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Assessment the Preterm Birth Risk Factors in Fatemieh Hospital of Hamadan, Iran; 2017-2018

Mohammad Kazem Sabzehei[1], Behnaz Basiri[1], Farzaneh Esna-Ashari[2],*Firozeh Hosseini[1]

[1]Department of Pediatrics, Hamadan University of Medical Sciences, Hamadan, IR Iran.
[2]Department of Community Medicine, Hamedan University of Medical Sciences, Hamedan, IR Iran.

Abstract

Background
Preterm birth significantly affects the neonates' survival. It also increases the risk of neonatal complications, prolongs the hospitalization period, and imposes high costs on the public health system. This study is aimed to assess the risk factors of the preterm birth.

Materials and Methods
This case-control study was carried out at a maternal referral hospital in Hamadan. The participants consisted of 470 preterm infants born in less than 37 weeks of gestational age (case group), and 470 term infants with normal gestational age (control group). Several variables including the neonatal birth weight, gestational age, type of delivery, the maternal age, history of infertility, birth order and maternal disease were compared in both groups. The collected data was extracted from the medical file and recorded in a pre-designed checklist; they were then analyzed using SPSS software (version 16.0).

Results
Mean gestational age (34.4±3.34 vs. 39.1±1.09 weeks, p=0.001), and mean neonatal weight (2475.43±683.28 vs. 3122.64±409.89 gr, p=0.001) were lower in the case group compared to the control group. Multivariate logistic regression analysis showed a statistically significant association between the preterm birth and older maternal age (OR: 1.07), history of infertility (OR: 0.5), mother exposure to smoking (OR: 2.4), intrauterine growth restriction (IUGR) (OR: 0.99), C-section delivery (OR: 0.39) and maternal diseases (OR: 0.96).

Conclusion
This study showed that older maternal age, history of infertility, mother's exposure to smoking, IUGR, C-section delivery, and maternal disease were independent risk factors for preterm birth. The identification of these factors is essential in reducing the risk of preterm birth.

Key Words: Newborn, Preterm birth, Risk factor.

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Corresponding Author:

Firozeh Hosseini, Department of Pediatrics, Hamadan University of Medical Sciences, Hamadan, Iran. Fax: +98- 8132640064.

Email: firozeh_hosseini@yahoo.com

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1- INTRODUCTION

Preterm birth (in less than 37 weeks of gestation) is an important health indicator in any community. Annually, 15 million births (on average, 11% of all births worldwide) are preterm (1, 2). The reduction of preterm birth rates by 10% is the primary goal of healthy people 2020 (3). Different studies have reported various rates of preterm birth (7-16%) in different cities of Iran (4). Despite the significant advances in infant care, preterm birth is still the leading cause of death and long-term disability worldwide (5, 6). It is also the leading cause of death among children under 5 years of age (7). Furthermore, it accounts for more than 1 million deaths per year worldwide (>90% mortality rate in low- and middle-income countries) (8). The pathophysiology of preterm birth has remained unknown. Many factors are involved in preterm birth, most of which can be controlled and prevented (9).

Although in most cases preterm births occur idiopathically, medical disorders including placental disorders (e.g. placental abruption and placenta previa), uterine anomalies (cervical insufficiency, bicornuate uterus), fetal membrane disrders (e.g. preterm rupture of membrane [PROM]), fetal abnormalities (e.g. fetal death, twin pregnancy), maternal systemic diseases (e.g. diabetes and hypertension), maternal infectious diseases (e.g. vaginitis, urinary tract infection, eclampsia, and preeclampsia) as well as the maternal lifestyle including smoking, alcohol abuse, addiction, inadequate nutrition, and sudden weight gain during pregnancy can affect the preterm birth (10-15). The results of various studies have shown that preterm birth is a determinant of the neonates' survival, their physical growth and brain development. Thus it can be regarded as a global health indicator. A preliminary step to reduce the neonatal mortality is to determine the risk factors of the preterm birth. Given the high prevalence of preterm birth and the national priority to reduce its rate, a case-control study was designed in an obstetrics and gynecology center in Hamadan to assess the risk factors for preterm birth in Fatemieh Hospital, Hamadan, Iran.

2- MATERIALS AND METHODS

2-1. Study design and population

This case-control study was carried out at Fatemieh Hospital, a referral center for maternal diseases and high risk pregnancies in Hamadan, Iran, for one year (March 2017 to March 2018). The participants consisted of 470 preterm infants with gestational age <37 weeks (case group), and 470 term infants (control group). The variables including neonatal weight, gestational age, type of delivery, maternal age, history of infertility, birth order, and maternal disease were compared in both groups. Medical records were used for data collection. Collected data was recorded by the investigator in a predesigned checklist.

2-2. Inclusion and exclusion criteria

Inclusion criteria were gestational age<37 weeks in the case group and gestational age>37 weeks in the control group. Exclusion criteria included the complicated pregnancies due to an important fetal anomaly or those who received interventions that may alter the pregnancy outcome, giving birth in other areas, and incomplete medical records.

2-3. Sample size calculation formula

The study by Martius et al. (16) was used to calculate the sample size. This study revealed that frequencies of hypertension was 9% in mothers of preterm infants (p_1 = 9%), and 4% in mothers of term infants (p_2 = 4%). Accordingly, the alpha error of 5% was 1.96% and beta error of 20% was 0.84 and the sample size was calculated as 377. Regarding 20% sample loss, it was multiplied by 1.25 and 470 term and 470

preterm infants were considered in the case and control groups, respectively.

2-4. Statistical analysis

The collected data was analyzed using SPSS software version 16.0. Quantitative data were reported as mean and standard deviation; while the qualitative ones were described by percent and ratio. Student's t-test was used to test the quantitative variables. Otherwise, the Mann–Whitney U test was used. Chi-square test was employed to test the qualitative variables. The relationship between preterm birth and the suspected risk factors was evaluated by simple and multiple logistic regression analysis. Significance level was considered as 0.05.

2-5. Ethical considerations

The project was approved in the ethics committee of Hamadan University of Medical Sciences at 8/6/17 with the ID code of IR.UMSHA.REC.1396.384.

3- RESULTS

In this case-control study, 470 preterm neonates were compared with 470 term neonates. The mean gestational age and the mean birth weight of neonates, and the mean Apgar score at 1 and 5 minutes after birth were significantly lower in the case group compared to the controls (P<0.05) (**Table.1**).

Table-1: Comparison of demographic data in case and control groups.

Variables	Case group (n=470)	Control group (n=470)	P-value
Mean gestational age, weeks	34.4±3.34	39.1±1.09	0.001
Mean birth weight, g	2475.43±683.28	3122.64±409.89	0.005
Birth weight, g <2500 ≥2500	 206(43.8) 264(56.2)	 18(3.8) 452(96.2)	0.001
Mean Apgar score at 1 minute	7.1±2.0	8.4±0.69	0.001
Mean Apgar score at 5 minutes	8.7±1.5	9.4±0.75	0.001

The mean maternal age of the preterm infants was higher and 90% (n=426) of the preterm infants were delivered by Cesarean section. The mean birth order was higher in the preterm infants (2.2±1.32 vs. 1.6±1.08). The frequency of maternal exposure to smoking (14.9% vs. 3.2%), infertility history (19.2% vs. 8.5%), uterine abnormalities (2.8% vs. 0.0%), intrauterine growth restriction [IUGR] (7.4% vs. 0.0%), and maternal diseases were significantly higher in the case group than the controls (P<0.05). The frequency of diabetes and maternal smoking was also higher in the case group than the control group (2.5% vs. 1.7% and 5% vs. 0%, respectively), but this difference was not significant (P>0.05) (**Table 2**). The multivariate logistic regression analysis showed that the maternal age, infertility history, maternal exposure to smoking, IUGR, Cesarean delivery, and maternal disease were significantly correlated with the preterm birth. The maternal exposure to smoking was higher than the other variables (**Table.3**).

Table-2: Comparison of frequency of risk factors for preterm birth in both study groups.

Variables	Case group (n=470)	Control group (n=470)	P-value
Mean maternal age, year	28.9±6.5	26.7±6.2	0.001
Type of delivery Caesarean section Normal vaginal	 426(90.6) 44(9.4)	 334(71.1) 136(28.9)	0.001
Mean birth order	2.2±1.32	1.6±1.08	0.001
Infertility history Yes No	 90(19.2) 380(80.8)	 40(8.5) 430(91.5)	0.001
Maternal smoking, cigarettes /day	5(1.1)	0(0.00)	0.101
Being exposed to smoke (Passive smoker) Yes No	 70(14.9) 400(85.1)	 15(3.2) 455(96.8)	0.001
Cephalic position Yes No	 419(89.2) 51(10.8)	 418(88.9) 52(11.1)	0.917
Premature rupture of membrane	90(19.1)	39(8.3)	0.001
Abortion	20(4.3)	8(1.7)	0.02
Diabetes	12(2.5)	8(1.7)	0.366
Uterine malformations	13(2.8)	0(0.00)	0.001
Polyhydramnios	17(3.6)	0(0.00)	0.001
Abruptio placenta	11(2.3)	0(0.00)	0.001
Intrauterine growth restriction (IUGR)	35(7.4)	0(0.00)	0.001
Preeclampsia	91(19.4)	4(0.8)	0.001

Table-3: Multivariate logistic regression analysis for independent risk factors of preterm birth.

Variables	Odd ratio	95% CI	P-value
Maternal age	1.07	1.10 – 1.40	0.001
Infertility history	0.5	0.28 – 0.89	0.02
Being exposed to smoke (Passive smoker)	2.4	1.1 – 4.9	0.02
Cesarean delivery	0.39	0.25 – 0.62	0.001
Intrauterine growth restriction (IUGR)	0.99	0.96 – 1.10	0.001
Maternal disease	0.96	0.94 – 0.98	0.001

CI: confidence interval.

4- DISCUSSION

The aim of this study was to assess the risk factors of preterm birth. As the overall prevalence of preterm birth in Iran was 9.2% (17), and based on the multivariate logistic regression analysis, a statistically significant association was observed between the preterm birth and older maternal age, history of infertility, maternal exposure to smoking, intrauterine growth restriction, Cesarean delivery, and maternal disease. In the current study, that the mean birth weight of the preterm infants was lower than the term ones. The birth weight is an important determinant of the infants' survival. LBW has been

directly related to neonatal mortality in different countries. Birth weight was the most important predictor of the preterm birth and most preterm infants weighed 2500 g or less (18). Our findings also showed lower Apgar score at the first and fifth minutes after birth in the preterm infants compared to the term ones. The difference was lower in the fifth minute compared to the first minute after birth which might be due to the protective interventions for the preterm infants immediately after birth. Other studies have also shown the lower Apgar scores in the preterm infants compared to the term infants (19). The risk factors assessment also showed a statistically significant higher prevalence of the chronic diseases such as hypertension in mothers of the premature infants compared to the mothers of the term infants. Temu et al. (20), also showed that the incidence of preeclampsia was nearly seven folds greater in the mothers of premature infants compared to the mothers of the term infants. Hypertension reduces the uteroplacental blood flow which may lead to an intra-uterine growth restriction resulting in premature birth.

A study in Turkey also showed that the incidence of the chronic diseases such as diabetes, anemia and hypertension were associated with the preterm birth. The same relationship was also found between the hypertension and preterm birth in this study (21). According to another study, the most important risk factors for the preterm birth were the pregnancy hypertension and preeclampsia (22). The present study also showed that the risk of preterm birth was higher in mothers with hypertension and preeclampsia. Based on this study, mean maternal age was greater in mothers with preterm infants than those giving birth to term infants (28.94 vs. 26.67 years old). Previous studies have also shown that the risk of preterm birth increased with the mothers' age. However, the risk of preterm birth was mostly reported in mothers older than 35 years in the previous studies (23). Derakhshi et al. (17) showed that maternal age was not a direct cause of prematurity. The results of this study showed that one of the risk factors for preterm birth was maternal smoking. The history of preterm infants' mothers' exposure to smoking or addiction was more than 5 times greater than the mothers of term infants. However, regarding the smoking and addiction history, the risk of bias is greater in Iran. Therefore, the rate of smoking might be underestimated. Cigarette smoking during pregnancy increases the risk of preterm birth. However, smoking cessation after the first trimester was associated with reduced risk of preterm birth even for high-frequency cigarette smokers (24).

Most preterm infants were born by Cesarean section in this study. It might be due to vital fetal and maternal condition which necessitated the C-section prior to complete gestation. Similar to the present study, Goldenberg et al. (25), showed that C-section due to vital maternal and fetal conditions increased the risk of preterm birth. Therefore, identification of risk factors for preterm term birth and effective interventions are expected to decrease the rate of Cesarean section. There is not enough evidence to evaluate the use of a policy of planned immediate Caesarean delivery for the preterm babies.

Further studies are required in this area, but recruitment is difficult. The results of current study also showed that higher birth order increased the risk of the preterm birth. The mean birth order was higher in the preterm infants (2.2 vs. 1.7). Martin et al. (26), showed that the risk of preterm birth increased with higher number of pregnancies and birth order. Evren et al. (21), also reported the higher risk of preterm birth in case of multiple pregnancies. The history of infertility was 8% greater in the mothers of preterm infants; thus it can be regarded as a risk

factor for preterm birth. Martius et al. (16), showed that the mothers with the history of infertility had 1.7 times greater risk of preterm birth. The results of this study showed that the uterus anomalies increased the risk of the preterm birth. Halimi Asl et al. (10), showed that 3.8% of the mothers with preterm infants and 1.7% of mothers with term infants suffered from the uterine anomalies. Ibeto et al. (27), also reported higher uterus anomalies and cervical abnormalities in mothers with preterm infants than those with term infants.

4-1. Study Limitations

This study was conducted only in one institution, Hamedan province, Iran, which is different with the other provinces in terms of socio-economic and cultural conditions. Therefore, the results of this study may not represent the country's population.

5- CONCLUSION

This study showed that the older maternal age, history of infertility, maternal exposure to smoking, IUGR, Cesarean delivery, and maternal disease are significantly associated to the preterm birth. It is necessary to identify these factors to reduce the risk of preterm birth.

6- CONFLICT OF INTEREST: None.

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