

Short cervix, wide anterior cervical angle and low cervical consistency index as a predictor of preterm birth: a case-control study



Andy Susanto¹, Anak Agung Gede Putra Wiradyana^{2*}, Ketut Suwiyoga²,
I Gusti Putu Mayun Mayura², Ida Bagus Fajar Manuaba², I Nyoman Bayu Mahendra²,
I Wayan Megadhana²

ABSTRACT

Objective: To determine and compare either change in length, anterior angle, and consistency of cervix can be used as the predictors of preterm labor or not.

Methods: This case-control study involved 54 pregnant women with gestational age 20 - 37 weeks, which the case group is women in preterm labor and the control group were not in labor at Sanglah General Hospital, Bali, Indonesia from November 2018 to October 2019. The samples were examined using Transvaginal Sonography (TVS) to collect Cervical Length (CL), Anterior Cervical Angle (ACA), and Cervical Consistency Index (CCI) data.

Results: Short CL could increase the risk of preterm labor by 9 times (OR = 8.80, 95% CI = 2.50-30.97, p-value 0.001). Wide ACA could increase the risk by 10 times (OR = 10.45, CI 95% = 2.92-37.39, p = 0.001). Low CCI could increase the risk by 7 times (OR = 7.43, 95% CI = 1.80-30.67, p = 0.003). Anterior cervical angle has the greatest role in the occurrence of preterm labor, followed by CL and CCI, although statistically insignificant (p=0.138; p=0.212= p:0.203).

Conclusion: Performing cervical examination using TVS as the antenatal care routine can help predict and prevent preterm delivery.

Keywords: cervical length, anterior cervical angle, cervical consistency index, preterm delivery, predictor.

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¹Resident of Obstetrics and Gynaecology Department, Sanglah General Hospital, Bali, Indonesia;

²Obstetrics and Gynaecology Department, Faculty of Medicine, Universitas Udayana-Sanglah General Hospital, Bali, Indonesia;

*Corresponding author:

Anak Agung Gede Putra Wiradyana;
Obstetrics and Gynaecology Department,
Faculty of Medicine, Universitas
Udayana-Sanglah General Hospital, Bali,
Indonesia;
putrawiradnyana@yahoo.com

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INTRODUCTION

Preterm delivery is one of the most significant contributors to neonatal mortality. Based on the data from World Health Organization (WHO) the incidence rate of preterm birth in Indonesia in 2010 was 15.5 per 100 births and put it in the world's 9th position.¹ Premature infant do not have mature organ systems, which can cause neonatal morbidity and mortality. Apart from respiratory distress, other long-term complications that are often found will significantly impact and ultimately reduce the future generations' quality.² From research on the epidemiology and pathogenesis, four main underlying causes of preterm labor are infection and inflammation, activation of the hypothalamic-pituitary-adrenal axis, decidual bleeding, and over enlargement of the uterus.³ Each of these will cause uterine contractions, cervical dilatation,

rupture of membranes, and finally preterm labor. The cervix will undergo structural modifications during labor. Several studies have been done to search for the contribution of length, anterior angle and consistency of cervix as its early changes to predict preterm labor.⁴⁻⁸

This study aims to determine the role of the short cervix, wide anterior cervical angle, and low cervical consistency index as risk factors for preterm labor, furthermore to compare these three variables.

METHOD

This research is a case-control study. This research was conducted in the Sanglah General Hospital, Bali, Indonesia, from November 2018 to October 2019 and has been approved by the Hospital's Ethics committee. This study's samples are the preterm pregnant women with gestational age 20 weeks to less than 37

weeks, where the case group is women with preterm delivery while the control is women with preterm pregnancy not in labor. The inclusion criteria in this study were: (a) Live, single pregnancy from 20 weeks gestation to less than 37 weeks; (b) uterine contractions at least two times in 10 minutes; (c) Dilatation of the cervix is equal to 2 cm; (d) Willing to participate in this research. Exclusion criteria: (a) premature rupture of membranes; (b) Antepartum bleeding; (c) Congenital abnormalities in the fetus; (d) Medical disorders that accompany pregnancy such as asthma, diabetes mellitus, hypertension, heart disease, and others; (f) has been treated with imminent preterm delivery in this pregnancy and has been sampled; (g) polyhydramnios; (h) history of treatment with antibiotics, tocolytics and anti-inflammatory in the last one week. All samples from the case and control groups will be examined using

transvaginal sonography (TVS) to collect Cervical Length (CL), Anterior Cervical Angle (ACA), and Cervical Consistency Index (CCI) data.

Cervical length is measured using standard protocol of The International Society of Ultrasound in Obstetrics & Gynaecology (ISUOG).⁴ Anterior cervical angle is measured using technique described by Sochacki-Wójcicka et al.⁵. The angle is measured between two imaginary lines created by internal and external opening of cervix with inner opening of cervix and anterior wall of uterus. Cervical consistency index is a ratio between the anteroposterior diameter of cervix after given maximal compression using transvaginal probe and before intervention. The technique used in this study was according Fernandez et al.⁶ study.

The cut-off point for the cervix concluded either short or long; wide or narrow ACA; high or low CCI in this study referred from previous studies.⁶⁻⁸ We categorized CL as short if < 2.5 mm; ACA is wide if >95°; CCI is low if <23%. Data were analyzed using SPSS version 25.0 (Armonk Corporation, NY, USA), risk analysis and chi-square test were used to determine the relationship between CCI, ACA, and CL towards preterm delivery, and final analysis using logistic regression was used to determine an essential factor that influenced preterm labour. All values considered significant if $p < 0.05$.

RESULT

A total of 54 pregnant women who came to the Obstetric Emergency Room and the Obstetrics and Gynaecology Outpatient Clinics at Sanglah General Hospital Denpasar from 20 November 2018 to 20 July 2020 were recruited into this study. The primary characteristics of two groups of subjects are presented in Table 1, and there is no difference in characteristics between the two groups ($p > 0.05$).

The relationship between CL and preterm delivery was shown in Table 2. Short CL can increase the risk of preterm labor by 9 times (OR = 8.80; 95% CI = 2.50-30.97; p -value 0.001).

The relationship between ACA and preterm delivery was shown in Table 3. Wide anterior cervical angle could

Table 1. Basic Characteristics of Subject.

Risk Factor	Case Group (n=27)		Control Group (n=27)		p-value
	Mean	SD	Mean	SD	
Age (years)	26.52	3.57	26.44	3.49	0.939
Gestation Age (weeks)	30.30	1.90	30.30	1.88	>0.99
Number of Pregnancy	2.00	0.83	2.04	0.85	0.872

Table 2. The relationship between cervical length and preterm delivery.

		Group		OR	CI 95%	p-value
		Case	Control			
Cervical Length	Short	18	5	8.80	2.50-30.97	0.001
	Long	9	22			

Table 3. The relationship between ACA and preterm delivery.

		Group		OR	CI 95%	p-value
		Case	Control			
Anterior Cervical Angle	Wide	22	8	10.45	2.92-37.39	0.001
	Narrow	5	19			

Table 4. The relationship between cervical consistency index and preterm delivery.

		Group		OR	CI 95%	p-value
		Case	Control			
Cervical Consistency Index	Low	13	3	7.43	1.80-30.67	0.003
	High	14	24			

Table 5. Multivariate Test of Risk Factor for Preterm Labor.

Variables	OR	CI 95%	p-value
Cervical Length	2.90	0.56-14.98	0.203
Anterior Cervical Angle	3.59	0.66-19.46	0.138
Cervical Consistency Index	2.82	0.55-14.38	0.212

increase the risk of preterm labor by 10 times (OR = 10.45; CI 95% = 2.92-37.39; p -value 0.001).

The relationship between cervical consistency index and preterm delivery was shown in Table 4. Low CCI can increase the risk of preterm labor by 7 times (OR = 7.43, 95% CI = 1.80-30.67; p

= 0.003).

The risk factors with the most significant influence on preterm labor occurrence were analyzed using logistic regression tests. The results of the analysis are presented in Table 5. Based on the results. Anterior cervical angle has the most significant role in preterm labor,

followed by cervical length and cervical consistency index. However, the three variables in the simultaneous analysis were not statistically significant.

DISCUSSION

The cervical length has been used as a predictor of preterm labor since 1990. Andersen et al.⁹ found that cervical length less than 39 mm using TVS was associated with the risk of preterm labor. In this study, a short cervical length (<2.5 cm) increased the risk of preterm labor by 9 times (OR = 8.80; 95% CI = 2.50-30.97; $p = 0.001$). These results are in line with the research conducted by DeFranco et al.¹⁰ and Van Baaren et al.¹¹ which stated the role of cervical length in predicting preterm labor. Berghella et al.⁴ stated that cervical length could be used as a predictor and prevent preterm labor.

A wide anterior cervical angle (>95°) can increase the risk of preterm labor by 10 times (OR = 10.45, CI 95% = 2.92-37.39, $p = 0.001$). Another study by Sur et al.¹², Llobet et al.¹³ found that a wide ACA increased the incidence of preterm labor. The ACA can be used as a predictive factor in the incidence of preterm labor less than 34 weeks. The study also included that the standard *cut-off rates* are 105° and 95° for second-trimester screening. In this study, the mean detection rates for preterm delivery were 5.9% and 23.5% for the false-positive rates of 5% and 10%, respectively. This non-uniformity requires more research to state the ability of the ACA to predict preterm delivery statistically.^{13,14}

In a study by Parra-Saavedra et al.⁶ the CCI was below the 10 percent percentile, 29% for gestational age before 32 weeks, 26% before 34 weeks, and 23% before 37 weeks had significant results. For a positive screening mean of 10%, CCI had a detection ability of 100%, 91% and 79% of preterm labor, respectively for gestational age under 32, 34, and 37 weeks. These results tend to be superior to cervical length measurements with outcomes of 33%, 27%, and 26% for preterm labor before 32, 34 and 37 weeks respectively. In this study, it was found that a low CCI (<23%) can increase the risk of preterm labor by 7 times (OR = 7.43; 95% CI = 1.80-30.67; $p = 0.003$). This is in line with research conducted by Parra-Saavedra et

al.⁶ which stated that the CCI could be used to predict preterm labor.

The risk factors that had the most significant influence on preterm labor occurrence were analyzed using logistic regression tests. This study found that the ACA had the most significant role in the occurrence of preterm labor, followed by a CL and CCI. However, comparing between these three variables in the analysis were not statistically significant. To date, no studies are measuring these three components together and comparing them.

The limitation of this research is the measurement of CCI especially in applying compression to the cervix by examiner could be a bias. Using more objective methods like elastography are encouraged in next research.

CONCLUSION

Predicting the incidence of preterm labor has contributed to its prevention efforts. Non-invasive testing is more sought after than invasive testing to reduce both maternal and fetal stress. TVS examination is one of the safe modalities for mother and fetus.

A short cervix can increase the risk of preterm labor by 9 times. A wide anterior cervical angle can increase the risk of preterm labor by 10 times. A low cervical consistency index can increase the risk of preterm labor by 7 times. Making cervical ultrasonography examination into the antenatal care routine can help predict and reduce the incidence of preterm delivery.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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AUTHOR CONTRIBUTION

Andy Susanto contributed for design, plan and conducted the research, data analysis and writing the original draft. Anak Agung Gede Putra Wiradyana: design, plan and supervise the research. Also Main supervisor of the research. Ketut Suwiyoga, I Gusti Putu Mayun Mayura,

Ida Bagus Fajar Manuaba, I Nyoman Bayu Mahendra: supporting for design, plan and supervise the research.

ETHICAL CONSIDERATION

This study has been approved by Ethical Committee Faculty Of Medicine Universitas Udayana/Sanglah General Hospital with ethical clearance reference number 357/UN14.2.2.VII.14/LP/2020.

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