Family Medicine & Primary Care Review 2023; 25(3): 264–269, https://doi.org/10.5114/fmpcr.2023.130086

ORIGINAL PAPERS

ISSN 1734-3402, eISSN 2449-8580

Relationship between maternal factors and preterm infant birth: a case-control study

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A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** The newborn mortality rate is one of the most significant health indicators in a country. According to global data, preterm births account for 60 to 80% of all new-born fatalities caused by congenital abnormalities. Despite extensive study in developed countries, there is virtually little information on the reasons for preterm births in studies in Iran and other regions of the world.
Objectives. The aim of this study was to determine the relationship between some maternal factors and preterm birth.
Material and methods. This case-control study was performed on 108 mothers who had preterm births (case group) and 108 mothers who had full term births (control group). A trained midwife, through interviews, collected maternal and neonatal data from the mother and their medical records.
Results. A strong relationship was reported between preterm birth and history of abortion (8.54 times), history of curettage (6.2 times), gestational diabetes (6.44 times), gestational hypertension (4.92 times), multiple gestation (5.5 times) and unwanted pregnancy (4.41 times), and an inadequate amount of prenatal care (4.81 times) was reported only in the case group.
Conclusions. Based on the results, it is important to identify risk factors for preterm delivery in mothers and educate pregnant women during pregnancy. Regular and timely prenatal care helps identify mothers in high-risk groups.
Key words: premature birth, premature obstetric labor, newborn infant, pregnancy.

Azizi A, Mansouri N, Nazarpour H. Relationship between maternal factors and preterm infant birth: a case-control study. *Fam Med Prim Care Rev* 2023; 25(3): 264–269, doi: https://doi.org/10.5114/fmpcr.2023.130086.

Background

One of the important health indicators in a country is birth mortality rate. According to global statistics, 60 to 80% of newborn fatalities associated with congenital anomalies are due to preterm births [1]. Studies in Iran showed that the premature birth rate is different in various cities of Iran [2, 3]. Several factors are involved in premature birth, including maternal age, history of previous preterm births, infections, premature rupture of membranes, multiple pregnancies and placental abruption. Some uterine abnormalities, surgery, smoking, multiple pregnancies and obesity have been identified [4, 5]. In a study conducted by Alavi et al. [2] to determine the risk factors associated with premature births, they found that obesity, stressful conditions of life, gestational diabetes, hypertension and a history of premature births are factors associated with premature births. A study by Stylianou-Riga et al. [6] showed that there is a significant relationship between oral and dental health and the duration of pregnancy, and oral and dental illnesses can be a risk factor for premature births. A study by Bouvier et al. showed that maternal age, pre-pregnancy BMI, previous history of preterm births and the failure to use prenatal care were risk factors for the premature births [7]. In a study by Baig et al. [8] in Pakistan, they found that low birth weight, history of multiple pregnancies, oral and dental disease, maternal anaemia and physical and mental stress were associated with premature births. In a study conducted by Assunção et al. [9] in Brazil, they found that a previous history of premature births, maternal age, inadequate prenatal care, being overweight during pregnancy, maternal physical injury and hypertension with eclampsia and non-eclampsia were related to premature births.

Objectives

Despite considerable research conducted in developed countries, very little information is known on the causes of preterm births in studies in Iran and other parts of the world. This study was designed to identify the causes associated with premature birth.

Material and methods

This case-control study was conducted to determine the maternal factors associated with preterm birth in educational hospitals (Imam Reza and Motazadi) affiliated with the Kermanshah University of Medical Science. The study was approved by Ethics Committee of the Kermanshah University of Medical Sciences.

Considering the values of $\alpha = 0.05$, $\beta = 0.1$, $p_0 = 5\%$ and $p_1 = 19\%$ [10], the sample size was estimated using the formula for determining the sample size in case-control studies, with 108 cases in the case group and 108 in the control group.

$$n = \frac{(z_{1-\alpha/2} + z_{1-\beta})^2 \times (p_1(1-p_1) + p_2(1-p_2)}{(p_1 - p_2)^2} .$$

The case group consisted of 108 mothers who had preterm births (gestational age before 37 weeks or less than 259 days after LMP or ultrasound), and the control group included 108 mothers whose term of birth was between 37 and 42 weeks of gestation). After each case of premature birth in each hospital, the normal term birth was then selected as a control in the same hospital that met the inclusion criteria.

Preterm births with congenital or chromosomal abnormalities were excluded from the study. The case and control groups were group-matched in terms of hospital of delivery. The necessary condition for both groups was considered as a "live birth". A trained midwife, through interviews, collected maternal and birth data with the mother, as well as data from hospital records.

Statistical analysis was performed using SPSS V. 20 software. The Chi-squared and *t*-Test were used to analyse the variables in the case and control groups, and logistic regression was used to analyse the relationship between the variables and preterm delivery.

Results

In this study, conducted on 216 women in the maternity ward, 108 were the classified as case, and 108 were controls. Of the case group, 35 neonates (32.4%) were female, with 46 neonates (42.6%) in the control group. There was no statistically significant difference between the two groups in foetal gender. The mothers' mean age in the case group was 29.81 ± 6.36 and 31.55 ± 6.50 in the control group, which was not statistically significant. The mean gestational age in the case and control groups was 39.1 ± 1.1 and 33.6 ± 1.75, respectively.

Data analysis showed there was a statistically significant relationship between preterm birth and the mother's education level ($p = 0.002$) and place of residence ($p = 0.001$). There were a statistically significant relationship between preterm birth and the mother's job ($p = 0.01$), history of preterm births ($p = 0.01$), history of abortion ($p = 0.001$), history of infertility ($p = 0.004$), history of curettage ($p < 0.001$), time between previous pregnancy ($p = 0.001$), type of pregnancy (wanted, unwanted) ($p = 0.001$), the number of births of the newborn ($p = 0.02$), the amount of prenatal care during pregnancy ($p = 0.001$), urinary tract infection (UTI) ($p < 0.001$), gestational diabetes ($p = 0.001$), gestational hypertension ($p = 0.001$), gum infection and poor oral hygiene ($p = 0.001$), multiple gestation ($p = 0.001$), preeclampsia ($p = 0.001$) and body mass index (BMI) ($p = 0.001$). Placental abruption, placenta previa and premature rupture of membranes (PROM) were reported only in the case group (Table 1).

The results showed that was no statistically significant relationship between preterm birth and the experiences of stressful events in the six months prior to labour, such as hospitalisation,

Table 1. Comparison of the frequency distribution of maternal variables in the case and control groups

Variable	Preterm delivery		Total *n* (%)	*p*
	Case *n* (%)	Control *n* (%)		
Mother's age (years)				
18–24	26 (24.1)	18 (16.7)	44 (20.4)	0.5
25–30	28 (25.9)	31 (28.7)	59 (27.3)	
31–35	18 (16.7)	18 (16.7)	36 (16.7)	
36–45	36 (33.3)	41 (38.0)	77 (35.6)	
Place of residence				
Urban	86 (79.6)	64 (59.3)	150 (69.4)	0.001
Rural	22 (20.4)	44 (40.7)	66 (30.6)	
Mother's job				
Housewife	68 (63.0)	84 (77.8)	152 (70.4)	0.01
Employee	68 (63.0)	24 (22.2)	64 (29.6)	
Number of live children				
Two or less	41 (38.0)	44 (40.7)	85 (39.4)	0.3
More than two	67 (62.0)	64 (59.3)	131 (60.6)	
Mother's education				
Illiterate	6 (5.6)	3 (2.80	9 (4.2)	0.002
Primary	19 (17.6)	12 (11.1)	31 (14.4)	
Guidance	76 (70.4)	66 (61.1)	142 (65.7)	
High school and collegiate	7 (6.50	27 (25.0)	34 (15.7)	
History of preterm births				
No	89 (82.4)	101 (93.5)	190 (88.0)	0.1
Yes	19 (17.6)	7 (6.5)	26 (12.0)	
History of abortion				
No	93 (86.1)	106 (98.1)	199 (92.1)	0.001
Yes	15 (13.9)	2 (1.9)	17 (7.9)	
History of repeated abortions				
No	96 (88.9)	103 (95.4)	199 (92.1)	0.06
Yes	12 (11.1)	5 (4.6)	17 (7.9)	
History of infertility				
No	84 (77.8)	99 (91.7)	183 (84.7)	0.004
Yes	24 (22.2)	9 (8.3)	33 (15.3)	
History of curettage				
No	83 (76.9)	103 (95.4)	186 (86.1)	< 0.001
Yes	25 (23.1)	5 (4.6)	30 (13.9)	
Time between previous pregnancy (years)				
More than 3	25 (23.1)	15 (13.9)	40 (18.5)	0.001
1–3	54 (50.0)	81 (75.0)	135 (62.5)	
Less than 1	29 (26.9)	12 (11.1)	41 (19.0)	
Number of births				
First	48 (44.4)	27 (25.0)	75 (34.7)	0.02
Second	40 (37.0)	57 (52.8)	97 (44.9)	
Third	13 (12.0)	17 (15.7)	30 (13.9)	
Fourth or more	7 (6.5)	7 (6.5)	14 (6.5)	
Type of pregnancy				
Wanted	45 (41.7)	82 (75.9)	127 (58.8)	0.001
Unwanted	63 (58.3)	26 (24.1)	89 (41.2)	
Multiple gestation				
Single	75 (69.4)	100 (92.6)	175 (81.0)	0.001
Two	29 (26.9)	8 (7.4)	37 (17.1)	
Three	4 (3.7)	0 (0.0)	4 (1.9)	
Neonatal care				
Four or more	81 (75.0)	101 (93.5)	182 (84.3)	0.001
Less four	27 (25.0)	7 (6.5)	34 (15.7)	
Hypertension				
No	63 (58.3)	105 (97.2)	168 (77.8)	0.001
Yes	45 (41.7)	3 (2.8)	48 (22.2)	
Preeclampsia				
No	88 (81.5)	107 (99.1)	195 (90.3)	0.001
Yes	20 (18.5)	1 (0.9)	21 (9.7)	
Gestational diabetes				
No	75 (69.4)	104 (96.3)	179 (82.9)	0.001
Yes	33 (30.6)	4 (3.7)	37 (17.1)	

Table 1. Comparison of the frequency distribution of maternal variables in the case and control groups

Variable	Preterm delivery		Total *n* (%)	*p*
	Case *n* (%)	Control *n* (%)		
Urinary tract infection (UTI)				
No	78 (72.2)	106 (98.1)	184 (85.2)	< 0.001
Yes	30 (27.8)	2 (1.9)	32 (14.8)	
Poor oral hygiene				
No	79 (73.1)	98 (90.7)	177 (81.9)	0.001
Yes	29 (26.9)	10 (9.3)	39 (18.1)	
Anaemia				
No	106 (98.1)	108 (100.0)	214 (99.1)	0.2
Yes	2 (1.9)	0 (0.0)	2 (0.9)	
Placental abruption				
No	95 (88.0)	108 (100.0)	203 (94.0)	< 0.001
Yes	13 (12.0)	0 (0.0)	13 (6.0)	
Rupture of membranes (ROM)				
No	67 (62.0)	108 (100.0)	175 (81.0)	< 0.001
Yes	41 (38.0)	0 (0.0)	41 (19.0)	
Placenta previa				
No	87 (80.6)	108 (100.0)	195 (90.3)	< 0.001
Yes	21 (19.4)	0 (0.0)	21 (9.7)	
Foetal gender				
Female	35 (32.4)	46 (42.6)	81 (37.5)	0.08
Male	73 (67.6)	62 (57.4)	135 (62.5)	
BMI				
Normal	49 (45.4)	55 (50.9)	104 (48.1)	0.001
Underweight	40 (37.0)	8 (7.4)	48 (22.2)	
Overweight	15 (13.9)	44 (40.7)	59 (27.3)	
Obese	4 (3.7)	1 (0.9)	5 (2.3)	

surgery during pregnancy, death of family members and the death of the husband in the case and control groups. There were also no significant differences between the two groups in the history of repeated abortions, bleeding and spotting in the first trimester of pregnancy, diabetes mellites, anaemia, renal diseases and heart disease (Table 1).

Our analysis showed preterm births in rural mothers were 2.68 times higher than in urban mothers (OR: 2.68; 95% CI: 1.46–4.92), those employed were 2.06 times higher than housewives (OR: 2.06; 95% CI: 1.13–3.74), those with a history of preterm births were 3.53 times higher (OR: 3.35; 95% CI: 2.6–5.9), history of abortion 8.54 times higher (OR: 8.54; 95% CI: 1.9–10.36), history of infertility 3.14 times higher (OR: 3.14; 95% CI: 1.38–7.13), history of curettage 6.2 times higher (OR: 6.2; 95% CI: 2.27–16.91), unwanted pregnancy 4.41 times higher (OR: 4.41; 95% CI: 2.46– 7.91), gestational hypertension 4.92 times higher (OR: 4.92; 95% CI: 2.71–9.32), gestational diabetes 6.44 times higher (OR: 6.44; 95% CI: 3.89–13.66), urinary tract infection (UTI) 2.38 times higher (OR: 2.38; 95% CI: 4.73–8.85), poor oral hygiene 3.59 times higher (OR: 3.59; 95% CI: 1.65–7.82) and multiple gestation 5.5 times higher (OR: 5.5; 95% CI: 2.4–12.59) at risk for preterm birth (Table 2).

Mothers with less than one year distance between previous births compared to those more than one year were 2.51 times higher at risk of preterm birth (OR: 2.51; 95% CI: 1.45–8.83). Those with number of births fourth and more compared to less than four were 1.34 times higher (OR: 1.34; 95% CI: 0.28–8.54), prenatal care less than four compared more than four were 4.81 times higher (OR: 4.81; 95% CI: 1.99–11.6) and mothers who were underweight (BMI < 18.5) compared to normal BMI were 3.58 times higher (OR: 3.58; 95% CI: 3.93–8.39) at risk for preterm birth (Table 2).

Table 2. Estimation of odds ratio to evaluate the intensity of the relationship between variables and preterm delivery based on the logistic regression model

	OR	95% CI	*p*
Mother's age (years)			
18–24	–	–	–
25–30	0.7	0.07–6.6	0.7
31–35	2.97	0.27–31.6	0.3
36–45	1.87	0.23–14.7	0.5
Place of residence			
Urban	–	–	–
Rural	2.68	1.46–4.92	0.01
Mother's job			
Housewife	–	–	–
Employee	2.06	1.13–3.74	0.01
Mother's education			
High school and collegiate	–	–	–
Illiterate	1.89	0.23–8.94	0.2
Elementary school	1.57	0.6–4.82	0.7
Middle school	1.39	0.56–6.98	0.1
History of preterm births			
No	–	–	–
Yes	3.53	2.6–5.9	
History of abortion			
No	–	–	–
Yes	8.54	1.9–10.36	0.01
History of infertility			
No	–	–	–
Yes	3.14	1.38–7.13	0.004
History of curettage			
No	–	–	–
Yes	6.2	2.27–16.91	< 0.001
Time between previous pregnancy (years)			
More than 3	–	–	–
1–3	0.17	0.03–1.12	0.06
Less than 1	2.51	1.45–8.83	0.02
Number of births			
First	–	–	–
Second	1.51	7.9– 9.12	0.07
Third	1.68	0.06–6.67	0.08
Fourth or more	1.34	0.28–8.54	0.1
Type of pregnancy			
Wanted	–	–	–
Unwanted	4.41	2.46–7.91	< 0.001
Multiple gestation			
Single	–	–	–
Two and more	5.5	2.4–12.59	< 0.001
Neonatal care			
Four and more	–	–	–
Less than four	4.81	1.99–11.6	< 0.001

Table 2. Estimation of odds ratio to evaluate the intensity of the relationship between variables and preterm delivery based on the logistic regression model

	OR	95% CI	*p*
Gestational hypertension			
No	–	–	–
Yes	4.92	2.71–9.32	0.001
Gestational diabetes			
No	–	–	–
Yes	6.44	3.89–13.66	< 0.001
Premature rupture of membranous (PROM)			
No	–	–	–
Yes	2.6	2.2–3.15	< 0.001
Poor oral hygiene			
No	–	–	–
Yes	3.59	1.65–7.82	0.001
Preeclampsia			
No	–	–	–
Yes	4.68	3.2–9.81	< 0.01
Foetal gender			
Female	–	–	–
Male	1.54	0.89–2.69	0.08
BMI			
Normal	–	–	–
Underweight	3.58	3.93–8.39	0.001
Overweight	0.66	0.12–3.54	0.6
Obese	1.91	1.26–9.27	0.04

Discussion

Preventing preterm birth is a big challenge because there are many reasons for preterm birth, and the reasons are not always well understood. These factors include medical and pregnancy conditions, behavioural factors and social, personal and economic characteristics. This case-control study was conducted to determine the maternal factors associated with preterm birth in 216 pregnant mothers who were referred to the birth department of educational hospitals (Imam Reza and Motazadi) in Kermanshah, Iran.

The findings of the present study showed that the chance of preterm birth in mothers with a history of hypertension was 4.92 times that of mothers without a history of hypertension, which shows a significant difference between maternal blood pressure and preterm birth in the case and control groups. The results obtained from studies by Derakhshi et al. and Bramham et al. are consistent [10, 11]. In addition, Fuchs et al. showed high blood pressure disorders in pregnancy, and Basu et al. stated that pre-existing or gestational hypertension has a statistically significant relationship with preterm birth [12, 13]. Therefore, it is necessary to control blood pressure in pregnant mothers and provide training related to this in prenatal care by the healthcare personnel responsible.

Another factor related to preterm birth is preeclampsia, which the present study showed increases the chance of preterm birth (OR = 4.81). This finding is consistent with the results of a study by Alavi et al., which showed that the chance of preterm birth in mothers who develop preeclampsia during pregnancy is 2.7 times higher than in mothers who do not have preeclampsia [2]. The study by Fuchs et al. also showed the role of hypertensive disorders of pregnancy in increasing the risk of preterm birth [12]. The results of a study by Mayrink et al. showed that weight gain per week and obesity in the 20th week of pregnancy are related to preeclampsia [14].

In the present study, the chance of preterm birth in mothers with premature rupture of the membrane was 2.6 times that of mothers without premature rupture of the membrane. This finding is consistent with the results of other studies. A study by Díaz-Rodríguez et al. showed that premature rupture of the membrane increases the odds of preterm birth by 2.5 times [4]. The studies conducted by Alavi et al. and Tshotetsi et al. have also noted premature rupture of the membrane as one of the risk factors associated with preterm birth (odds ratio 3.27 and 7.33, respectively) [2, 15]. In a study by Bouvier et al., a mother's thinness (underweight) and low level of education were reported as specific risk factors of premature rupture of the water sac [7]. Receiving proper and relevant education about a mother's nutrition in pre-pregnancy care and during pregnancy is recommended to prevent premature rupture of the water sac.

In the present study, the highest ratio of mothers for preterm birth was reported in the age group of 31 to 35 years (OR = 2.97) and then in the age group of 35 to 45 years (OR = 1.87), while in the study by Díaz-Rodríguez et al., the age group of 30 to 34 years and the age group over 35 years had the lowest odds ratio (OR = 2.21) for preterm birth, which is not consistent with our study [4]. The results obtained from the study by Assunção et al. and the study by Momeni et al. showed that there is a significant difference between the age of mother and preterm birth, and the findings of these two studies are consistent with the results of our study [3, 9]. In the studies by Ghelichkhani et al.and Stylianou-Riga et al. and Li Ke et al., the age group over 35 was more at risk of preterm birth [6, 16, 17]. However, in the study by Basu et al., young mothers were identified as having a high risk for preterm birth [13]. It can be said that contradictory results have been reported regarding the relationship between maternal age and preterm birth, which requires a more detailed investigation, such as conducting systematic review. However, education to increase women's awareness about the appropriate age for pregnancy through mass media and healthcare personnel in pre-pregnancy care can be effective in reducing preterm birth and other age-related pregnancy complications.

In this study, the chance of preterm birth in mothers with a history of abortion was 8.54 times higher than in mothers without a history of abortion, which shows a significant difference between the case and control groups. The result obtained in this research is consistent with the study by Heaman et al. In the study by Ghelichkhani et al., the ratio of preterm birth in mothers with a history of abortion was reported to be 1.67 [5, 16]. However, the study by Li Ke et al. showed that previous induced abortion did not increase the risk of preterm birth in the next pregnancy for first-time mothers among women in southern China compared to women who did not report a previous induced abortion [17]. Pregnant mothers who have a history of abortion are considered high-risk pregnancies, and the amount of prenatal care should be increased to prevent known complications related to this history.

In the present study, the chance of preterm birth in mothers with a history of infertility was 3.14 times that of mothers without a history of infertility, which shows a significant difference between the case and control groups. In the study by Derakhshi et al., the chance of preterm birth in mothers with a history of infertility was 3.9 times that of mothers without a history of infertility, which is consistent with the results of the present study [10]. The the study by Ghelichkhani et al., preterm birth was significantly higher in mothers with a history of infertility than in mothers without a history of infertility [16]. In women with a history of infertility, due to the importance of stress that couples feel due to pregnancy, they may face more problems during pregnancy. Thus, in prenatal care, taking these records into account allows us to help these couples have a better pregnancy.

The results of the present study showed that the odds ratio of preterm birth in mothers with a history of preterm birth is significantly higher than in mothers without a history of pre-

term birth (OR = 3.53). In the study by Escobar-Padilla et al., the odds ratio of preterm birth in mothers with a history of preterm birth was 1.4 times that of mothers without a history of preterm birth, which is consistent with the results of the present study [18]. This odds ratio was also reported as 2.2 times higher in a study by Díaz-Rodríguez et al., 4.1 in the study by Alavi et al., and 5.3 in the study by Ghelichkhani et al., indicating that a history of preterm birth can be a risk factor for an increased chance of preterm birth [2, 4, 16]. These results indicate the necessity of evaluating mothers at risk of preterm birth by healthcare staff in order to timely diagnose the risk factors of preterm birth and prevent preterm birth.

In the present study, multiple pregnancies were observed more in mothers of preterm babies than in mothers of full-term babies, and the difference between the case and control groups was significant (OR = 5.5). In the study by Escobar et al., it was shown that twin pregnancy increases the chance of preterm birth by 5.8 times. The study by Li Ke et al. also showed that preterm birth in multiple pregnancies is significantly higher than in singleton pregnancies [17, 18]. In multiple pregnancies, excessive uterine expansion may contribute to a shortness of the cervix and, as a result, preterm birth. Therefore, cervical evaluation is a suitable method to improve the prediction and prevention of premature birth in twin pregnancies [19].

Another maternal factor related to preterm birth that was investigated in the research was the mother's BMI. The findings of the present study showed that the chance of preterm birth in mothers who had a pre-pregnancy BMI of less than 18.5 was 3.58 times higher than that of mothers who had a normal pre-pregnancy BMI, which shows a significant difference between the two case groups. The preterm birth in obese mother was 1.91 times higher than in mother with normal BMI. In the study by Girma et al., the standardised odds ratio of preterm birth was reported to be 5.62 times higher in thin mothers than in mothers with normal BMI [20]. In the study by Basu et al., a statistically significant relationship was found between maternal obesity and preterm birth [13]. However, in the study by Soltani et al., there was no statistically significant relationship between preterm birth and a mother's BMI [21]. Proper weight gain during pregnancy plays an important role in the growth and health of the foetus. Thin and underweight women need to gain more weight during pregnancy, and paying attention to nutrition and the pattern of food consumption in pre-pregnancy care and during pregnancy in these women is very important for doctors and healthcare personnel. Although there is no convincing mechanism for perinatal complications associated with maternal obesity, based on available data, increased insulin resistance in obese mothers before pregnancy appears to be associated with hyperinsulinemia, inflammation and oxidative stress in preterm dysfunction. The placenta and foetus play a role [22].

The findings of the present study showed that there is a statistically significant relationship between gestational diabetes and preterm birth, and this was 6.44 times higher in mothers with gestational diabetes than in mothers without gestational diabetes. The results of the study by Derakhshi et al. showed that diabetes increases the chance of preterm birth 3.5 times, and there was a significant difference between the two groups [10]. In the study by Fuchs et al., a statistically significant relationship between preterm birth and gestational diabetes and preventive prediabetes was reported [12]. In the studies of Stylianou-Riga et al. and Basu et al., the relationship between preterm birth and gestational diabetes was noted [6, 13]. To reduce the complications of diabetes during pregnancy, mothers with known diabetes should have their blood sugar controlled by a doctor before pregnancy. For timely diagnosis of gestational diabetes, all pregnant mothers should be screened for diabetes in the 24th to 28th week of pregnancy.

In this study, the chance of preterm birth in male infants was 1.54 times higher than that of female infants. While in the study by Momeni et al., the chance of preterm birth in female babies was 1.41 times higher than that of male babies [3]. In the studies of Tshotetsi et al. and Taha et al., preterm birth in female babies was significantly higher than in male babies [15, 23], but the study of Peelen et al., which was conducted on the data obtained from the Dutch perinatal registration system from 1999 to 2010 including 1,736,615 singleton births, showed that the relative risk of premature birth in male infants was 1.5 times higher than that of female infants [24]. However, no significant difference was reported in infant mortality.

The results of this study indicate that a low level of education in mothers increases the chance of preterm birth. Thus,the chance of preterm birth in illiterate mothers was 1.89 timeshigher than in mothers with high school and university education.

A study by Heaman et al., which examined 6,421 Canadian women in terms of risk factors associated with preterm birth, showed that a low level of maternal education increases the chance of preterm birth [5]. The study by Taha et al. also showed that preterm birth was significantly higher in mothers with lower secondary education levels [24]. More preterm births in mothers with low education levels can probably be due to the fact that these mothers visit doctors less for prenatal care due to their low socio-economic status. However, in studies by Derakhshi, and Soltani et al., no statistically significant relationship between a mother's education level and preterm birth was reported [10, 21]. In the study by Ghelichkhani et al., contrary to the mentioned studies, preterm birth was 2.02 times higher in mothers with a university education than in mothers with non-university education [16].

The frequency of prenatal care is one of the variables related to preterm birth. In this study, the chance of preterm birth in mothers who had less than 4 cares during pregnancy was 4.81 times higher than in mothers who had four or more prenatal care. In the study by Tshotetsi et al., the odds ratio for preterm birth was 1.3 times higher in mothers who had less than 5 care during pregnancy [15]. In the study by Alavi et al., preterm birth in mothers with adequate care was 67% less than preterm birth in mothers with insufficient care [2]. It is obvious that mothers who do not receive adequate care during pregnancy do not receive the necessary and adequate training and counselling for self-care, and high-risk pregnancies are not diagnosed in time by the medical staff. Therefore, more preterm births in these mothers can be expected.

Conclusions

The findings of this study showed a strong relationship between preterm birth and history of abortion, history of curettage, gestational diabetes, gestational hypertension, unwanted pregnancy and inadequate amount of prenatal care. Based on the results, it is important to identify risk factors for preterm delivery in mothers and educate pregnant women during pregnancy. Regular and timely prenatal care helps identify mothers in high-risk groups.

Acknowledgments. We are grateful to all the patients for their participation in the present study and to the multidisciplinary team of Imam Reza Hospital and Montazeri Hospital in Kermanshah for the support in sample collection.

Source of funding: This study was financially support by Kermanshah University of Medical Sciences (Grant 9539).
Conflicts of interest: The authors declare no conflicts of interest.

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Received: 11.03.2022
Reviewed: 15.03.2022
Accepted: 19.01.2023

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