Jurnal Riset Kesehatan Modern

https://journalversa.com/s/index.php/jrkm

Vol 6, No 2 April 2024

ACCURACY OF CERVICAL TRANSVAGINAL ULTRASONOGRAPHY IN PREDICTING PRETERM BIRTH : SYSTEMATIC REVIEW

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ABSTRAK

Lamanya kehamilan normal adalah 40 minggu (280 hari), dimulai pada hari pertama haid terakhir wanita atau 267 hari setelah pembuahan, mana saja yang lebih dulu. Menurut Organisasi Kesehatan Dunia (WHO), persalinan prematur didefinisikan sebagai permulaan persalinan antara usia kehamilan 20 dan 37 minggu, berapa pun berat lahir bayi. Standarisasi pengukuran panjang saluran serviks diperlukan agar efektif dalam memprediksi kelahiran prematur. Hal ini mencakup penggunaan metodologi standar untuk pengumpulan gambar, identifikasi posisi saluran serviks, dan lokalisasi os eksternal dan internal tulang belakang leher. USG transvaginal jauh lebih dapat direproduksi dibandingkan USG transabdominal, dengan pengukuran yang tidak dibatasi oleh berat badan ibu, posisi serviks, atau adanya bayangan obstruktif dari komponen janin. Menurut penelitian, terdapat hubungan antara panjang serviks dan risiko kelahiran prematur; leher rahim yang lebih pendek dikaitkan dengan peningkatan risiko kelahiran prematur. Artikel ini menunjukkan bahwa skrining TVUS adalah metode yang efektif untuk mendeteksi dan menghindari kelahiran prematur pada janin tunggal dan gamet.

Kata Kunci: Serviks, Kehamilan, Kelahiran Preterm, Ultrasonografi Transvaginal.

ABSTRACT

Normal pregnancy duration is 40 weeks (280 days), commencing on the first day of the woman's last menstrual period or 267 days after conception, whichever comes first. According to the World Health Organization (WHO), preterm labor is defined as the onset of labor between 20 and 37 weeks of pregnancy, regardless of the baby's birth weight. Standardizing the measurement of the length of the cervical canal is necessary for its effectiveness in predicting preterm delivery. This includes the use of standardized methodologies for image collection, the identification of the position of the cervical canal, and the localization of the external and internal os of the cervical spine. Transvaginal ultrasound is far more reproducible than transabdominal ultrasound, with measurements that are not limited by the mother's weight, cervical position, or the presence of obstructive shadows from fetal components. According to studies, there is a link between the length of the cervix and the risk of preterm delivery; a shorter cervix is connected with an increased risk of premature birth. This article demonstrates that TVUS screening is an effective method for detecting and avoiding preterm delivery in both single fetuses and gametes.

Keywords: *Cervical, Pregnancy, Preterm Cirth, Transvaginal Ultrasonography.*

A. INTRODUCTION

In the United States, preterm birth affects roughly 12% of all pregnancies, but in Europe it affects between 5% and 9% of all pregnancies. It is the main cause of death in the first month of life all over the world that premature delivery. Additionally, the chance of neurological impairment and learning issues is raised as a result of this factor. Scores for the risk of premature delivery have shown to be unsatisfactory due to their low sensitivity and weak positive predictive value. This is especially true in nulliparas, who do not have a previous history of premature birth.[1–3]

The routine practice of digital vaginal examination (VE) in prenatal care does not minimize the risk of premature births and instead results in an increased number of hospitalizations that are not essential. Even when indications of imminent preterm birth are present, the usefulness of VE is modest both in terms of its sensitivity and its predictive ability. There is no sensitivity nor specificity associated with the occurrence of uterine contractions. Therefore, improving the identification of patients who are at risk of having preterm births is a prerequisite for working toward the goal of lowering the incidence of preterm births.[4–6]

The clinical challenge is whether this is truly preterm labor necessitating admission in a unit with a newborn intensive care unit (NICU) and tocolytics and corticosteroids to expedite fetal lung development.[7] False preterm labor generally resolves spontaneously, making aggressive management iatrogenic and expensive. Premature labor is difficult to diagnose, especially in women with cervical dilatation <2 cm and effacement <80%, the most typical presentation. In a randomized trial of antibiotics for suspected preterm labor (90% had cervical dilatation <2 cm), 90% did not deliver within 48 hours and 16% delivered within 7 days. In the placebo arm of a major multicenter tocolytics trial, over 40% of women experiencing similar symptoms did not deliver within 7 days.[8,9]

Many studies have indicated that the decrease in CL by transvaginal ultrasounds (TVUE) among symptomatic women defines a high-risk group that is more likely to be in early labor and deliver birth prematurely. These studies differ in size, inclusion and outcome criteria, and premature delivery rate.[10] TVUE of CL was measured at between 28 and 31 weeks. Preterm delivery prediction was best at 18–30 mm CL. Short cervixes have always shortened delivery times. These studies imply that a 30 mm threshold can detect 70-100% of symptomatic women who will deliver preterm. CL > 30 mm has a nearly 100% negative predictive value (NPV) for preterm delivery before 34–37 weeks, predicting people who will not deliver early. The best positive predictive value (PPV) is 70% at 20 mm, indicating women most likely to deliver preterm.[11,12]

This article investigate accuracy of cervical transvaginal ultrasonography in predicting preterm birth.

B. RESEARCH METHODS

Protocol

This review followed the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 criteria. These components served as the foundation for the regulations that were put in place.

Eligibility Criteria

This literature review on accuracy of "cervical transvaginal ultrasonography" and "predicting preterm birth" was prepared to analyze the existing research on these two topics. These are the primary issues raised in the study under examination. If you want your work to be evaluated, you must satisfy the following requirements: 1) Articles must be written in English and emphasize the accuracy "cervical transvaginal ultrasonography" and "predicting preterm birth" in order to be approved for publication. 2) Papers were evaluated if they were published after 2015 but before the time of this systematic review. The following genres will not be accepted for publishing in the anthology: Editorials, submissions without a DOI, reviews of previously published papers, and entries that are significantly similar to those previously published in the journal do not qualify as original research.

Search Strategy

The search for studies to be included in the systematic review was carried out from January, 11th 2023 using the PubMed and SagePub databases by inputting the words: “cervical transvaginal ultrasonography” and “predicting preterm birth". Where *("cervic"[All Fields] OR "cervicals"[All Fields] OR "cervices"[All Fields] OR "neck"[MeSH Terms] OR "neck"[All Fields] OR "cervical"[All Fields] OR "uterine cervicitis"[MeSH Terms] OR ("uterine"[All Fields] AND "cervicitis"[All Fields]) OR "uterine cervicitis"[All Fields] OR "cervicitis"[All Fields]) AND ("transvaginal"[All Fields] OR "transvaginally"[All Fields]) AND ("diagnostic imaging"[MeSH Subheading] OR ("diagnostic"[All Fields] AND "imaging"[All Fields]) OR "diagnostic imaging"[All Fields] OR "ultrasonography"[All Fields] OR "ultrasonography"[MeSH Terms] OR "ultrasonographies"[All Fields]) AND ("predict"[All Fields] OR "predictabilities"[All Fields] OR "predictability"[All Fields] OR "predictable"[All Fields] OR "predictably"[All Fields] OR "predicted"[All Fields] OR "predicting"[All Fields] OR "prediction"[All Fields] OR "predictions"[All Fields] OR "predictive"[All Fields] OR "predictively"[All Fields] OR "predictiveness"[All Fields] OR "predictives"[All Fields] OR "predictivities"[All Fields] OR "predictivity"[All Fields] OR "predicts"[All Fields]) AND ("premature birth"[MeSH Terms] OR ("premature"[All Fields] AND "birth"[All Fields]) OR "premature birth"[All Fields] OR ("preterm"[All Fields] AND "birth"[All Fields]) OR "preterm birth"[All Fields])* is used as search keywords.

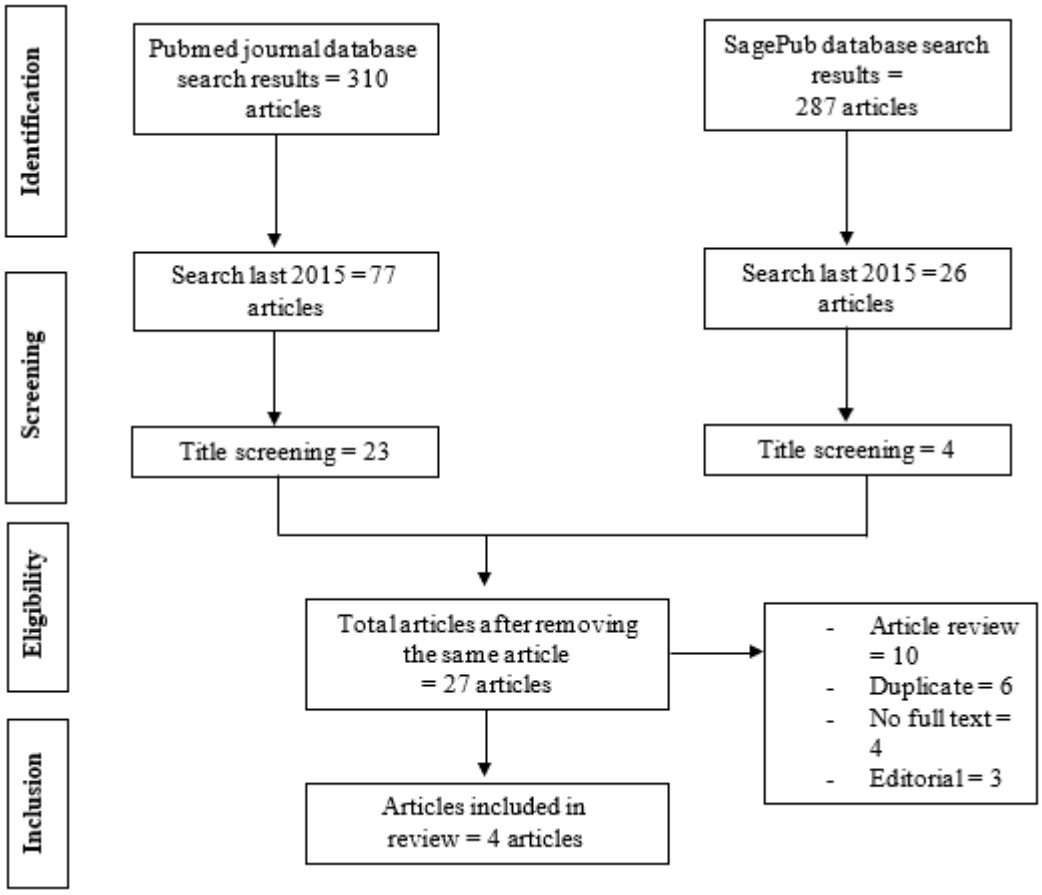

Figure 1. Article search flowchart

Data retrieval

After reviewing titles and abstracts of past research, the study's author adjusted the inclusion and exclusion criteria. The study's supplemental materials contain revised criteria. This limited the problem and showed which areas needed additional exploration. After reviewing similar studies, the author reached this conclusion. During the systematic review, only studies that satisfied all inclusion criteria were included. We only considered research ideas that satisfied all standards. This ensured a full examination. This project collected study information, including title, author, publication date, location, research study design, and parameters. These can be learned. Information sources include: This information can be presented in several ways.

Quality Assessment and Data Synthesis

To pick which articles to examine, the writers independently reviewed some of the research in the titles and abstracts. Then, the complete texts of publications that match the systematic review criteria will be reviewed to determine which papers will be included. So the review can select publications. "Which studies are good enough for the review?"

C. RESULTS AND DISCUSSION

Results

Raval, et al (2020)13 study showed During the prenatal phase of the study, transvaginal ultrasonography was performed on 150 women who met the selection criteria between 16 and 24 weeks of gestation. Of those 150 women, 36 (or 24%) gave birth to preterm infants. The results of this investigation showed that the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were, respectively, 80.5%, 94.73%, 82.85% and 93.91%.

Table 1. The litelature include in this study

Author	Origin	Method	Sample Size	Result
Raval, 2020[13]	Indonesia	Prospective observational study	150	Transvaginal ultrasounds were done on 150 pregnant women who met the selection criteria between 16 and 24 weeks of pregnancy. Of these 150 women, 36 (24%) had babies too soon. This study found that the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were, in order, 80.5%, 94.73%, 82.85%, and 93.91%.
Gordon, 2016[14]	United State	Multicenter, randomized, controlled trial	125	The mean gestational age at delivery was 35.7 weeks (95% confidence interval [CI], 35.2-36.2) among those managed with TVCL and 35.5 weeks (95% CI, 34.7-36.4) among the control patients. The Kaplan- Meier estimates of deliveries <38 weeks were not significantly different between groups. This was true whether we compared curves with a log- rank test (P = .67), Breslow test (P = .67), or Tarone-Ware test (P = .64). The percentage of deliveries <35 0/7 weeks did not differ: 27.4% for subjects managed with routine TVCL and 28.6% for control subjects (relative risk, 0.96; 95% CI, 0.60-1.54). Our study had an 80% power to detect a 12-day difference in the gestational age at delivery with 95% confidence.

El-Gharib, 2017[15]	Egypt	Prospective study	150	Ninety-two percent of twin pregnancies delivered by cesarean section and 16% babies had a neonatal intensive care unit requisitioned. Ninety-two patients were delivered in smaller than 37 gestational weeks and the mean CL measurement (CLM) was <37.64 ± 6.23 mm. According to the ROC curve analysis, CLM was found to be a discriminating

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Esplin, et al (2017) conducted a study with 9,410 patients. They showed cervical length of 25 mm or less occurred in 35 of 439 (8.0%) at 16 to 22 weeks' gestation and in 94 of 403 (23.3%) at 22 to 30 weeks' gestation. Fetal fibronectin levels of 50 ng/mL or greater at 16 to 22 weeks identified 30 of 410 women (7.3%) with spontaneous preterm birth and 31 of 384 (8.1%) at 22 to 30 weeks. The area under the receiver operating characteristic curve for screening between 22 and 30 weeks for fetal fibronectin level alone was 0.59 (95% CI, 0.56-0.62), for transvaginal cervical length alone was 0.67 (95% CI, 0.64-0.70), and for the combination as continuous variables was 0.67 (95% CI, 0.64- 0.70).[16]

Discussion

The typical length of a healthy pregnancy is 40 weeks (280 days), beginning on the first day of the woman's last menstrual cycle or 267 days following conception, whichever comes first. According to the World Health Organization (WHO), preterm labor is the commencement of labor after 20 weeks of gestation but before 37 weeks of gestation, irrespective of the baby's birth weight. The delivery of a baby too soon is the major cause of newborn illness and death; thus, preventing premature births is an essential healthcare objective. Even while healthcare

facilities and perinatal care have significantly improved, the number of babies born prematurely is still on the rise.[17,18]

Although it only affects 5–10% of pregnancies, premature birth is responsible for 85% of all perinatal morbidity and mortality. It is estimated that 15 million babies are born prematurely each year, and that number is only growing. Premature birth affects around one in every ten newborns. There are issues associated with premature birth that claim the lives of over one million children each year. The most common cause of mortality in neonates and children younger than 5 years old in the world is premature birth. When compared to other causes of mortality, problems connected to preterm birth account for a disproportionately high number.[4,19]

The measurement of the length of the cervical canal has to be standardized in order for it to be effective in predicting preterm birth. This comprises the utilization of standardized techniques for the capture of images, the determination of the location of the cervical canal, as well as the localization of the cervical external and internal os. Guidelines have been proposed by the Fetal Medicine Foundation for the measuring of cervical length using transvaginal ultrasound. A request is made for the pregnant woman to empty her bladder. A vaginal probe is placed into the anterior vaginal fornix while the pregnant lady is in the dorsal lithotomy posture.[20]

A view of the cervix in the sagittal plane was acquired. The cervical canal may be recognized as a narrow line that extends down the longitudinal axis of the cervix and runs through the middle of the cervix. The picture is magnified to the point that it takes up at least half of the screen. When pressing on the cervix with the probe, there should be as little pressure as feasible. The time allotted for the exam need to be between three and five minutes. The length of the cervical spine is measured along a single line that runs between internal and external os.[20,21]

When performed between 16 and 24 weeks of pregnancy, a transvaginal ultrasound examination of a short cervical length (CL) is a relatively reliable predictor of spontaneous preterm birth (SPTB). Those with the shortest CL have the highest risk of SPTB, independent of their reproductive history. This is because the risk of SPTB is inversely related to the length of the CL. The clinical cut-off to identify a "short" CL has fluctuated in the extant literature from 15 to 30 mm, and this varies depending on the population that was investigated as well as the gestational age at the time of measurement.[1,21]

When it comes to the method of determining CL, transvaginal ultrasonography is regarded as the "gold standard." After making sure the bladder is empty, the vaginal transducer has to be inserted into the anterior fornix of the vagina and positioned in such a way that it allows for visualization of the endocervical canal. In order to achieve the CL measurement, the picture is first magnified such that it takes up at least half of the screen, and then calipers are positioned at both the internal and exterior os. In cases when the cervical os is curved, the addition of the lengths of two distinct straight lines might be used.[1,21]

Transvaginal ultrasound is far more repeatable than transabdominal ultrasonography, with measures that are not constrained by the mother's weight, cervical position, or the presence

of obstructive shadowing from fetal components. In addition, preliminary monitoring with transabdominal ultrasound followed by transvaginal measures for those who have a presumption that they have a short cervix is not cost- effective. In light of this, the term "CL" will, for the duration of this paper, presume a transvaginal approach.[1,21,22]

The Society for Maternal-Fetal Medicine makes the following recommendations:

(1) routine transvaginal cervical length screening should only be performed on women who have a singleton pregnancy and a history of prior spontaneous preterm birth (grade 1A); (2) routine transvaginal cervical length screening should not be performed on women who have cervical cerclage, multiple gestation, preterm premature rupture of membranes, or placenta previa (grade 2B); and (3) medical professionals who decide to implement universal cervical length screening should follow (grade 2B).[23]

Transvaginal ultrasound is the most effective screening and diagnostic technique for diagnosing a short cervical length during the early stages of pregnancy. It also assists in the prediction of preterm labor during the early stages of pregnancy. It is better, risk- free, and more accurate than digital examination, transabdominal ultrasonography, or ultrasound performed transperineally.[2,22]

Studies have shown that there is a correlation between the length of the cervix and the likelihood of having a premature birth; a shorter cervix is associated with an increased likelihood of having a premature birth. When assessed on transvaginal sonography during the early stages of pregnancy, the cervical length of all 35 pregnant women in this research was less than 25 millimeters. 29 of them gave birth prematurely, while the remaining 6 gave birth at the full term. 115 individuals had cervical lengths more than 25 millimeters, and 7 of those patients delivered their babies prematurely, while 108 delivered their babies full term.[13]

It is possible to employ universal CL screening to identify asymptomatic women who are at risk of PTB. This provides an opportunity to give therapies that may minimize the risk of PTB. Those who advocate for widespread screening point to the results of two large randomized studies in which it was proven that vaginal progesterone can lower the incidence of invasive pulmonary tuberculosis (ITB) in women who have a short cervix. Even additional evidence may be supplied by two cost-effective analyses, both of which suggest that universal cervical length screening is a cost-effective way to reducing PTB.[24,25]

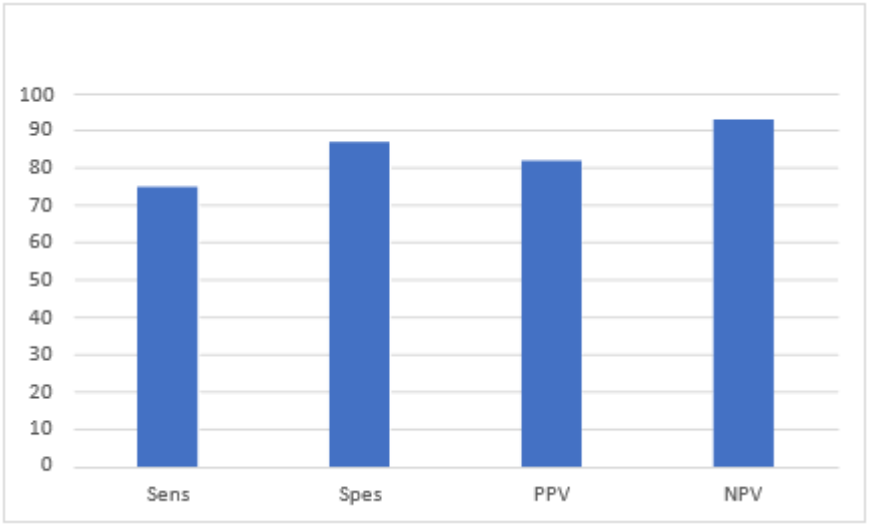

Figure 2. Sensitivity, specificity, PPV and NPV TVUS in predicting PTB

Both of these studies were conducted in the United States. The method of CL screening shifts depending on the a priori risk of PTB that is being assessed. A CL screening with TVUS is currently recommended for women who have had a previous sPTB by both the Society for Maternal-Fetal Medicine (SMFM)[26] and the American College of Obstetricians and Gynecologists (ACOG) recommendations. However, whether or not universal CL screening of singleton pregnancies without a history of sPTB should be done for the purpose of sPTB prevention is still up for dispute.[6,24]

D. CONCLUSION

This article shows that screening using TVUS is a good option for preventing and knowing the risk of premature birth, both in single fetuses and gamelia.

REFERENCES

Son M, Miller ES. Predicting preterm birth: Cervical length and fetal fibronectin. Semin Perinatol. Desember 2017;41(8):445–51.

Ville Y, Rozenberg P. Predictors of preterm birth. Best Pract Res Clin Obstet Gynaecol. Oktober 2018;52:23–32.

Sedgh G, Finer LB, Bankole A, Eilers MA, Singh S. Adolescent pregnancy, birth, and abortion rates across countries: levels and recent trends. J Adolesc Heal. 2015;56(2):223–30.

Rothman BK. Pregnancy, birth and risk: an introduction. Vol. 16, Health, Risk & Society. Taylor & Francis; 2014. hal. 1–6.

Kenneth JL, Steven LB, Catherine YS, Jodi SD, Barbara LH, Cunningham K. Williams Obstetri. 26 ed. New York: The McGraw-Hill Companies; 2020.

Practice bulletin no. 130: prediction and prevention of preterm birth. Obstet Gynecol. Oktober 2012;120(4):964–73.

Gomella T, Cuningham M, Eyal F. Neonatology: Management, procedure, On- Call Problems, Disease, and Drug. New York: McGraw-Hill Education; 2020.

Shah PS, Balkhair T, Ohlsson A, Beyene J, Scott F, Frick C. Intention to become pregnant and low birth weight and preterm birth: a systematic review. Matern Child Health J. 2011;15(2):205–16.

Kamath M, Bhattchraya S. Best Practice & Research Clinical Obstetrics and Gynaecology. Am Coll Obstet Gynecol. 2012;729–38.

Habli M, Sibai BM. Danforth's obstetrics and gynecology. 12 ed. Philadelphia: Lippincot Williams & Wilkins; 2018.

To MS, Skentou C, Chan C, Zagaliki A, Nicolaides KH. Cervical assessment at

the routine 23-week scan: standardizing techniques. Ultrasound Obstet Gynecol Off J Int Soc Ultrasound Obstet Gynecol. 2001;17(3):217–9.

Erasmus I, Nicolaou E, Van Gelderen CJ, Nicolaides KH. Cervical length at 23 weeks' gestation-relation to demographic characteristics and previous obstetric history in South African women. South African Med J. 2005;95(9).

Raval BM, Sisodiya VP, Yadava PA, Mehta ST, Patel SR, Dadhania BH. Measurement of cervical length using transvaginal sonography for prediction of preterm labour. Int J Reprod Contraception, Obstet Gynecol. 2020;9(11):4471–7.

Gordon MC, McKenna DS, Stewart TL, Howard BC, Foster KF, Higby K, et al. Transvaginal cervical length scans to prevent prematurity in twins: a randomized controlled trial. Am J Obstet Gynecol. Februari 2016;214(2):277.e1-277.e7.

El-Gharib MN, Albehoty SB. Transvaginal cervical length measurement at 22- to 26-week pregnancy in prediction of preterm births in twin pregnancies. J Matern neonatal Med Off J Eur Assoc Perinat Med Fed Asia Ocean Perinat Soc Int Soc Perinat Obstet. Maret 2017;30(6):729–32.

Esplin MS, Elovitz MA, Iams JD, Parker CB, Wapner RJ, Grobman WA, et al. Predictive Accuracy of Serial Transvaginal Cervical Lengths and Quantitative Vaginal Fetal Fibronectin Levels for Spontaneous Preterm Birth Among Nulliparous Women. JAMA. Maret 2017;317(10):1047–56.

Behrman RE, Butler AS. Preterm birth: causes, consequences, and prevention. 2007;

Ghose S, Samal S, Armugam S, Parida P. Measurement of cervical biometry using transvaginal ultrasonography in predicting preterm labor. J Nat Sci Biol Med. 2014;5(2):369.

Liu L, Oza S, Hogan D, Chu Y, Perin J, Zhu J, et al. Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. Lancet. 2016;388(10063):3027–35.

Dutta DC, Konar H. DC Dutta's Textbook pf Obstetrics. 8 ed. New Delhi: Jaypee Brothers Medical Publishers; 2015.

Lim K, Butt K, Crane JM. No. 257-Ultrasonographic Cervical Length Assessment in Predicting Preterm Birth in Singleton Pregnancies. J Obstet Gynaecol Canada JOGC = J d'obstetrique Gynecol du Canada JOGC. Februari 2018;40(2):e151–64.

Reicher L, Fouks Y, Yogev Y. Cervical Assessment for Predicting Preterm Birth- Cervical Length and Beyond. J Clin Med. Februari 2021;10(4).

McIntosh J, Feltovich H, Berghella V, Manuck T. The role of routine cervical length screening in selected high- and low-risk women for preterm birth prevention. Am J Obstet Gynecol. September 2016;215(3):B2-7.

Parry S, Simhan H, Elovitz M, Iams J. Universal maternal cervical length screening during the second trimester: pros and cons of a strategy to identify women at risk of spontaneous preterm delivery. Am J Obstet Gynecol. Agustus 2012;207(2):101–6.

Cahill AG, Odibo AO, Caughey AB, Stamilio DM, Hassan SS, Macones GA, et al. Universal cervical length screening and treatment with vaginal progesterone to prevent preterm birth: a decision and economic analysis. Am J Obstet Gynecol. Juni 2010;202(6):548.e1-8.

Khalifeh A, Berghella V. Universal cervical length screening in singleton gestations without a previous preterm birth: ten reasons why it should

be implemented. Am J Obstet Gynecol. Mei 2016;214(5):603.e1-5.