Original Article

Maternal predictive factors for preterm birth: A case–control study in Southern Iran

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Abstract:

BACKGROUND: Preterm birth (PTB) is one of the most important factors that increase the risk of chronic diseases and postpartum death in infants. The aim of this study was to determine the maternal factors that affect the birth of preterm infants in the city of Bandar Abbas.

MATERIALS AND METHODS: This is a case–control study that was performed on 400 preterm infants. Sampling was done by a simple method, and information was gathered by interviewing the mothers and their medical records. Data were collected by SPSS software version 16. To compare risk factors in the two groups, conditional logistic regression was used, and $P < 0.05$ was considered statistically significant.

RESULTS: Results showed that factors such as type of delivery (odds ratio [OR] = 3.584, 95% confidence interval [CI]: 1.981–6.485), preeclampsia (OR = 2.688, 95% CI: 1.164–6.207), history of PTB (OR = 4.171, 95% CI: 1.483–11.728), premature rupture of membranes (OR = 3.273, 95% CI: 1.745–6.137), care during prenatal (OR = 0.334, 95% CI: 0.159–0.701), placental abruption (OR = 3.209, 95% CI: 1.209–8.519), placenta previa (OR = 9.333, 95% CI: 2.086–41.770), and cervical insufficiency (OR = 11, 95% CI: 1.381–87.641) were independent risk factors of preterm infant birth.

CONCLUSIONS: The PTB risk is higher for women with cervical insufficiency, history of placenta previa, and history of preterm. Early recognition and management of these high-risk conditions among pregnant women may lead to a reduction in PTB rates.

Keywords:
Infant, pregnancy, preterm birth, risk factor

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Introduction

According to the definition of the World Health Organization, preterm birth (PTB) is defined as giving birth before the 37th week or <259 days of the last day of menstruation.[1] PTB is one of the greatest public health problems around the world, accounting for 6%–10% of births in high-income countries and 15% in low-income countries.[2] According to the available statistics, 3.1% of the diseases are attributable to PTB,[3] causing 35% of the 1.3 million annual infant mortalities worldwide.[4] After pneumonia, PTB is the second leading cause of death in children under the age of 5 years.[4-6] Of the approximately 130 million infants born annually across the world, about 15 million are PTBs. In general, the prevalence of PTB is between 5% and 18% in 184 countries, most of which are in sub-Saharan Africa and Asia.[7] According to the reports published in 2010, the prevalence of PTB in Iran is 12.9%, ranking 38th among 184 countries in the world.[8]

PTB is a risk factor that puts the infant at risk of chronic diseases and postpartum death.[9] Some of these sociodemographic factors are associated with gynecological diseases, maternal disorders, and common medical problems of infants.[10-12] A wide range of maternal, fetal, and placental factors contributes to the birth of preterm infants. Among these factors, one can refer to multiple birth, smoking, uterus problems, and placenta previa.[13] Premature infants particularly have more risk factors such as death, illness, long-term motor impairment, and cognitive, visual, auditory, behavioral, social-emotional, health, and growth problems compared to normal babies, and impose a higher cost on the society due to behavioral disorders and lack of ability to adapt to the environment.[14]

Considering the role of PTB as an important risk factor for neonatal mortality, it is necessary to identify factors that are associated with PTB. Therefore, since few studies have been conducted in Iran to identify factors that affect PTB, this study was conducted to identify the risk factors that play the most role in the occurrence of PTB, so that a favorable ground could be provided for effective intervention to reduce the incidence of PTB and, consequently, the rate of infant mortality.

Materials and Methods

Study design and participant
In this case–control study, maternal factors affecting the birth of a baby were examined as a case item (one to one) to determine the factors that affect the birth of a preterm infant. The data collection process began in October 2018 and lasted for 3 months. All women with vaginal delivery and cesarean section were enrolled in this study.

Definition of the case and control
PTB is defined as the birth of a baby before 37 weeks.[15] All women with preterm infants (before 3 days old) and willing to participate in the study were placed in the case group. The control group consisted of women who had given birth to a full-term infant (37 weeks) and willing to participate in the study. We excluded all women who were not literate and were physically weak and unable to respond to the questions, as well as those who had congenital and genetic abnormalities diagnosed by pediatricians.

New Ballard Score (NBS) was used to validate the infant's age at the time of birth.[16] To select the preterm infants, first, the infants who were diagnosed with last normal menstrual period were selected, and then, the final assessment of the infants was performed based on NBS (score 10–31), and newborns with a gestational age of 28–37 weeks were allocated in the case group.

Sampling method
Due to the fact that most deliveries in Bandar Abbas take place in two hospitals, Shariati and Children, these two hospitals were selected as the study site. Simple sampling method was used to select the samples in this study. The selection of samples in the control group was followed by the selection of a sample in the case group.

Sample size
Kelsey formula was used to estimate the sample size for the case and control groups.[10] Based on the results of Nia *et al*. study,[17] 400 women were enrolled in the study and divided into the case and control groups with a ratio of 1:1 (200 in case and 200 in control groups).

Quality control
Two of the research colleagues were trained in three sessions on subjects such as the process of entering people into the study, obtaining consent, completing the checklist, using NBS, accessing information and medical records, and research ethics. The checklist's data containing information such as history of maternal disease, preeclampsia, drug addiction, history of abortion and stillbirth, polyhydramnios, and placenta previa (according to the gynecologist and the information in the patient's medical record) were completed by interviewing the women and studying their medical records. The questions were designed with extensive review of related texts and applying the comments of experts. To determine the validity of checklist, an expert panel was used. For this purpose, the checklist was given to eight experts in the field and their comments were used to amend the checklist.

Data analysis
Data after the collection were entered into SPSS software version 16. To compare the risk factors in the two groups, conditional logistic regression was used. Furthermore, descriptive statistics (frequency, percentage, mean, and standard deviation) were used to describe the data. $P < 0.05$ was considered statistically significant.

Results

The mean age of mothers in the case group was 28.3 ± 6.4 years and in the control group was 27.5 ± 5.9 years, and there was a significant difference between them in that regard ($P = 0.032$). Out of 200 preterm infants in this study, 114 were boys and 86 were girls, and among the full-term neonates, 90 were boys and 110 were girls. Furthermore, the maternal birth rate in the case group was 1.88 ± 1.07 and in the control group was 1.84 ± 1.16 [Table 1].

According to the logistic regression model, in this study, the chance of preterm infant birth in mothers with the

history of unwanted pregnancy was 0.327 (0.327–0.779) of the mothers with wanted pregnancy. Furthermore, the history of preeclampsia, preterm infant, placental abruption, premature rupture of membrane (PROM), history of placenta previa, and the cervical insufficiency increased the chance of preterm infant birth by 2.688 (1.164–6.207), 4.171 (1.483–11.728), 3.209 (1.209–8.519), 3.273 (1.745–6.137), 9.333 (2.086–41.770), and 11 (1.381–87.641) times, respectively. Moreover, women with the cesarean section and <7 times pregnancies had the chance of having a premature infant by 3.584 and 0.334, respectively [Table 2].

In this study, the prevalence of polyhydramnios was estimated to be 1.5% in the case group and 1.8% in the control group (odds ratio = 4.5). The chance of preterm infant birth in mothers with a history of abortion and stillbirth was 2.1 times higher than mothers who did not have such problem. Furthermore, drug addiction increased the odds of preterm infant birth by 0.8 time, but no significant difference was observed in the three aforementioned variables ($P > 0.05$).

Multivariate logistic regression analysis showed that among factors related to PTB, type of pregnancy, preeclampsia, history of preterm infant, placenta abruption, PROM, history of placenta previa, number of prenatal care, cervical insufficiency, and type of delivery remained in the model using forward method and had a significant relationship with the PTB ($P < 0.001$).

Discussion

According to the results of this study, one of the factors that affected the birth of preterm infant was type of delivery. In the present study, the chance of preterm infant birth in mothers with cesarean delivery was 4 times more than in mothers with vaginal delivery. This is similar to the findings of Safari Moradabadi *et al*.[18] and Mokuolu *et al*.[19] studies.

Studies have shown that vaginal delivery has no causal relationship with PTB. However, it can result in childbirth indication due to obstetric complications such as pregnancy-induced hypertension and antepartum hemorrhage as observed in this study.[7,12,19]

In this study, history of preeclampsia increased the chance of preterm infant birth by about 3 times. This result is consistent with the findings of other studies.[11,20-26] Preeclampsia and eclampsia have been accepted as preventable and controllable diseases in today's world, and due to their relatively high prevalence and significant complications that they have for mother and fetus, they need to be considered more, because the early diagnosis and treatment of preeclampsia can have significant effects on the health of mother and infant.[27]

Table 1: Socio-demographic characteristics

variable	Group	Frequency (percentage)		P
		Case (*n*=200)	Control (*n*=200)	
Mother's education	Below diploma	96 (48)	88 (44)	0.668
	Diploma	66 (33)	72 (36)	
	University	38 (19)	40 (20)	
Husband's education	Below diploma	90 (45)	90 (45)	0.843
	Diploma	72 (36)	68 (34)	
	University	38 (19)	42 (21)	
Place of residence	City	122 (61)	118 (59)	0.783
	Village	78 (39)	82 (41)	
Employment	Housewife	188 (94)	194 (97)	0.867
	Employed	12 (6)	6 (3)	

Table 2: Multivariate analysis of factors associated with preterm birth

Variable		Groups Frequency (percent)		Modified odds ratio OR (CI 95%)	P
		Case (*n*=200)	Control (*n*=200)		
Type of delivery (Current)	C-section	114 (57)	54 (27)	3.584 (1.981-6.485)	<0.001
	Natural	86 (43)	146 (73)		
Preeclampsia	Yes	42 (21)	18 (9)	2.688 (1.164-6.207)	0.028
	No	158 (79)	182 (91)		
History of premature infant	Yes	36 (18)	10 (5)	4.171 (1.483-11.728)	0.007
	No	164 (82)	190 (95)		
Placental abruption	Yes	34 (17)	12 (6)	3.209 (1.209-8.519)	0.025
	No	166 (83)	188 (94)		
Premature rupture of membrane	Yes	90 (45)	40 (20)	3.273 (1.745-6.137)	<0.001
	No	110 (55)	160 (80)		
Placenta previa	Yes	32 (16)	4 (2)	9.333 (2.086-41.770)	<0.001
	No	168 (84)	196 (98)		
Number of prenatal cares	≥7	142 (71)	176 (88)	0.334 (0.159-0.701)	0.005
	<7	58 (29)	24 (12)		
Cervical insufficiency	Yes	20 (10)	2 (1)	11 (1.381-87.641)	0.010
	No	180 (90)	198 (99)		
Type of pregnancy	Wanted	158 (79)	184 (92)	0.327 (0.327-0.779)	0.015
	Unwanted	42 (21)	16 (8)		

In this study, prenatal care was another factor that affected the birth of the preterm infant. Mothers with insufficient prenatal care (<7) had a higher chance of having a preterm baby. This result is in line with the studies of Namakin *et al*.[21] and Nia *et al*.[17] The results of various studies indicate the role of prenatal care in reducing the risk of preterm infant birth.[12,28,29] Therefore, it seems that prenatal care and identification of risk factors such as hypertension and blood sugar can be effective in reducing the birth of preterm infants. Dadipoor and Alavi. and Ratzon *et al*. refer to the role of insufficient care during pregnancy as one of the factors affecting the birth of preterm infant.[20,30] Factors that may lead to inadequate prenatal care include the lack of free prenatal care services, particularly in the afternoon time for employed women, low numbers of health centers and crowded health centers due to staff shortages, inadequate education on how to perform prenatal care for physicians and midwives working in the private sector, and lack of adequate monitoring and supervision on how health-care professionals provide services in private clinics. The consequence of this problem, despite imposing significant cost of care in private sector on families, will increase the chance of preterm infant birth.

Although no significant relationship was found between the history of abortion and stillbirth and the birth of preterm infant in the case and control groups, according to the results, the chance of preterm infant birth in mothers with a history of abortion and stillbirth was over 2 times of normal women. The relationship between the history of abortion and the increased risk of preterm delivery in subsequent pregnancies has been reported in various studies.[31-33] Furthermore, abortion history has been reported as a risk factor for the birth of preterm infants in various cohort studies.[33,34] This issue highlights the importance of paying special attention to high-risk mothers in need of intensive care.

Based on the results of this study, one of the strongest risk factors for preterm infant birth was the history of preterm labor which increased the risk of preterm delivery in women with the history of this problem. Behrman's study pointed to the fact that history of preterm delivery increases the chance of preterm infant birth in subsequent pregnancies.[35] The results of this study are consistent with the findings of other studies in this regard.[36,37]

Based on the results of this study, the chance of having a preterm baby in mothers with a history of PROMs was 3 times more than mothers who had no history of this problem. Offiah *et al*. showed that the prevalence of preterm labor is higher in mothers with the history of PROM.[38] Other studies have also reported a higher chance of preterm infant birth in mothers with a history of PROMs.[7,21,39] PROM is mainly due to infections and other harmful lifestyle behaviors such as smoking or drinking. Many studies have shown that infection is a major cause of preterm delivery.[40,41]

Although there was no relationship between drug addiction and the birth of a preterm infant in our research, the regression results showed that the chance of preterm infant birth in mothers who smoked was 1 time higher than healthy mothers. In other studies, smoking during pregnancy has been reported as a risk factor for preterm infant birth.[42-44] In this regard, psychological interventions seem to be effective. In a systematic study, data collected from 14 studies showed that various types of psychological interventions can significantly reduce the rate of smoking in women during pregnancy.[45] Dadipoor *et al*. in a study referred to the shortage of pharmacological interventions,[46] while anti-drug laws have been having many benefits. A review of 11 studies related to national and local tobacco prohibition during pregnancy showed that this intervention has led to a 10% reduction in the birth of preterm infants.[47]

Limitations

The use of secondary data for some variables was another limitation of our study. Furthermore, only mothers who had alive birth and their babies who were evaluated for gestational age were interviewed in this study. The present study did not investigate the factors affecting the birth of dead preterm infants, and also, our study was limited to mothers who gave birth in hospital. In addition, convenience samples were another limitation on the generalizability of results.

Conclusions

The PTB risk is higher for women with cervical insufficiency, history of placenta previa, and history of preterm. Better management of these gynecological complications provides a practical way to reduce the high rate of preterm labor to elucidate the mechanisms that cause preterm labor.

Conflicts of interest
There are no conflicts of interest.

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