimester of pregnancy (2). The incidence of cervical insufficiency is approximately 1-2% in all pregnancies. However, up to 15% of pregnancy losses during the 16–28th week of gestation can be attributed to cervical insufficiency (3). Cervical insufficiency is one of the most important causes of late miscarriage or spontaneous preterm birth (4), has become a serious obstacle to safe delivery and has led to postpartum complications for both the mother and fetus (3).

Despite advances in medical science over the past few decades, recurrent pregnancy loss, preterm birth, and their complications remain a significant problem. One of the most common causes of pregnancy loss and preterm birth is cervical insufficiency (5, 6). Once a short cervix is diagnosed, interventions can be considered to prevent preterm birth. These interventions include administering progesterone to the pregnant mother to relax the uterus, or perform cerclage procedure to close up and lengthen the cervix (1).

Cervical cerclage is currently an effective intervention for controlling cervical insufficiency in pregnancies with a history of pregnancy loss or severe preterm birth (before 34 weeks of gestation), which reduces morbidity and mortality in pregnant women with cervical insufficiency (2, 7–10). Although cervical cerclage has been used since the 1950s to prevent preterm birth in women with cervical insufficiency, its effectiveness remains controversial (1). Such an intervention requires that women at risk be identified before the cervix becomes too short or dilated (11). Several factors can predict the risk of cervical insufficiency, including a history of late miscarriage or preterm birth, which are of particular importance and are included in some screening protocols (12). Other risk factors include a history of cervical procedures or cerclage, prolonged second stage of labor (13, 14), and polycystic ovary syndrome (PCOS) (15, 16). However, there is disagreement about the importance of the studied risk factors, and the definition and diagnosis of cervical insufficiency remains unclear (2, 8, 17). Therefore, it is important to identify risk factors and comorbidities of cervical insufficiency in order to resolve the controversy surrounding cerclage (1) and to understand the potential of this intervention to reduce the risk of pregnancy loss or preterm birth (18).

No study has been conducted in Iran to investigate the characteristics and risk factors of women undergoing cervical cerclage. Considering that pregnancy complications can have long-term effects on the fetus and its future, this study was conducted to investigate the risk factors in women undergoing cervical cerclage at Imam Khomeini Hospital in Ahvaz during 10 years.

Methods

After approval by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences with the code IR.AJUMS.HGOLESTAN.REC.1401.085, this cross-sectional study was conducted on women undergoing cervical cerclage at Imam Khomeini Hospital in Ahvaz over a 10-year period from 2011 to 2021. Based on 0.5 cervical insufficiency prevalence in the general female population (19) and considering 95% confidence interval, an effect size of 0.1 and a power of 95% and using the G*Power software, a sample size of at least 268 people was considered.

In this study, pregnant women over 18 years of age undergoing cervical cerclage (solely due to cervical insufficiency) were included in the study, and patients undergoing preventive cerclage surgery (for various reasons including high-risk or multiple pregnancies) and cases with incomplete information in the file were excluded from the study.

The required data were collected by reviewing the patients' medical records and, if possible, by contacting the patients by phone and were recorded in the patient information questionnaire. The diagnosis of cervical insufficiency was made by an obstetrician and gynecologist based on the findings of transvaginal ultrasonography. Basic patient information including age, height, weight, body mass index (BMI), ethnicity, occupation, economic status, smoking, and the presence of underlying disease were collected. Clinical characteristics and obstetric information including gestational age at the time of diagnosis of cervical insufficiency, parity, gravidity, type of previous delivery, history of preterm delivery (gestational age ≤ 37 weeks), history of multiple pregnancy, history of curettage and abortion, family history of cervical insufficiency, menstrual disorder and its cause, as well as history of infertility and its treatment method, and cervical length at the time of diagnosis of cervical insufficiency in the ultrasound were also reviewed and recorded.

After data collection, they were analyzed using SPSS statistical software (SPSS Inc., Chicago, IL, U.S.A.) version 22. Mean, standard deviation, frequency, and percentage were used to describe the data. Normality of the data was assessed by Kolmogorov-Smirnov test and homogeneity of variances was assessed by Leven test. Independent t-test was used to compare the mean of variables between two groups, and Spearman correlation test was used to determine the relationship between quantitative variables, and $p<0.05$ was considered significant.

Results

278 pregnant women with cervical insufficiency with a mean age of 27.95±6.43 years (range of 18 to 47 years) were studied in this research. The mean weight of the patients was 68.85±10.78 kg (Table 1).

The mean gestational age at cervical insufficiency diagnosis in patients was 16.51±2.91 weeks (between 11 and 28 weeks of gestation). The mean number of pregnancies was 2.72±1.40 (between 1 and 6) and the mean number of previous deliveries was 1.06±1.10 (between 0 and 4). Moreover, 214 patients (77%) had a history of pregnancy and 166 (59.7%) had a history of previous deliveries. 141 patients (50.7%) had a history of preterm birth, 68 (24.5%) had a family history of cervical insufficiency, and 18 (6.5%) had menstrual disorders, 4 of which were due to PCOS and 14 to other causes. Moreover, 48 (17.3%) of women had a history of infertility (Table 2).

Table 1. Demographic characteristics of women undergoing cervical cerclage at Imam Khomeini Hospital in Ahvaz

Variable	Mean±SD (min-max) or Number(%)
Age (years)	27.95±6.43 (18-47)
Height (cm)	162.44±5.65 (145-175)
Weight (kg)	68.85±10.78 (40-101)
BMI (kg/m²)	26.06±3.70 (17.31-37.70)
Ethnic group	
Fars	161(57.9)
Arab	115(41.4)

Lur	2(0.7)
Job	
Housewife	192(69.1)
Employed	86(30.9)
Education	
Illiterate	6(2.2)
School education	138(49.6)
High school diploma	63(22.7)
Advanced Diploma	32(11.5)
Bachelor's degree	36(12.9)
Master's degree	3(1.1)
Economic situation	
Weak	4(1.4)
Average	263(94.6)
Good	11(4.0)
Smoking	0(0)
Underlying disease	82(29.5)

Table 2. Pregnancy history and risk factors of cervical insufficiency in women undergoing cervical cerclage

Variable	Mean±SD (min-max) or Number(%)
Gestational age (weeks)	16.51±2.91 (11-28)
Gravida	2.72±1.40 (1-6)
Parity	1.06±1.10 (0-4)
Pregnancy history	214(77)
Labor history	166(59.7)
Type of previous delivery	
Virginal	108(65.1)
Cesarean section	58(34.9)
History of preterm birth	141(50.7)
History of multiple delivery	23(8.3)
History of curettage	42(15.1)
History of miscarriage	120(43.2)
Family history of cervical insufficiency	68(24.5)
Menstrual disorder	18(6.5)
Cause of menstrual disorder	
PCOS	4(1.4)
Other	14(5.1)
History of infertility	48(17.3)
Assisted reproductive technique	
ART	35(12.6)
Fertility medications	13(4.7)
Cervical length (mm)	25.39±7.19 (10.0-42.0)

ART: Assisted Reproductive Technology

The results of Pearson correlation test showed that there was a direct and significant relationship between the length of the cervix before cerclage and the age of the pregnant mothers (r=0.124, p=0.040). However, there was no significant relationship between the length of the cervix before cerclage and the gestational age (r=0.012, p=0.845) and BMI (r=0.105, p=0.084). There was no significant difference in the length of the cervix based on parity, type of delivery, assisted reproductive technology, history of infertility, and history of cervical insufficiency (Table 3).

Table 3. Comparison of cervical length before cerclage based on different variables

Variable	Cervical length (mm) Mean±SD	p-value[*]
Parity		
Nulliparous	24.64±6.22	0.154
Multiparous	25.90±7.74	
Type of delivery		
Vaginal	25.69±7.08	0.696
Cesarean section	25.23±7.93	
Assisted reproductive technique		
ART	25.98±6.41	0.364
Fertility medications	25.19±4.58	
History of infertility		
Yes	26.47±5.69	0.260
No	25.16±7.40	
History of cervical insufficiency		
Yes	25.55±7.36	0.830
No	25.33±7.15	

[*]**Independent t-test**

Discussion

The results of the present study demonstrated that history of preterm delivery, history of miscarriage, history of cervical insufficiency, and history of infertility are the most important and common risk factors for cervical insufficiency and cerclage in the study population. Therefore, a thorough and complete medical history in the initial evaluation of pregnant women can inform physicians about the risk factors for cervical insufficiency. It is necessary to conduct detailed assessments of these risk factors, especially in women after a second-trimester loss or premature birth, or in cases where such complications have occurred in a previous pregnancy (20).

In their study about factors associated with cervical insufficiency in pregnant women who underwent cerclage, Mirbolouk et al. reported that in primiparous mothers, the most common associated factor was miscarriage, followed by dilation and curettage (21). The results of a study by Saremi et al. investigating the associated factors in patients undergoing cerclage showed that 41.5% of women had a history of miscarriage and 49.2% were gravida 1 (22).

In the present study, there was no significant association between pre-cerclage cervical length and gestational age. However, in a study by Saremi et al. on women with cervical insufficiency, it was reported that shorter cervical length was associated with older gestational age (22). These results indicate that most individuals with shorter cervical length had older gestational age. However, this association may have been

non-random. Therefore, an analytical study and comparison with a control group with a large sample size is recommended to examine this relationship more closely. Kunpalin et al. also reported a history of preterm labor in 32.2% of women undergoing cervical cerclage (23). In the study of Vyas et al., a history of previous curettage, precipitous delivery, and prolonged second stage of labor were reported as independent predictors of cervical insufficiency in multiparous women (13). In the study of Barinov et al., history of infertility was reported in 27%, pregnancy through IVF in 13.9%, history of spontaneous abortion in 43.75%, and history of preterm birth in 20.8% of women undergoing cervical cerclage, and 83% of women had a history of previous childbirth (24). In a large population-based study, Meng et al. showed that history of miscarriage was present in 47%, history of preterm birth in 20.09%, multiple pregnancy in 4%, and history of curettage in 2.9% of women with cervical insufficiency, and history of prolonged second stage of labor was strongly associated with the occurrence of cervical insufficiency and was introduced as an independent predictor of the occurrence of cervical insufficiency (11). In the study of Kondo et al., history of preterm birth was observed in 42.85% of women and history of cervical cerclage in 34% of women with cervical insufficiency undergoing cerclage (therapeutic and preventive) (9). Some studies have also reported the presence of subclinical infections in women undergoing cervical cerclage (17, 23, 25). In the present study, however, it was not possible to measure and investigate this due to the retrospective nature of the study.

According to the findings of the present study and other previous studies, history of late miscarriage or preterm delivery is an important predictor of cervical insufficiency, and therefore is included in some screening protocols (12). Also, most cases had a history of previous delivery, which should be taken into account in the management of cervical insufficiency. Another possible risk factor is history of infertility. The differences in the prevalence of risk factors in women undergoing cervical cerclage in different studies are due to differences in sample size, differences in sample characteristics, methodology, and outcome definitions. Therefore, further studies with precise methodology are necessary to determine the different risk factors in these women.

The results of the present study demonstrated that there was a direct and significant relationship between the pre-cerclage cervical length measured by transvaginal ultrasonography and the age of the pregnant mothers. These results indicate that with increasing maternal age, cervical length increases and the risk of cervical insufficiency decreases. These results are consistent with the findings of Meng et al., who showed that higher maternal age is associated with a significant decrease in the risk of cervical insufficiency in both nulliparous and multiparous women (11). However, there is no clear evidence regarding the importance of maternal age for the risk of cervical insufficiency. In the study of Roman et al., a weak negative association between the age of women undergoing cervical cerclage and the risk of cervical insufficiency was also reported for older women. However, this study was conducted only on multiple pregnancies and the sample size in the group of women undergoing cervical cerclage was 17 (26). However, these results are consistent with the present study.

In the present study, only cases of therapeutic cerclage (simply due to cervical insufficiency in pregnant mothers with short cervix length) were included in the study, and patients undergoing preventive cerclage surgery (for various reasons including high-risk pregnancies and multiple pregnancy) were not included in the study. The results indicate that risk factors, especially preterm birth, abortion, and unnecessary curettage, should be avoided as much as possible, and by improving skills in this field and by using hydrophilic or pharmacological dilators such as prostaglandins in the cervix, the number of cases of cervical insufficiency can be reduced in the future and its negative consequences, including the risk of pregnancy loss or preterm delivery, can be prevented. However, more analytical and comparative studies are recommended to further investigate the associated factors and risk factors of cervical insufficiency and cerclage.

It is worth noting that the present study had some limitations; for instance, it was conducted retrospectively by reviewing the patients' medical records and it was not possible to examine some associated factors, including urinary tract infections as well as pregnancy and delivery outcomes. Furthermore, information related to the history of cervical procedures, including history of hysteroscopy, removal of cervical lesions, and dilation and curettage or incision of the cervix, was not evaluated.

The results of the present study showed that the most common associated factors in women undergoing cervical cerclage were history of preterm birth, history of abortion, history of curettage, history of infertility, and family history of cervical insufficiency and history of infertility. Therefore, it is recommended that women who are pregnant or planning to become pregnant be evaluated regarding risk factors for cervical insufficiency. Attention to the identified risk factors can be used in the management and screening of cervical insufficiency, appropriate intervention measures, and prevention of its negative consequences, including the risk of pregnancy loss or preterm delivery.

Acknowledgment

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