DOI:https://doi.org/10.53555/8ketwx72 Publication URL: https://nnpub.org/index.php/MHS/article/view/1867

THE ACCURACY OF RISK SCORES IN PREDICTING PRETERM BIRTH : A SYSTEMATIC REVIEW

Hatsari Marintan Porman Surtana Siahaan

**Dr H Marsidi Judono Regional Hospital, Indonesia*

Corresponding Author:
ihats888@gmail.com

Abstract

Introduction: *Preterm birth (PTB) is a leading cause of infant illness and death. PTB is spontaneous in two-thirds of instances. SPTB is problematic because it has several causes. If SPTB has occurred before, it will likely happen again. PTB is hard to forecast because the scenario is varied and there are many causes and risk factors. Risk score accuracy in predicting premature birth is discussed.*

The aim: *This study demonstrated the accurateness of risk score predictions for premature birth.*

Methods: *This study demonstrated that it met all of the requirements by comparing itself to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines. As a result, the specialists were able to ensure that the study was as up to date as possible. Publications published between 2013 and 2023 were considered for this search strategy. This was accomplished using a variety of online reference sources, including Pubmed and SagePub. It was chosen not to include review pieces, previously published works, or works that were just partially completed.*

Result: *In the PubMed database, the results of our search brought up 415 articles and SagePub 366 articles. The results of the search conducted for the last year of 2013 yielded a total 56 articles for PubMed and 49 articles from SagePub. In the end, we compiled a total of 10 papers.*

Conclusion: *Preterm birth has been associated to a short cervix, a maternal age over 35, a maternal body mass index above 25, smoking, and concomitant risk factors like hypertension and diabetes.*

Keyword: *Cervical length; Mother age; Preterm birth; Risk scores*

INTRODUCTION

One of the main reasons babies get sick or die during pregnancy is giving birth before the due date or preterm birth (PTB). Two-thirds of PTB cases are caused by spontaneous PTB (SPTB). The other one-third are medically necessary because of problems with the mother or the baby. SPTB is traditionally characterized as birth between $20^{0/7}$ and $37^{0/7}$ weeks gestation following spontaneous commencement of labor, preterm prelabor membrane rupture, or premature cervix dilatation (cervical insufficiency).[1,2]

However, several experts have recently realized that some spontaneous deliveries late in the second trimester (e.g., $16^{0/7}$ to $19^{6/7}$), formerly thought to be miscarriages, may also be SPTB due to similarities in risk factors, presentation, and recurrence.[3] Preterm infants require lengthy hospitalizations and are at a high risk of unfavorable outcomes such as breathing issues, neurodevelopmental sequelae, necrotizing enterocolitis, feeding difficulties, blindness, deafness, and intraventricular hemorrhage. Preterm newborns are also more likely to die during the neonatal period and up to the age of five years than term infants.[4,5]

It is estimated that over 15 million babies are born prematurely every year across the globe, which corresponds to a global preterm birth rate of approximately 11%.[6] Preterm birth is the greatest cause of death among children, accounting for 18% of all deaths among children aged under 5 years and as high as 35% of all deaths among infants (aged 28 days). With 1 million children dying owing to preterm birth before the age of 5 years, preterm birth is the top cause of death among children. There are huge differences in the rates of preterm birth and mortality from country to country and even within countries itself.[7,8]

On the other hand, the burden of preterm birth is particularly significant in low- and middle-income nations, particularly those in Southeast Asia and sub-Saharan Africa. The percentage of babies born prematurely is on the rise in several countries.[6] The problem of premature birth is of the utmost importance if the United Nations is going to meet its target number 3.2 for Sustainable Development Goal 3, which is to put an end to all preventable deaths of infants and children under the age of 5 by the year 2030.[7] Since PTB affects society in the US and around the world, a lot of attention has been dedicated to discovering the most at-risk women, with a concentration on SPTB because it causes most early births.[8]

SPTB is a bad thing because it can be caused by a number of different things. SPTB is most likely to happen again if it has happened before. But other than that, it's hard to predict PTB because the situation is different and there are many different causes and risk factors The talk about the facts about how well risk scores can predict a premature birth. Approximately one-half of preterm births are the result of spontaneous preterm labor, one-fourth are the result of preterm prelabor rupture of membranes (PPROM), and one-fourth are medically indicated by maternal or neonatal complications. In the United States, there are significant racial disparities in the preterm birth rate.[9,10]

This study demonstrated the accurateness of risk score predictions for premature birth.

METHODS

PRISMA 2020 complied with data acquisition, processing, and reporting requirements. Multiple variables influenced the choice to implement new restrictions. This review investigates the predictive accuracy of risk scores for preterm birth. According to the study's key findings, all written materials regarding the effect of nocturia on mortality must be composed in English. This systematic review examined scholastic articles published after 2013 that met the study's inclusion criteria. The collection will exclude editorials, entries without a DOI, reviews of previously published books, and excessively lengthy duplicate journal articles.

The search for studies to be included in the systematic review was carried out from September, 28th 2023 using the PubMed and SagePub databases by inputting the words: “risk scores” and “predicting preterm birth”. Where *("risk factors"[MeSH Terms] OR ("risk"[All Fields] AND "factors"[All Fields]) OR "risk factors"[All Fields] OR ("risk"[All Fields] AND "scores"[All Fields]) OR "risk scores"[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.

Their abstracts and titles had an equivalent impact on the acceptability of studies. Therefore, they must rely on historical records. Due to the typical consistency of research findings, unpublished English papers are required. Only studies fulfilling the inclusion criteria were considered for the systematic review. This limits the search to only those results meeting the specified criteria. The evaluation process is divided into the sections listed below. The study considered authors, publication dates, geographical locations, activities, and motivations. After EndNote recorded a search's results, the database searched for and removed duplicate articles.

Two individuals reviewed the titles and abstracts of all the papers for this article. Before deciding which articles to cover, each author meticulously considers pertinent abstracts and article titles. Each paper that satisfies the review criteria will be subjected to a rigorous and exhaustive analysis. Following the conclusion of our investigation, we will revisit any pertinent scientific publications that we may have overlooked the first time around. a relevant research was included, while irrelevant research was excluded.

RESULT

Miller, et al (2015)[11] showed age of the mother and in vitro fertilization were not substantially related to a short cervix. Black (adjusted odds ratio [aOR] = 3.77, 95% confidence interval [CI] = 2.42-5.87) and Hispanic (aOR = 1.73, 95% CI =

1.10-2.74) race-ethnicity, current tobacco use (aOR = 3.67, 95% CI = 1.56-8.62), prior indicated preterm birth (aOR = 2.26, 95% CI = 1.26-4.05), and having a prior cervical excisional procedure (aOR = 2.96, 95% CI = 1.86-4.70) were independent risk factors for a short cervix. Universal screening has a specificity of 62.8%, whereas risk-based screening has 96.5%. The sensitivity to offer transvaginal scanning was 62.8% with one variable and 14% with two factors.

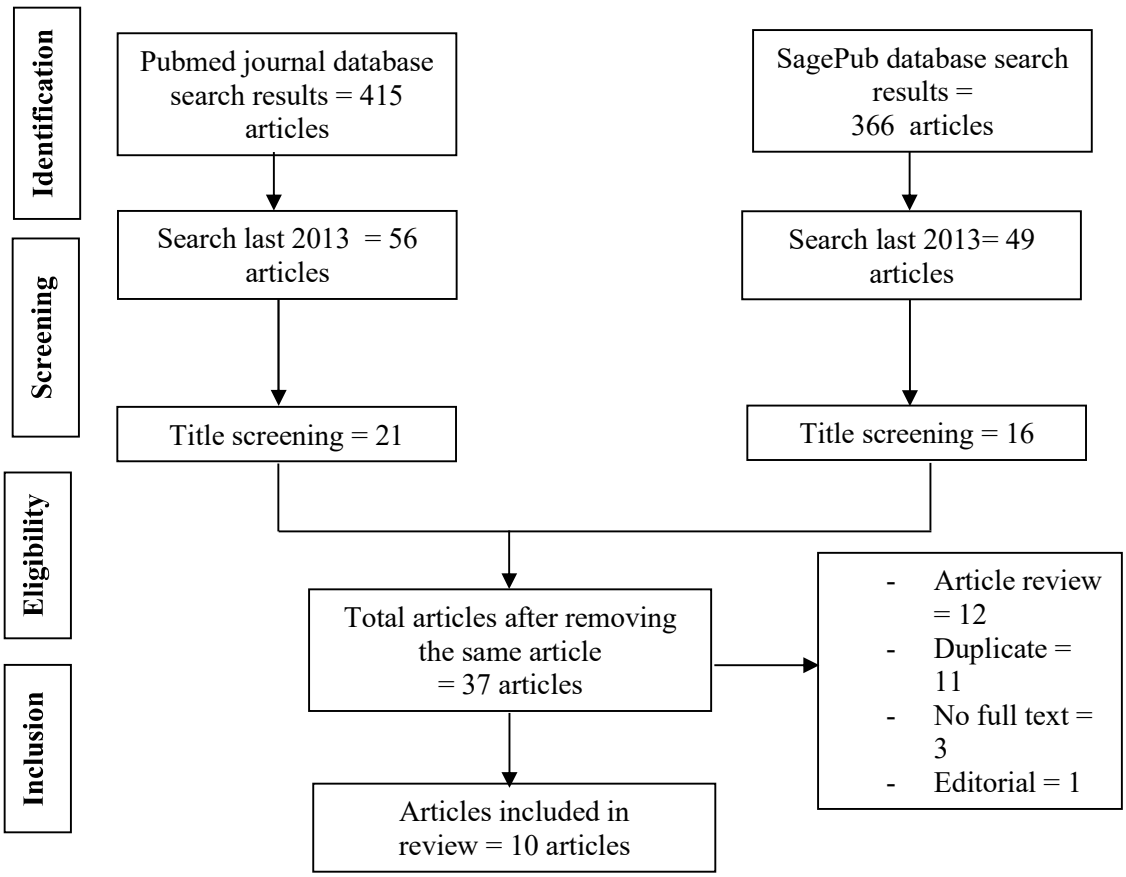

Figure 1. Article search flowchart

Cho, et al (2016)[12] showed the mean cervical lengths did not differ substantially between the two techniques (mean SD = 3.78 ± 0.82 cm for transabdominal and 3.82 ± 0.77 cm for transvaginal sonography, respectively; P =.09). The findings of this study indicate that transabdominal sonography accurately predicted transvaginal short cervical lengths with a 100% success rate in cases when the cervical length was 2 cm or less. The predictive accuracies of transabdominal sonography for preterm birth were found to be 21.4%, 98.68%, 50.00%, 95.32%, and 13.22%, respectively. On the other hand, transvaginal sonography demonstrated predictive accuracies of 28.57%, 94.94%, 66.6%, and 95.78%. Transabdominal sonography instances have been found to accurately predict premature birth based on the presence of short cervical lengths.

Esplin, et al (2017)[13] conducted a study with 9,410 women, of which 474 (5.0%) had spontaneous preterm births, 335 (3.6%) had medically indicated preterm births, and 8601 (91.4%) had term births. Between 16 and 22 weeks of pregnancy, 8.0% of women with spontaneous preterm birth had a cervical length 25 mm, and 23.3% between 22 and 30 weeks. At 16 to 22 weeks, 7.3% of women with spontaneous preterm birth had fetal fibronectin levels >50 ng/mL, and 8.1% did so at 22 to 30 weeks. The area under the receiver operating characteristic (ROC) curve for screening between 22 and 30 weeks was 0.59 (95% CI = 0.56–0.62) for fetal fibronectin level alone, 0.67 (95% CI = 0.64–0.70) for transvaginal cervical length alone, and 0.67 (95% CI, 0.64–0.70) for the combination as continuous variables.

Li, et al (2022)[3] showed Higher education level of pregnant women (bachelor [OR = 0.82; 95%CI = 0.81-0.84]; master [OR = 0.82; 95%CI = 0.81-0.83]), pre-pregnancy overweight (OR = 0.96; 95% CI = 0.95-0.98) and obesity (OR = 0.94; 95%CI = 0.93-0.96), and prenatal care (OR = 0.48; 95%CI = 0.47-0.50) were associated with a reduced risk of preterm birth, while age ≥ 35 years (OR = 1.27; 95%CI = 1.26-1.29), black race (OR = 1.26; 95%CI = 1.23-1.29), pre-pregnancy underweight (OR = 1.26; 95%CI = 1.22-1.30), pregnancy smoking (OR = 1.27; 95%CI = 1.24-1.30), pre-pregnancy diabetes (OR = 2.08; 95%CI = 1.99-2.16), pre-pregnancy hypertension (OR = 2.22; 95%CI = 2.16-2.29), previous preterm birth (OR = 2.95; 95%CI = 2.88-3.01), and plurality (OR = 12.99; 95%CI = 12.73-13.24) were related to an increased risk of preterm birth. The AUC and accuracy of the prediction model in the testing set were 0.688 (95%CI = 0.686-0.689) and 0.762 (95%CI = 0.762-0.763), respectively.

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Risk Predictor	Conclusion
Miller, 2015[11]	United State of America (USA)	Cohort study	18,250 women	Short cervix, maternal age, race	Ultrasonograms for cervical length assessment will be greatly reduced if screening is limited to women with at least one risk factor for a short cervix. This approach leaves 40% of women with short cervixes untreated.
Cho, 2016[12]	Republic of Korea	Prospective study, comparative	1,465 women	Cervical Lengths Measured by Transabdominal and Transvaginal Sonography for Predicting Preterm Birth	Women with long cervical lengths on transabdominal sonography may not need transvaginal sonography. If transabdominal sonography shows unmeasurable or short cervical lengths (less than two or two and a half centimeters), transvaginal sonography can quantify them to predict premature birth.
Premkumar, 2016[14]	USA	Retrospective cohort study	23,425 singleton pregnancies	Maternal race / ethnicity and chronic hypertension	Chronic hypertension impacts medically indicated preterm birth differently by race/ethnicity. Despite limited data on medically indicated preterm delivery, the higher influence of chronic hypertension among African-American and Asian/Pacific Islander women on medically indicated and total preterm birth rates reveals an independent variable that was not studied.
Esplin, 2017[13]	USA	Prospective observational cohort study	9,410 women	Serial transvaginal cervical lengths and quantitative vaginal fetal fibronectin levels	Quantitative vaginal fetal fibronectin and serial transvaginal ultrasonography cervical length did not predict spontaneous preterm birth in nulliparous singleton pregnancies. These data do not support routinely testing these women.
Liu, 2019[5]	USA	Population-based cohort study	7,141,630 singleton livebirths	Maternal age and race	In general, having a mother who was obese before getting pregnant increases the risk of premature birth, however this risk varies by age and race or ethnicity. Further research is needed to understand the mechanics.
Wei, 2019[15]	China	Retrospective cohort study	Population-based retrospective cohort study	DM	Preconception IFG or DM was associated with spontaneous abortion, PTB, macrosomia, SGA, and perinatal infant mortality. Policymakers should prioritize preconception glycemic control.
Gete, 2020[4]	Australia	Prospective observational cohort study	3,508 singleton live births	Dietery pattern	In women who have never given birth, following the traditional vegetable pattern before pregnancy reduces the chance of preterm delivery, especially spontaneous preterm birth. This discovery requires further study.
Li, 2022[3]	USA	Case control study	3,006,989 pregnant women in 2019 and 3,039,922 pregnant	Normogram based on information on pregnant women and their spouses	The nomogram for predicting preterm delivery in pregnant women performed well, and the required predictors are clinically available. Thus, the nomogram may be a simple preterm birth prediction tool.

			women in 2018		
Merlo, 2022[16]	Italy	Case control study	126,839 nulliparous women	PTBS	All study regions had more preterm deliveries as the Preterm Birth Score increased. The internal validation set and Marche had nearly ideal calibration plots, however Sicily had slightly different probability for high Preterm Birth Scores. Marche, Sicily, and the internal validation set had 60%, 61%, and 56% AUCs.
Belaghi, 2021[17]	Iran	Case control study	112,963 with a singleton gestation who gave birth between 20–42	Diabetes	Even though artificial neural networks had a slightly higher AUC than logistic regression, it was still hard to predict babies that would be born before they're due in the first trimester. Adding data from the second trimester, on the other hand, made predictions a little better using both logistic regression and machine learning.

Obese mothers are more likely to give birth prematurely, however this risk varies by age and race or ethnicity. Understanding the mechanics requires more investigation.[5] After adjustment for lifestyle factors and pregnancy complications, highest tertile adherence to the traditional vegetables pattern before pregnancy was associated with a lower risk of preterm birth and spontaneous preterm birth compared to lowest tertile (aOR = 0.72, 95% CI = 0.53-0.99) and (RR ratio = 0.62, 95% CI = 0.39-1.00). However, pre-pregnancy BMI reduced these connections. LBW was not associated with prenatal nutrition.[4]

The influence of chronic hypertension on preterm birth and medically indicated preterm birth exhibits variability across different racial and ethnic groups. The potential existence of an unaccounted independent variable in the data analysis is suggested by the elevated impact of chronic hypertension on both medically indicated and total preterm birth rates in African-American and Asian/Pacific Islander women. It is important to note that the dataset had limited information on the indication for medically indicated preterm delivery.[14]

Other study develop a Preterm Birth Score. The incidence of preterm delivery demonstrated a positive correlation with the escalating Preterm Birth Score across all locations examined in the study. The internal validation set and Marche yielded calibration plots that were nearly ideal, indicating a strong alignment between predicted and observed probability. However, in Sicily, there was a tiny discrepancy between the expected and observed probabilities for high Preterm Birth Score values. The receiver operating characteristic curve yielded area values of 60%, 61%, and 56% for the internal validation set, Marche, and Sicily, respectively.[16]

Belaghi, et al (2021)[17] identified 13 variables associated with preterm birth in the first trimester, with diabetes and abnormal pregnancy-associated plasma protein A concentration being the strongest predictors. With artificial neural networks in the validation sample, the first trimester maximum AUC was 60% (95% CI = 58–62%). In the second trimester, 17 factors were significantly related with preterm birth, with pregnancy problems having the highest AOR (13.03; 95% CI = 12.21–13.90). AUC improved to 65% (95% CI = 63–66%) with artificial neural networks in the validation sample during the second trimester. Artificial neural networks had an AUC of 80% (95% CI = 79–81%) with pregnancy problems. All models had 94–97% negative predictive values for spontaneous PTB in the first and second trimesters.

DISCUSSION

More women are getting pregnant with the help of assisted reproductive technology (ART) and more babies are being born before they're due because birth rates have dropped so much and the average age of the mother at conception is going up. Even though a lot of work has been made in treating premature babies, the goal of stopping premature births has not yet been reached. A recent piece focused on the main way to stop women who don't have any symptoms from giving birth early and have a high chance of doing so.[18]

Because the risk of SPTB always goes down as the cervix gets shorter, having a short cervix in the middle of the third trimester is one of the biggest risk factors for SPTB.[11] You can get a TVS, transabdominal, transperineal, or digital cervix check. Digital checks find out the length, location, consistency, and dilation. Assessment based on opinion. Neck length was wrongly estimated. It can't find changes in the internal cervical os or the upper cervical canal. Ultrasound can help both diseases because it can go through cervical tissue. TVS and TPS are done with a dorsal lithotomy. These traits are necessary for accurate readings.[19] It is possible that women whose transabdominal sonography shows that their cervix is long may not need transvaginal sonography.[12]

It was shown by To et al. that the normal range of cervical length was 36 mm. Only 1% of women had lengths less than 15 mm. For experimental studies, this cut-off point means "high risk".[20,21] Celik et al.[22] used cervical-length measurements between 20 and 24 weeks' gestation and maternal history in approximately 58 000 women to build preterm delivery risk models. Patients who delivered before 28, 28–30, 31–33, and 34–36 weeks were compared. Sensitivities were 81%, 59%, 53%, and 29% for 10% false-positives. Honest et al.[23] examined five cervical-length studies between 20 and 24 weeks with cut-offs of 20–30 mm to predict preterm birth before 34 weeks. Positive probability ratios were 2.3 for 30 mm and 7.6 for 20.

A large-sample model for predicting preterm birth was made in another study. Having a bachelor's degree or higher, being overweight or obese before pregnancy, and getting prenatal care were all linked to a lower risk of preterm birth. On the other hand, being younger than 35 years old, being black, being underweight before pregnancy, smoking during pregnancy, having diabetes or gestational diabetes, high blood pressure before or during pregnancy, gestational hypertension, hypertension eclampsia, having had a preterm birth before, or having a previous preterm birth were all linked to a higher risk. The AUC of the model used to predict preterm birth in the tested set was 0.688. It also did well when tested by people outside the model.[3]

Some studies associate preterm birth with African ethnicity and maternal age. In a meta-analysis, Black Americans had a higher rate of preterm birth than white Americans.[24] Preterm birth was more prevalent among African pregnant women over 35. Numerous variables can influence preterm birth and BMI before pregnancy. Obesity prior to pregnancy and the risk of preterm birth varied by age and race in a large sample study.[4,5] The study found that preterm birth risk decreased with overweight and obesity. Other covariates may affect our results. Diabetes and hypertension were connected to preterm birth.[5,25] Smoking contributed to fetal death or impairment.[26]

CONCLUSION

There are a number of risk factors that have been linked to premature birth, including a cervix that is too short, a maternal age that is larger than 35 years, a maternal body mass index that is greater than 25, smoking habits, and comorbid risk factors (such as hypertension and diabetes).

REFERENCE

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

[2]. Cunningham FG, Leveno KJ, Bloom SL, Cunningham FG; Leveno KJ; Bloom SL; et al, Cunningham FG, Leveno KJ, et al. Williams Obstetri. 25 ed. New York: The McGraw-Hill Companies; 2020.

[3]. Li Y, Fu X, Guo X, Liang H, Cao D, Shi J. Maternal preterm birth prediction in the United States: a case-control database study. BMC Pediatr. September 2022;22(1):547.

[4]. Gete DG, Waller M, Mishra GD. Prepregnancy dietary patterns and risk of preterm birth and low birth weight: findings from the Australian Longitudinal Study on Women's Health. Am J Clin Nutr. Mei 2020;111(5):1048–58.

[5]. Liu B, Xu G, Sun Y, Du Y, Gao R, Snetselaar LG, et al. Association between maternal pre-pregnancy obesity and preterm birth according to maternal age and race or ethnicity: a population-based study. lancet Diabetes Endocrinol. September 2019;7(9):707–14.

[6]. Purisch SE, Gyamfi-Bannerman C. Epidemiology of preterm birth. In: Seminars in perinatology. Elsevier; 2017. hal. 387–91.

[7]. Walani SR. Global burden of preterm birth. Int J Gynaecol Obstet Off organ Int Fed Gynaecol Obstet. Juli 2020;150(1):31–3.

[8]. Cao G, Liu J, Liu M. Global, regional, and national incidence and mortality of neonatal preterm birth, 1990-2019. JAMA Pediatr. 2022;176(8):787–96.

[9]. Gynecologists AC of O and. Prediction and prevention of spontaneous preterm birth: ACOG Practice Bulletin, Number 234. Obstet Gynecol. 2021;138(2):e65–90.

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

[11]. Miller ES, Tita AT, Grobman WA. Second-Trimester Cervical Length Screening Among Asymptomatic Women: An Evaluation of Risk-Based Strategies. Obstet Gynecol. Juli 2015;126(1):61–6.

[12]. Cho HJ, Roh H-J. Correlation Between Cervical Lengths Measured by Transabdominal and Transvaginal Sonography for Predicting Preterm Birth. J ultrasound Med Off J Am Inst Ultrasound Med. Maret 2016;35(3):537–44.

[13]. 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.

[14]. Premkumar A, Henry DE, Moghadassi M, Nakagawa S, Norton ME. The interaction between maternal race/ethnicity and chronic hypertension on preterm birth. Am J Obstet Gynecol. Desember 2016;215(6):787.e1-787.e8.

[15]. Wei Y, Xu Q, Yang H, Yang Y, Wang L, Chen H, et al. Preconception diabetes mellitus and adverse pregnancy outcomes in over 6.4 million women: A population-based cohort study in China. PLoS Med. Oktober 2019;16(10):e1002926.

[16]. Merlo I, Cantarutti A, Allotta A, Tavormina EE, Iommi M, Pompili M, et al. Development and Validation of a Novel Pre-Pregnancy Score Predictive of Preterm Birth in Nulliparous Women Using Data from Italian Healthcare Utilization Databases. In: Healthcare. MDPI; 2022. hal. 1443.

[17]. Arabi Belaghi R, Beyene J, McDonald SD. Prediction of preterm birth in nulliparous women using logistic regression

and machine learning. PLoS One. 2021;16(6):e0252025.
[18]. Konar H. DC Dutta's Textbook Of Obstetrics Including Perinatology and Contraception. 8 ed. New Delhi: Jaypee Brothers Medical Publishers; 2015.
[19]. Kagan KO, Sonek J. How to measure cervical length. Ultrasound Obstet Gynecol Off J Int Soc Ultrasound Obstet Gynecol. Maret 2015;45(3):358–62.
[20]. To MS, Skentou CA, Royston P, Yu CKH, Nicolaides KH. Prediction of patient-specific risk of early preterm delivery using maternal history and sonographic measurement of cervical length: a population-based prospective study. Ultrasound Obstet Gynecol Off J Int Soc Ultrasound Obstet Gynecol. April 2006;27(4):362–7.
[21]. Fonseca EB, Celik E, Parra M, Singh M, Nicolaides KH. Progesterone and the risk of preterm birth among women with a short cervix. N Engl J Med. Agustus 2007;357(5):462–9.
[22]. Celik E, To M, Gajewska K, Smith GCS, Nicolaides KH. Cervical length and obstetric history predict spontaneous preterm birth: development and validation of a model to provide individualized risk assessment. Ultrasound Obstet Gynecol Off J Int Soc Ultrasound Obstet Gynecol. Mei 2008;31(5):549–54.
[23]. Honest H, Forbes CA, Durée KH, Norman G, Duffy SB, Tsourapas A, et al. Screening to prevent spontaneous preterm birth: systematic reviews of accuracy and effectiveness literature with economic modelling. Health Technol Assess. September 2009;13(43):1–627.
[24]. Mehra R, Boyd LM, Ickovics JR. Racial residential segregation and adverse birth outcomes: A systematic review and meta-analysis. Soc Sci Med. Oktober 2017;191:237–50.
[25]. Bertagnolli M, Luu TM, Lewandowski AJ, Leeson P, Nuyt AM. Preterm Birth and Hypertension: Is There a Link? Curr Hypertens Rep. April 2016;18(4):28.
[26]. Stock SJ, Bauld L. Maternal smoking and preterm birth: An unresolved health challenge. PLoS Med. September 2020;17(9):e1003386.