CASE SERIES

22(94), November- December, 2018

ISSN 2321–7359 EISSN 2321–7367

Medical Science

Predicting preterm labor based on vaginal PH and cervical length at 22-24 weeks of gestation: A cross-sectional study

Khadije Rezaie-Keikhaie[1]✉, Maryam Moshfeghi[2], Zohreh Kazemi[3], Leili Rezaie-kahkhaie[4], Maryam Nakhaemoghadam[5]

Objective: **The present study was conducted aimed to investigating predicting preterm labor based on vaginal PH and cervical length at 22-24 weeks of gestation.** ***Material and Method:*** **This cross-sectional study was done on 168 pregnant women between 22 and 24 weeks of pregnancy. Cervical length and vaginal PH was measured. The patients were followed up till delivery and the gestational age were recorded. Data were collected using information forms and analyzed using SPSS version 21.** ***Results:*** **In this study mean age was 28.86±6 years. Mean cervical length and vaginal PH were significantly lower and higher in women with preterm labor than women with term labor.** ***Conclusions:*** **This study showed vaginal PH and cervical length are the preterm labor predictors and the risk of preterm labor in short cervix is higher than alkaline vagina.**

INTRODUCTION

The incidence of labor prior to the fetal life (20-28 weeks) and before 37 weeks of full pregnancy (259 days) is called preterm labor (PTL); if it happens before 34 weeks of gestation, it is called early preterm labor and if happens between 34-37 weeks of gestation, it is called late preterm labor (1). The prevalence of preterm labor is reported to be 5-18% in 184 countries with valid statistics; this figure is increasing day by day (2). According to the WHO report; as a major cause of child mortality, preterm labor has accounted for more than 1,000,000 deaths in 2013; additionally, many surviving children suffer several learning disabilities, eyesight problems and hearing loss throughout their lives (3). The statistics show that more than 90% of newborn babies die in the 23rd week of gestation, and 60% of infants born in the 26th and 30% of babies born in the 31st week of gestation may have physical deficiencies, a situation which would impose huge costs on health care services. Meanwhile, this group needs special care during the first week of birth and even after discharge from the hospital, and a large psychological and economic burden is inflicted on the infant and community (4). The threat of preterm labor is possible when uterine contractions exist without evidence of a change in the cervix (5). Main causes of preterm labor include automatic (30-50%), multiple pregnancy (10-30%), premature rupture of the embryo (10-40%), preeclampsia and eclampsia (6-9%), intrauterine growth restriction (4-2%), cervical failure and diabetes (6). Bacterial vaginosis is a change in the normal vaginal flora in which the number of lactobacilli is reduced and various species, such as anaerobic bacteria, increase (7). Bacterial vaginosis accounts for the majority of negative embryonic outcomes, including preterm labor and rupture of the curves (8-10). The invasion of the genital system with this organism increases the pH of the vagina, which is the key to diagnosis (11).Cervical failure is defined as inefficacy of this organ, defined in reference books less than 30mm in length (1). The cervix is defined as the distance between the outer and inner hole in the endocervical canal (12). Over the past decades, the use of trans-vaginal ultrasound for the diagnosis of cervical failure has been very much paid attention to. Women who have had a history of preterm labor or premature rupture of the curtains, women with a history of cervical surgery or cervical anomalies, women at the two end of fertility, those who have intrauterine contact with DES, and people with Ehlers-Danlos, are at the risk of preterm labor (13, 14). Screening at-risk patients by using trans-vaginal ultrasound, determining the length of the cervix and early intervention through cerclage prevents preterm labor (6). Women who do not have the above-mentioned risk factors are included within the low-risk group. It is not enough to measure the length of the cervix in this group, but recent studies suggest that it is better to measure cervical length in subjects whose ultrasound has turned out to include anomalies in the second trimester (1, 15). Given the adverse outcomes, prediction of preterm labor is one of the important objectives of prenatal care (6, 16). Given the limited number of studies conducted on prognostic

[1]Associate Professor, Department of Obstetrics and Gynecology, Medicinal Herbs Research Center, Zabol University of Medical Sciences, Zabol, Iran; [2]Royan Institute - Department of Endocrinology and Female Infertility, Reproductive Biomedicine, Research Center, ACECR, Tehran, Iran; [3]Department of Obstetrics and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran; [4]Assistant Professor, Medicinal Herbs Research Center, Zabol University of Medical Sciences, Zabol, Iran; [5]Assistant Professor, Medicinal Herbs Research Center, Zabol University of Medical Sciences, Zabol, Iran.

✉*Corresponding Author:* Leili Rezaie-kahkhaie, Medicinal Herbs Research Center, Zabol University of Medical Sciences, Zabol, Iran. Email: abasetmalekrn@gmail.com

© 2018 Discovery Publication. All Rights Reserved. www.discoveryjournals.org | OPEN ACCESS

potential of cervical length and vaginal PH in preterm labor in domestic resources and the controversy in this field in foreign resources, the present study was conducted to compare prognostic power of these two procedures in weeks 24-28 Gestation; the main objective is to implement timely interventions to prevent the occurrence of preterm labor and its complications. Determining Predictability of Preterm Delivery based on vaginal PH, cervical length at 24-22 weeks of gestation.

METHODS

The present cross-sectional study was conducted on all pregnant women (n=168) at gestational age of 24-28 weeks admitting to pregnancy clinic and hospitalized in Imam Ali Hospital, Zabol from September 2016 to September 2017. Sampling method was Conesus. Being at gestational age of 22-24 weeks and asking for prenatal care were the main inclusion criteria for participating subjects; suspected curioamnionitis (fever <38.5), vaginal bleeding, history of cervical surgery, known pre-pregnancy cervical abnormalities, cerclage, autoimmune diseases, sexual proximity, or use of products that affect the vaginal pH within the last 24 hours, major embryonic anomalies detected in previous ultrasounds or screening tests for the first and second trimester of pregnancy, lack of consent for collaboration, history of preterm labor, history of repeated abortions, history of multiple pregnancy, preeclampsia and eclampsia, and the use of estrogen-preventing drugs such as corticosteroids, phenytoin and tranquilizers were the main exclusion criteria. Required data was collected using an information form, which included demographic information and characteristics of pregnant mothers, gestational age based on the last menstrual period and first trimester ultrasound, PH measurement with pH meter, and cervical length measurement determined through trans-vaginal ultrasound. The findings were processed by SPSS21. After clearing and correcting missing data, the obtained results were described with central and peripheral indexes. T-test, chi-square and logistic regression were used to calculate the chances of generating preterm labor in each of the variables and compare the data related to each item with other findings. Logistic regression model was used to investigate the effect of confounding variables (pregnant mother's age and number of pregnancies).This study approved by ethics committee of Zabol university of Medical Science by Code: ZBMU.1.1396.108.

RESULTS

Present study was conducted on 168 pregnant women with gestational age of 22-24 weeks. The mean age of the subjects was 28.86 years with a standard deviation of 6. The youngest and oldest subjects were 16 and 40 years old. 44 subjects (19.26%) had preterm labor and the rest experienced labor at 37 weeks of gestation or later. The mean age of women with term labor was 29 years and the mean age of women with preterm labor was 28.4 years, a difference which did not turn out to be statistically significant (p = 0.538). Term pregnant ladies had a mean gravid of 2.70, while women with preterm labor had a mean gravity of 2.52, and the difference between the two groups was not significant in terms of gravidity (p = 0.550).

The mean cervical length was 38.72 and 30.50 in pregnant women with preterm and term labor, and the two groups showed a significant difference in cervical length (p <0.001). The vaginal pH of women with term and preterm labor was 3.90 and 4.84, respectively. The difference between the two groups was significant in terms of mean vaginal pH (p <0.001). The mean age of women with early preterm labor was 28.8 years and the mean age of women with late preterm labor was 27.8 years, and this difference was not statistically significant (p = 0.55). The mean gravid of early preterm labor subjects was 2.37, while women with late preterm labor had a mean gravid of 2.41; the difference between two groups was not significant in terms of gravid (p = 0.933). The mean cervical length in early and late preterm labor women was 28.11 and 32.16, respectively. The two groups had a significant difference in terms of cervical length (p = 0.033).The mean vaginal pH of early and late preterm labor subjects was 4.97 and 4.73, and the difference was not significant between the two groups in regard with the mean vaginal pH (p = 0.324)

The frequency of cervix with a length of less than 30 mm in term and preterm women was 1.61% and 50%, respectively. This difference was statistically significant in two groups (p <0.001).Also, the frequency of alkaline vaginal PH was 12.1% and 65.91% in preterm and term women, which was statistically significant (p <0.001). Table 1 and figure 1.

The frequency of cervix with a length of less than 30 mm in early and late preterm women was 78.9% and 37.5%; this difference was statistically significant between two groups (p = 0.008). Also, the frequency of alkaline vaginal PH in early and late preterm women was 52.6% and 34.4%, and this difference was not statistically significant between two groups (p = 0.247), (Table 2). Table 3 shows that cervical length has a more predictive role than vaginal PH in preterm labor. According to this table, 44.4% of preterm labor can be justified with cervical length less than 30 mm.

DISCUSSION

The results of the present study indicated that there was significant difference between women with preterm and term labor in regard with vaginal pH and cervical length; however, the difference between the subjects was not significant in terms of age, abortion history and number of previous pregnancies. Based on the results of the present study, cervical length in women with preterm labor was significantly lower than that of women who had experienced term labor. Logistic regression results showed that shortened cervix increases the chance of preterm labor by about 46 times; thus, there is a relationship between the length of the cervix and the preterm labor. Short cervical length also has a greater risk for early rather than late preterm labor.

The results of Frouzanfard et al study, which was conducted in 2013 in Kashan, were almost consistent with the present research. Their study was conducted on 438 pregnant women with 18-24 weeks of gestation admitting to clinics and personal offices for ordinary pregnancy care; the cervical length of subjects was measured by trans-vaginal ultrasonography and vaginal pH was evaluated using pH meter. The analysis of the results showed that cervical length less than 30 mm increases the chance of preterm labor by approximately 14-fold, and 71% of subjects with cervical length less than 30 mm experienced preterm labor. The results of the present study showed that the chance of preterm labor in alkaline pH is 3 times higher than acidic PH, and the alkaline vagina has a greater risk for late rather than early preterm labor, while short cervical length is more likely to cause early rather than late preterm labor (1). The results of their study turned out to be consistent with the findings of the present research in terms of the relationship between preterm labor with alkaline pH and short cervical length; however, there was no significant difference in regard with the role of alkaline PH in early or late preterm delivery in the present study. On the other hand, it was observed that vaginal pH in women with preterm labor was significantly higher than that of women with term labor. The results of logistic regression showed that alkaline pH increased the

© 2018 Discovery Publication. All Rights Reserved. www.discoveryjournals.org | OPEN ACCESS

Table 1 The frequency of short cervical length and alkaline vaginal pH in women with term and preterm labor

Labor status		Vaginal PH		Cervical length	
		Alkaline (5 and higher)	Acidic (less than 5)	More than 30 mm	Less than 30 mm
Term	Frequency	15	109	122	2
	Percent	12.1	87.9	98.39	1.61
Preterm	Frequency	29	15	22	22
	Percent	65.91	34.09	50	50
P value		<0.001		<0.001	

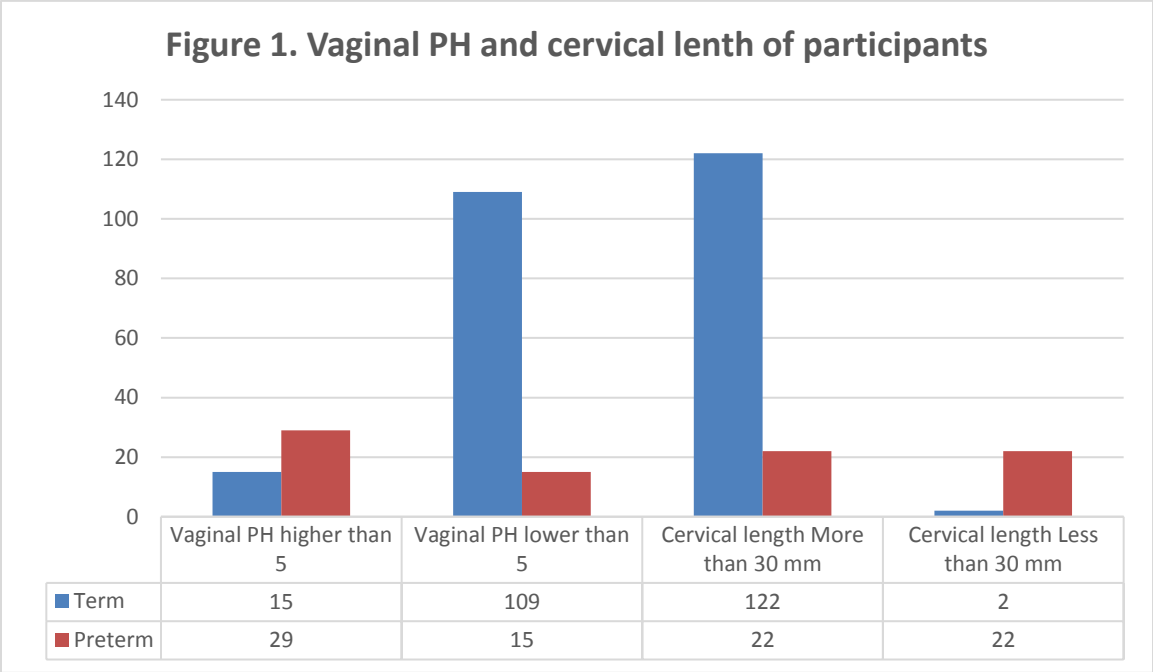

Table 2 Frequency of short cervical length and alkaline vaginal pH in women with early and late preterm labor

Labor status		Vaginal PH		Cervical length	
		Alkaline (5 and higher)	Acidic (less than 5)	More than 30 mm	Less than 30 mm
Early preterm	Frequency	11	9	4	15
	Percent	52.6	47.4	21.1	78.9
Late preterm	Frequency	11	21	20	12
	Percent	34.4	65.6	62.5	37.5
P value		0.247		0.008	

Table 3 Model Summary

	Correlation coefficient	Coefficient of determination	Adjusted coefficient of determination	Standard deviation
Vaginal PH	0.616	0.379	0.375	0.36445
Cervical length	0.666	0.444	0.437	0.34602

chance of preterm labor by about 14 times. There turned out to be a relationship between preterm labor and vaginal PH. Sendag et al. study was conducted on 240 pregnant women at gestational age ages of 16-22 weeks in 2012. Possible vaginitis was assessed by determining the pH and wet smear in these patients; at the same time, cervical length was determined by trans-vaginal ultrasound; after data analysis, there turned out to be a significant relationship between increase in vaginal PH(PH>5) and the increased risk of preterm labor; there was, also, a significant relationship between increased vaginal pH and shortened cervical length (11).

© 2018 Discovery Publication. All Rights Reserved. www.discoveryjournals.org | OPEN ACCESS

Several studies have been conducted in order to compare various parameters involved in, or affecting, the prediction of preterm labor. For example, Rodke et al study was conducted on 343 pregnant women in 2010; according to the results of their study, high vaginal pH 5 and shortened cervical lengths turned out to be prognostic factors in the occurrence of preterm labor. However, this relationship is more solid in higher 5-fold PH than the short cervical length, which is different from the present study(17).The reason for this difference can be related to the borderline point in considering shortened cervical length; i.e. 25 mm in Rodke et al study and 30 mm in the present research.

CONCLUSION

Short cervical length and vaginal pH are prognostic factors in possible occurrence of preterm labor. According to the present study, short cervical length is a more efficient prognostic factor in comparison with high vaginal pH for preterm labor. In addition, short cervical length is more likely to cause early rather than late preterm labor. Due to the relationship between short cervical length and preterm labor, it is recommended to implement ultrasound in the second trimester to remove the possibility of embryonic anomaly in order to take necessary measures and actions in case of necessity.

REFERENCES

1. Foroozanfard F, Mesdaghinia E, Tabasi Z, Sehat M, Totonian S. Prediction of preterm labor based on vaginal pH and cervical length in low risk population during the second trimester of pregnancy. Feyz Journal of Kashan University of Medical Sciences. 2014;18(3).
2. birth P. [Available from: www.who.int/mediacentre/factsheets/fc363.
3. Romero R, Dey SK, Fisher SJ. Preterm labor: one syndrome, many causes. Science. 2014;345(6198):760-5.
4. Ekele B AL. Cervical cerclage for prevention of preterm delivery in women with short cervix. The LANCET. 2004;363(9424):1849-53.
5. David James PS, Carl Weiner, Bernard Gonik. High Risk Pregnancy 4th Edition2010.
6. Robyn Horsager SWR, Vanessa L. Rogers, Patricia C. Santiago-Muñoz, Kevin C. Worley, Barbara L. Hoffman. Williams Obstetrics, 24th Edition, Study Guide2014.
7. Truter I, Graz M. Bacterial vaginosis: Literature review of treatment options with specific emphasis on non-antibiotic treatment. African Journal of Pharmacy and Pharmacology. 2013;7(48):3060-7.
8. Christensen P KM. Bacterial vaginosis and pregnancy. acta obstet gynecol scand. 1994:741-2.
9. El-Sheikhah A, Elzahaby I, El-Shenofy O, Wali I. Correlation between increased vaginal pH and abnormalities in the vaginal flora with respect to cervical length and their role in the prediction of preterm birth. Journal of Evidence-Based Women's Health Journal Society. 2014;4(2):99-104.
10. Lata I, Pradeep Y, Sujata AJ. Estimation of the incidence of bacterial vaginosis and other vaginal infections and its consequences on maternal/fetal outcome in pregnant women attending an antenatal clinic in a tertiary care hospital in North India. Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine. 2010;35(2):285.
11. Sendag F, Kazandi M, Akercan F, Kazandi A, Karadadas N, Sagol S. Vaginal fluid pH, cervicovaginitis and cervical length in pregnancy. Clinical & Experimental Obstetrics & Gynecology. 2010;37(2):127.
12. Palma-Dias R, Fonseca M, Stein N, Schmidt A, Magalhaes J. Relation of cervical length at 22-24 weeks of gestation to demographic characteristics and obstetric history. Brazilian journal of medical and biological research. 2004;37(5):737-44.
13. Podobnik M, Bulić M, Smiljanicé N, Bistrički J. Ultrasonography in the detection of cervical incompetency. Journal of clinical ultrasound. 1988;16(6):383-91.
14. Doğan O, Pulatoğlu Ç, Başbuğ A, Kaya AE, Yassa M. Discriminating Performance of Early Uterine and Cervical Artery Pulsatility and Resistivity In Pre-Invasive Cervical Lesions. The Medical Bulletin of Sisli Etfal Hospital. 2018.
15. Gjessing HK, Grøttum P, Økland I, Eik-Nes SH. Fetal size monitoring and birth-weight prediction: a new population-based approach. Ultrasound in Obstetrics & Gynecology. 2017;49(4):500-7.
16. Romero R, Conde-Agudelo A, Da Fonseca E, O'brien JM, Cetingoz E, Creasy GW, et al. 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. 2018;218(2):161-80.
17. Matijevic R, Grgic O, Knezevic M. Vaginal pH versus cervical length in the mid-trimester as screening predictors of preterm labor in a low-risk population. International Journal of Gynecology & Obstetrics. 2010;111(1):41-4.

Article Key Words
Preterm labor, cervical length, bacterial vaginosis

Conflicts of Interest Statement
None declared.

Financial resources
None declared.

Article History
Received: 05 August 2018
Accepted: 17 September 2018
Published: November-December 2018

Citation
Khadije Rezaie-Keikhaie, Maryam Moshfeghi, Zohreh Kazemi, Leili Rezaie-kahkhaie, Maryam Nakhaemoghadam. Predicting preterm labor based on vaginal PH and cervical length at 22-24 weeks of gestation: A cross-sectional study. *Medical Science*, 2018, 22(94), 529-532

Publication License
This work is licensed under a Creative Commons Attribution 4.0 International License.

General Note
Article is recommended to print as color digital version in recycled paper. *Save trees, save nature*

© 2018 Discovery Publication. All Rights Reserved. www.discoveryjournals.org | OPEN ACCESS