**HİTİT MEDICAL JOURNAL**
**HİTİT ÜNİVERSİTESİ TIP FAKÜLTESİ DERGİSİ**

e-ISSN: 2687-4717 Cilt|Volume: 6 • Sayı|Issue: 3 - Ekim|October 2024

# The Roles of Maternal Height and Body Mass Index in Preterm Birth Prediction

Erken Doğumu Öngörmede Anne Boyu ve Vücut Kitle İndeksinin Rolü

**Fahri Burçin Fıratlıgil[1] | Kazım Emre Karaşahin[2]**

[1]Ankara Etlik City Hospital, Perinatology Clinics, Ankara, Türkiye
[2]Gülhane Traning and Research Hospital, Obstetrics and Gynecology Department, Ankara, Türkiye

**Sorumlu Yazar | Correspondence Author**
**Fahri Burçin Fıratlıgil**
md.fahri@gmail.com
**Address for Correspondence:** Ankara Etlik City Hospital, Perinatology Clinics, Ankara, Türkiye.

**Makale Bilgisi | Article Information**
**Makale Türü | Article Type:** Araştırma Makalesi | Research Article
**Doi:** https://doi.org/10.52827/hititmedj.1413814
**Geliş Tarihi | Received:** 04.01.2024
**Kabul Tarihi | Accepted:** 02.09.2024
**Yayım Tarihi | Published:** 14.10.2024

**Atıf | Cite As**
Fıratlıgil FB, Karaşahin KE. The Roles of Maternal Height and Body Mass Index in Preterm Birth Prediction. Hitit Medical Journal 2024;6(3):274-280. https://doi.org/10.52827/hititmedj.1413814

**Hakem Değerlendirmesi:** Alan editörü tarafından atanan en az iki farklı kurumda çalışan bağımsız hakemler tarafından değerlendirilmiştir.
**Etik Beyanı:** GATA etik komite tarafından onay alınmıştır (Ekim 14, 2014; EGT, OGT: 50687469-1491-550-14/1648.4-1968).
**İntihal Kontrolleri:** Evet (iThenticate)
**Çıkar Çatışması:** Yazarlar çalışma ile ilgili çıkar çatışması beyan etmemiştir.
**Şikayetler:** hmj@hitit.edu.tr
**Katkı Beyanı:** Fikir/Hipotez: FBF Tasarım: KEK Veri Toplama/Veri İşleme: FBF, KEK Veri Analizi: FBF, KEK Makalenin Hazırlanması: FBF, KEK.
**Hasta Onamı:** Hasta onamına gerek yoktur.
**Finansal Destek:** Bu çalışma ile ilgili herhangi bir finansal kaynaktan yararlanılmamıştır.


**Peer Review:** Evaluated by independent reviewers working in the at least two different institutions appointed by the field editor.
**Ethical Statement:** It was approved by the GATA ethics committee (October 14, 2014; EGT.OGT: 50687469-1491-550-14/1648.4-1968).
**Plagiarism Check:** Yes (iThenticate)
**Conflict of Interest:** The authors declared that, there are no conflicts of interest.
**Complaints:** hmj@hitit.edu.tr
**Authorship Contribution:** Idea/Hypothesis: FBF Design: KEK Data Collection/Data Processing: FBF, KEK Data Analysis: FBF, KEK Manuscript Preparation: FBF, KEK.
**Informed Consent:** Not applicable.
**Financial Disclosure:** There are no financial funds for this article.

# The Roles of Maternal Height and Body Mass Index in Preterm Birth Prediction


**ABSTRACT**

**Objective:** To investigate the role of maternal height and body mass index in the prediction of preterm birth.

**Material and Method:** Patients who had either cesarean section and/or spontaneous vaginal delivery in Department of Obstetrics and Gynecology in the last 5 years were included in the study. Demographic data, weeks of gestation at the time of delivery, maternal height and body mass index of the patients with preterm delivery were recorded retrospectively for the study group. The control group consisted of retrospectively selected patients who had given birth after the expected date of delivery using the Naegele method.

**Results:** In the study, 295 of 541 pregnant women had a preterm birth (study group), while 246 women had given birth after the expected date of delivery (control group). Maternal height and body mass index had an influence on preterm birth. The sensitivity and specificity values for a height of 152.5 cm and a body mass index of 21.3 kg/m2 were (1.0 and 0.13) and (1.0 and 0.06), respectively. In the receiver characteristics analysis of these variables affecting preterm birth, the area under the curve for body mass index and maternal height were 0.763 and 0.708, respectively.

**Conclusion:** We conclude that height and body mass index were found to be good discriminators for the prediction of preterm birth.



**Keywords:** Body mass index, height, labour, pregnancy.


---


**ÖZET**

**Amaç:** Erken doğumun öngörülmesinde anne boyu ve vücut kitle indeksinin rolünü araştırmak.

**Gereç ve Yöntem:** Kadın Hastalıkları ve Doğum Kliniğinde son 5 yıl içinde sezaryen ve/veya spontan vajinal doğum yapan hastalar çalışmaya dahil edildi. Çalışma grubu için erken doğum yapan hastaların demografik verileri, doğum sırasındaki gebelik haftaları, anne boyu ve vücut kitle indeksi retrospektif olarak kaydedilmiştir. Kontrol grubu, Naegele yöntemi kullanılarak beklenen doğum tarihinden sonra doğum yapan ve retrospektif olarak seçilen hastalardan oluşmuştur.

**Bulgular:** Çalışmada 541 gebenin 295'i erken doğum yapmış (çalışma grubu), 246'sı ise beklenen doğum tarihinden sonra doğum yapmıştır (kontrol grubu). Anne boyunun ve vücut kitle indeksinin erken doğum üzerinde etkisi vardı. Boy uzunluğunun 152,5 cm ve vücut kitle indeksinin 21,3 kg/m2 olması için duyarlılık ve özgüllük değerleri sırasıyla (1,0 ve 0,13) ve (1,0 ve 0,06) idi. Erken doğumu etkileyen bu değişkenlerin alıcı özellikleri analizinde, vücut kitle indeksi ve anne boyu için eğri altında kalan alan sırasıyla 0,763 ve 0,708'dir.

**Sonuç:** Boy ve vücut kitle indeksinin erken doğumun öngörülmesinde iyi ayırt edici değişkenler olduğu sonucuna varılmıştır.



**Anahtar Sözcükler:** Boy, doğum, gebelik, vücut kitle indeksi.

## Introduction

In recent times, medical and technological developments in neonatal units have significantly improved the prognosis for low birth weight babies. However, the number of premature births has not decreased. Preterm births, which occur in 11% of all pregnancies, are births before 37 weeks gestation (1). In the United States, the preterm birth rate is about 9.7% (2). The causes of preterm delivery are heterogenous, and numerous risk factors have been identified, including both young and advanced maternal age, intrauterine infections, smoking, previous preterm delivery, short maternal stature, and prepregnancy underweight [body mass index (BMI) < 18.5 kg/m$^2$]. In addition, some studies have shown that pre-pregnancy obesity (BMI ≥ 25 kg/m$^2$) is associated with an increased risk of very and moderately preterm births (3).

Preterm birth is the single most important factor in determining the future of a fetus without anomalies, and it remains the leading cause of perinatal mortality and morbidity (4). The most critical mortality and morbidity associated with complications of preterm birth is before 34 weeks of gestation. The rate of preterm births has increased over the last 20 years due to the increase in multiple pregnancies through assisted reproductive techniques and the increase in the frequency of invasive obstetric procedures (5). The gestational age and maturity of the fetus increase the life expectancy of the newborn and not the birth weight (6). It has been found that 83% of neonatal mortality is due to births before 37 weeks' gestation (7,8).

The prediction or prevention of preterm birth has therefore become one of the most important issues in obstetrics. Pre-diagnosis of preterm birth and prevention by determining the risk factors is the best approach to reduce the preterm birth rate. Early detection of pregnant women at high risk of preterm birth is therefore an important step in reducing fetal morbidity and mortality (9). Comprehensive studies to determine the risk of preterm birth have been conducted on various factors ranging from simple pelvic floor measurements to digital examination and sonographic assessment of the cervix (10,11). In this study, we investigated the association between low maternal height and lower maternal BMI and preterm birth.

## Material and Methods

This case-control study was conducted retrospectively at the Obstetrics-Gynecology Department between January 2009 and December 2014. This study was performed in accordance with the principles of the Helsinki Declaration, and it was approved by the GATA ethics committee (October 14, 2014; EGT.OGT: 50687469-1491-550-14/1648.4-1968).

*Inclusion and Exclusion criteria*

The study included singleton pregnancies with preterm delivery (>27 weeks' gestation to <37 weeks' gestation) with spontaneous labor and singleton pregnancies with delivery after 40 weeks' gestation. Pregnant women were excluded from the study if they had elevated liver enzymes, multiple pregnancies, polyhydramnios, induced labor due to FGR, preeclampsia or similar causes, placental abnormalities such as placenta previa, uterine abnormalities and surgery, group B streptococcus positivity, fetal abnormalities, had given birth before 27 and after 42 weeks of gestation, and smoked cigarettes.

*Study Design*

Patients who had a preterm spontaneous vaginal delivery and/or a cesarean section (CS) were included in the study group (Group I). Patients who had a postdated spontaneous vaginal delivery and/or cesarean section were included in the control group (Group II). A postdated pregnancy is defined as a pregnancy that has exceeded the expected date of delivery (more than 280 days - calculated according to the Naegele rule -to calculate the expected date of birth, subtract 3 months and add 7 days to the date of the last menstruation-). When comparing the groups, the aim of selecting post-dated pregnancies for the control group was to increase the significance by excluding term pregnancies (≥37 weeks' gestation and ≤40 weeks' gestation) between the two groups.

*Data*

541 pregnant women were included in the study. If the women did not know their exact week of gestation (due to early or late ovulation or an unknown last menstruation), gestational age was determined by the earliest ultrasound measurement. The weeks of

gestation were confirmed by measuring the crown-rump length (CRL) at the twelfth week in all pregnant women. A sample of approximately 295 pregnant women was included in Group I and a sample of approximately 246 pregnant women was included in Group II.

For the study, the data were taken from the patient files or the hospital files of the two groups. Patient demographics, gestational age at birth, smoking status, maternal height and BMI were recorded.In our hospital's antenatal clinic, height and weight are measured in a standardized way during the first trimester at the patient's first visit to the nurses' room and recorded in the patient's medical file. This data was taken from the patient's records and included in the study.

BMI was calculated using the following formula: Patient's weight (kg) / square of patient's height (m).

*Ultrasound examination and fetal monitoring*

Ultrasound measurements were performed using the General Electic Logiq S6®, 1.5 - 4.5 MHz probe (Waukesha, WI USA) to confirm gestational age, assess gross fetal anomalies, determine amniotic fluid volume, cervical length and placental implantation. A Philips AvalonTM FM20 cardiotocograph was used to detect uterine contractions and assess fetal behavior.

*Statistical analysis*

The SPSS 15.0 program for Windows Evaluation Version was used for the statistical analysis. Numbers, percentages, averages and standard deviations were used to analyze the data. The Kolmogorov-Smirnov test was used to check the conformity of the continuous variables with the normal distribution. For comparison between groups, the student t-test was used for continuous variables, while the chi-square test was used for discontinuous variables. Logistic regression analysis was performed to identify the variables (height and BMI) important for predicting preterm birth. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were determined using receiver operating characteristic (ROC) analysis to obtain cut-off values for detecting the role of maternal height and BMI in preterm birth. Statistical significance was assessed at the $p < 0.05$ level for all outcomes.

## Results

In the study, 4893 patient records who had given birth in the Department of Obstetrics and Gynecology within the last 5 years were retrospectively analyzed. 541 of the 4893 patients who met the study criteria were selected. The average age of the patients in the study was 28 ± 6.7 years. The average height and weight of the patients were 160.6 ± 6.9 cm and 73.8 ± 12.4 kg, respectively. The average BMI was 28.6 ± 4.7 kg/m$^2$. 295 of 541 patients (54.5%) who had a preterm delivery were designated as the study group, while 45.5% (n:246) of patients who had a post-dated birth were designated as the control group.

The demographic parameters of the groups are shown in Table I.

**Table I** Comparison of the demographic parameters of the groups

| | Group I (n=295) | Group II (n=246) | *p* |
|---|---|---|---|
| **Age**[a] | 26 ± 5.4 | 30.3 ± 7.3 | *<0.001* |
| **Delivery Week**[a] | 31.6 ± 2.9 | 41.0 ± 0.8 | *<0.001* |
| **Height(cm)**[a] | 158.5 ± 4.8 | 163.2 ± 6.2 | *<0.001* |
| **BMI (kg/m$^2$)**[a] | 26.6 ± 3.4 | 31.1 ± 4.9 | *<0.001* |
| **Number of Births**[b] | | | |
| 0 | 133 (45.1) | 101 (41.1) | |
| 1 | 106 (35.9) | 109 (44.3) | |
| 2 | 38 (12.9) | 30 (12.2) | *0.134* |
| 3 | 14 (4.7) | 5 (2.0) | |
| 4 | 4 (1.4) | 1 (0.4) | |
| **Abortion**[b] | | | |
| 0 | 110 (37.3) | 92 (37.4) | |
| 1 | 85 (28.8) | 77 (31.3) | *0.758* |
| 2 | 100 (33.9) | 77 (31.3) | |
| **History of preterm**[b] | | | |
| Yes | 89 (30.2) | 23 (9.3) | *<0.001* |
| No | 206 (69.8) | 223 (90.7) | |

BMI: body mass index.

[a] Non-parametric data was expressed with mean and standart deviation;

[b] Parametric data was expressed with numbers and percentage.

In the logistic regression analysis performed to identify the factors influencing preterm birth, the odds ratio (OR) for age was 0.901 (95% confidence interval (CB): 0.864 – 0.938), for height: 0.728 (95% confidence interval: 0.682 – 0.777), for BMI: 0.630 (95% confidence interval: 0.575 – 0.690) and for retrospective preterm birth: 3.637 (95% confidence interval: 1.800 - 7.350) (Table II).

**Table II** Evaluation of the factors affecting preterm birth by logistic regression analysis

| | ß | OR | %95 CB |
|---|---|---|---|
| **Age** | -0.105 | 0.901 | 0.864 – 0.938 |
| **Height** | -0.318 | 0.728 | 0.682 – 0.777 |
| **BMI** | -0.463 | 0.630 | 0.575 – 0.690 |
| **History of preterm** | 1.291 | 3.637 | 1.800 – 7.350 |

BMI: body mass index; ß: Logit Coefficient; OR: Odds Ratio; CB: Confidence Bounds; *p*: Logistic Regression Analysis

When these factors were analyzed using ROC analysis, the area under the curve (AUC) was 0.667 for age, 0.763 for BMI, 0.708 for height, and 0.604 for retrospective preterm birth. Each value was statistically significant (*p<0.001*) (Table III, Figure I).

**Table III** Evaluation of the factors affecting preterm birth by ROC analysis

| | AUC | %95 CB | *p* |
|---|---|---|---|
| **Age** | 0.667 | 0.621 – 0.713 | *<0.001* |
| **Height** | 0.708 | 0.665 – 0.752 | *<0.001* |
| **BMI** | 0.763 | 0.723 – 0.804 | *<0.001* |
| **History of preterm** | 0.604 | 0.557 – 0.651 | *<0.001* |

AUC: area under curve; BMI: body mass index; CB: Confidence Bounds; *p*: ROC Analysis

The values for sensitivity, specificity, PPV, NPV and accuracy were calculated for the variables height and BMI. For the height variable, the sensitivity for the point of best estimate, which was 165.5 cm, was 0.95, the specificity 0.37, the PPV 64%, the NPV 86% and the accuracy 68.5, while for the BMI variable, for the point of best estimate, which was 30.5 kg/m$^2$, the sensitivity was 0.87, the specificity 0.55, the PPV 70%, the NPV 78% and the accuracy 72.4% (Table IV).

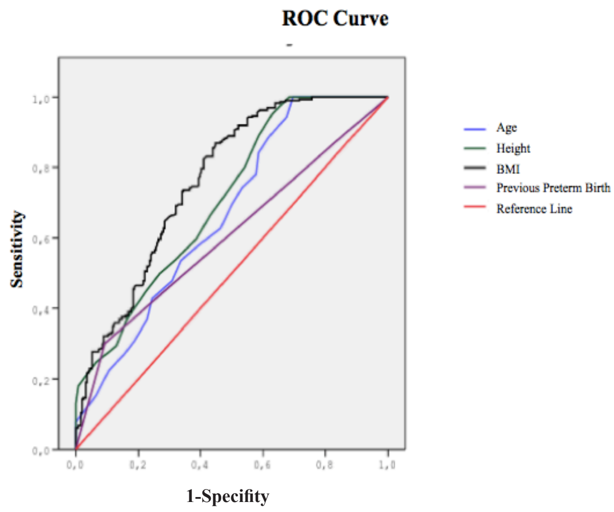


**Figure I** Illustration of the factors affecting preterm birth with ROC curve

**Table IV** The performance values for preterm birth in terms of height and BMI variables

| | | Sensitivity | Specificity | PPV | NPV | Accuracy |
|---|---|---|---|---|---|---|
| **Height** (cm) | 152.5 | 0.13 | 1.0 | 1.0 | 0.49 | 0.524 |
| | 165.5 | 0.95 | 0.37 | 0.64 | 0.86 | 0.685 |
| | 166.5 | 1.0 | 0.32 | 0.64 | 1.0 | 0.691 |
| **BMI** (kg/m$^2$) | 21.3 | 0.06 | 1.0 | 1.0 | 0.44 | 0.487 |
| | 30.5 | 0.87 | 0.55 | 0.70 | 0.78 | 0.724 |
| | 34.7 | 1.0 | 0.24 | 0.61 | 1.0 | 0.654 |

BMI: body mass index; NPV: negative predictive value; PPV: positive predictive value

## Discussion

Over the last 20 years, an increase in the preterm birth rate has been observed, possibly due to the increase in multiple pregnancies through assisted reproductive techniques as well as the increase in the frequency of invasive obstetric procedures (4). The proportion of preterm births in Turkey is about 15% (12). In present study, we found a preterm birth rate of 13.6% in our hospital, a tertiary center that admits high-risk patients from smaller centers. Thus, our aim was to predict and possibly prevent preterm births and its complications by identifying patients at high risk of preterm birth.

There are several studies investigating how different etiologic factors cause spontaneous preterm birth (1,13). In this study, we aimed to investigate whether maternal height and BMI can be used to predict preterm birth. We conclude that pregnant women with a small body size or a low BMI have a higher risk of preterm birth.

There are studies indicating that the most important demographic factor in the etiology of preterm birth is the young age of the mother, especially if she is 19 years old or younger (14,15). Lao et al. (14) showed that the risk of preterm birth increases in young pregnant women, while it is inversely proportional to the mother's body size. This increase in the risk of preterm birth in young women was associated with the underdeveloped anatomical body structure of young women. In our study, the mean age of mothers who had a preterm birth was 26 ± 5.4 years, while the mean age of postdate birth was 30.3 ± 7.3 years, with the difference being statistically significant (*$p<0.001$*). The results of the present study are consistent with these studies.

Pregnant women who have already had a preterm birth also have a higher risk of preterm birth in subsequent pregnancies (16,17,18). Schaaf et al. (16) have shown that pregnant women who have already had a preterm birth have an approximately 3-fold higher risk of a preterm birth in their next pregnancies. It has also been shown that pregnant women who have already had a preterm birth and subsequently experience a multiple pregnancy have a higher risk of preterm birth. El-Bastawissi et al. in the USA pointed out that the odds ratio (OR) for the risk of preterm birth with a previous preterm birth is 6 (18). In the present study, a statistically significant increase in the risk of preterm birth was found when patients who had a previous preterm birth were compared with those who had a later birth ($p<0.001$), and an OR of 3.637 was found.

In the meta-analysis examining maternal body size for its influence on preterm birth and abortion, it was found that pregnant women with smaller body size had a higher risk of preterm birth than pregnant women who were taller (19). The present study showed that the height of all pregnant women with preterm birth was less than 166.5 cm, while the height of all pregnant women with post-date birth was more than 152.5 cm. For the point of best estimate (the point at which the total amount of specificity and sensitivity is highest), which was 165.5 cm, the sensitivity was found to be 0.95 (meaning that 95% of pregnant women with a preterm birth are included), while the specificity was 0.37 (meaning that only 37% of pregnant women with a late birth are included).

Ehrenberg et al. (20) examined obese pregnant women with regard to the risk of preterm birth and their uterine activity. They conclude that obese/overweight women have a lower preterm birth rate before 35 weeks of gestation due to their lower uterine activity and contraction fraction compared to normal or underweight pregnant women. Apart from that study, Zhang et al. (21) found that dilation arrest was observed in pregnant women with high BMI in the first stage of labor, which in turn led to an increased cesarean section rate compared to pregnant women with normal or low BMI (OR: 3.54). This arrest of labor observed in the first stage of labor and the increase in cesarean section rate were associated with weaker myometrial contraction and lower $Ca^{2+}$ concentration in obese pregnant women. A local study by Cnattingius et al. (22) in Sweden showed that with an increase in BMI, the risk of spontaneous preterm birth also increased, OR:1.58, when BMI was ≥30 kg/m$^2$.

In the study, the BMI of all pregnant women with preterm births was below 34.7 kg/m$^2$. In addition, the BMI of all pregnant women with a post-date birth was above 21.3 kg/m$^2$. When we set the best estimate for BMI at 30.5 kg/m$^2$, the sensitivity was 0.87 (meaning that 87% of pregnant women with preterm births are affected), while the specificity was 0.55 (meaning that 55% of pregnant women with late-term births are affected). Positive predictive value and negative predictive value were determined to be 70% and 78%, respectively. The accuracy for predicting preterm birth was calculated to be 72.4% when 30.5kg/m$^2$ was used as the best estimate. Our results showed that both BMI and maternal height were found to be significant predictors of preterm birth. However, BMI was the more useful criterion than maternal height.

In conclusion, there are different values/results in the literature regarding the importance and effect of BMI and maternal height in predicting preterm birth. In order to obtain an average result for these two criteria in our country, the distribution of BMI in a normal pregnancy, the distribution of weight gain by weeks of gestation and the mother's height should be determined. Since most preterm births occur in pregnancies without risk, we compared

BMI and maternal height between groups without considering the history of preterm birth. Even though we did not exclude the risk of history of preterm birth, it is obvious that mothers with the same height and approximately the same BMI had previous preterm births. Therefore, we believe that close monitoring of BMI and maternal height as thresholds from the beginning of pregnancy is an appropriate approach to reduce preterm birth and its complications. However, as this is a retrospective study, the results of the study require a prospective follow-up protocol to assess their validity.

**Acknowledgements**

We are grateful to all participants and their families who spent their precious time and participated in this research program. We are also thankful for the tireless efforts of the research team members.

## References

1. Walani SR. Global burden of preterm birth. Int J Gynaecol Obstet 2020;150(1):31-33.
2. Ohuma EO, Moller AB, Bradley E, et al. National, regional, and global estimates of preterm birth in 2020, with trends from 2010: a systematic analysis [published correction appears in Lancet 2024 Feb 17;403(10427):618.
3. Pedersen DC, Bjerregaard LG, Rasmussen KM, Nohr EA, Baker JL. Associations of maternal birth weight, childhood height, BMI, and change in height and BMI from childhood to pregnancy with risks of preterm delivery. Am J Clin Nutr 2022;115(4):1217-1226.
4. Mocking M, Adu-Bonsaffoh K, Osman KA, et al. Causes, survival rates, and short-term outcomes of preterm births in a tertiary hospital in a low resource setting: An observational cohort study. Front Glob Womens Health 2023;3:989020.
5. Joseph KS, Kramer MS, Marcoux S, et al. Determinants of preterm birth rates in Canada from 1981 through 1983 and from 1992 through 1994. N Engl J Med 1998;339:1434.
6. Husby A, Wohlfahrt J, Melbye M. Gestational age at birth and cognitive outcomes in adolescence: population based full sibling cohort study. BMJ 2023;380:e072779.
7. Richter LL, Ting J, Muraca GM, Synnes A, Lim KI, Lisonkova S. Temporal trends in neonatal mortality and morbidity following spontaneous and clinician-initiated preterm birth in Washington State, USA: a population-based study. BMJ Open 2019;9(1):e023004.
8. Kesim M, Karlık İ, Yalcın A, Calışkan K. Kliniğimizdeki perinatal mortalite oranlarının değerlendirilmesi. Perinatoloji Dergisi 1996;4(2): 88-93.
9. Marić I, Stevenson DK, Aghaeepour N, Gaudillière B, Wong RJ, Angst MS. Predicting Preterm Birth Using Proteomics. Clin Perinatol 2024;51(2):391-409.
10. Karlık İ, Kesim M, Erol M. Fotal solunum hareketleri ile erken doğum eyleminin izlenmesi. Kadın Doğum Dergisi 1995;11(1): 8-11.
11. Prasad M, Al-Taher H. Maternal height and labour outcome. J Obstet Gynaecol 2002;22(5):513-515.
12. Koc E, Demirel N, Bas AY, et al. Early neonatal outcomes of very-low-birth-weight infants in Turkey: A prospective multicenter study of the Turkish Neonatal Society. PLoS One 2019;18;14(12):e0226679.
13. Zhong Y, Lu H, Jiang Y, et al. Effect of homemade peanut oil consumption during pregnancy on low birth weight and preterm birth outcomes: a cohort study in Southwestern China. Glob Health Action 2024;17(1):2336312.
14. Lao TT, Ho LF. Relationship between preterm delivery and maternal height in teenage pregnancies. Hum Reprod 2000;15(2):463-468.
15. Harrison A, Gordon-Strachan G, James Bateman C, et al. ECD - Pregnancy outcomes of a birth cohort. Are adolescent mothers really at more risk?. Psychol Health Med 2024;29(6):1142-1154.
16. Schaaf JM, Hof MH, Mol BW, Abu-Hanna A, Ravelli AC. Recurrence risk of preterm birth in subsequent twin pregnancy after preterm singleton delivery. BJOG 2012;119(13):1624-1629.
17. Stevenson DK, Winn VD, Shaw GM, England SK, Wong RJ. Solving the Puzzle of Preterm Birth. Clin Perinatol 2024;51(2):291-300.
18. El-Bastawissi AY, Sorensen TK, Akafomo CK, Frederick IO, Xiao R, Williams MA. History of fetal loss and other adverse pregnancy outcomes in relation to subsequent risk of preterm delivery. Matern Child Health J 2003;7(1): 53-58.
19. Han Z, Lutsiv O, Mulla S, McDonald SD. Maternal height and the risk of preterm birth and low birth weight: a systematic review and meta-analyses. J Obstet Gynaecol Can 2012;34(8):721-746.
20. Ehrenberg HM, Iams JD, Goldenberg RL, et al. Maternal obesity, uterine activity, and the risk of spontaneous preterm birth. Obstet Gynecol 2009;113(1):48-52.
21. Zhang J, Bricker L, Wray S, Quenby S. Poor uterine contractility in obese women. BJOG 2007;114(3):343-348.
22. Cnattingius S, Villamor E, Johansson S, et al. Maternal obesity and risk of preterm delivery. JAMA 2013;309(22):2362-2370.