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Research Article

Risk Factors for Preterm Labor among Women Attending El Shatby Maternity University Hospital, Alexandria, Egypt

Abstract

Introduction: Despite the progress made in perinatal medicine over the past two decades, the problem of preterm labor continues to frustrate satisfactory reproductive outcomes and its prevention still awaits needed improvements. Several factors have been identified to be associated with preterm birth (PTB).

Objective: To identify the possible epidemiological risk factors contributing to the occurrence of preterm birth among women attending El Shatby Maternity University Hospital.

Methods: A case control study was carried out. Two hundred women who delivered preterm babies (from 22 weeks to less than 37 completed weeks of gestation) were matched for BMI with 200 women who delivered full term babies (equal to or more than 37 completed weeks of gestation). Data were collected using a face to face interview, along with a record review. The variables found to be significantly related to preterm birth by the initial univariate analysis were further analyzed using a multiple logistic regression analysis.

Results: Being primigravida, with hypertensive disorders of pregnancy, antepartum hemorrhage, and previous history of preterm birth were found to be associated with a high probability of PTB (OR > 10.5). Past history of gynecological operations and history of urinary tract infection were found to be associated with a moderate probability of PTB (OR>4.5-10.5).

Conclusion: Improvement of the current practice of screening for and the treatment of either gynecological or chronic medical disorders that could complicate pregnancies could decrease the risk of preterm birth.

Introduction

Preterm birth (PTB) refers to the birth of a baby that occurs before 37 completed weeks of gestation [1]. PTB could be further categorized as late preterm delivery from 34 to 37 completed weeks of gestation, moderately preterm from 32 to 34 completed weeks, very preterm for those less than 32 completed weeks, and extremely preterm if less than 28 completed weeks [2].

According to The World Health Organization (WHO), preterm labor is defined as the onset of labor (regular uterine contractions and cervical effacement and dilatation) at a gestational age of less than 37 completed weeks (259 days) from the first day of the last menstrual period [3].

In the United States, preterm is the leading cause of neonatal mortality. It precedes almost half of preterm births, and preterm birth occurs in approximately 12% of pregnancies [4]. International comparisons of preterm labor are problematic because of differences in the completeness of registration of births, varyingdefinitions of preterm labor, and inconsistent ascertainment of gestational age [5]. The cost associated with providing care for preterm infants, who may spend numerous months in hospital, has significant implications for the economy [6].

Approximately 30–35% of PTB are induced or iatrogenic because of medical or obstetric complications; 40–45% are spontaneous, and 25–30% are due to preterm (pre-labor) rupture of membranes (PPROM) [7]. Despite the progress made in perinatal medicine over the past two decades, the problem of preterm labor continues to frustrate satisfactory reproductive outcome and its prevention still awaits needed improvements [8]. Several factors have been identified to be associated with PTB. However, such an association does not establish causality. The American College of Obstetricians and Gynecologists guidelines Stated that the clinical predisposing factors of PTB were prior PTB, smoking, vaginal bleeding during pregnancy, and short cervix [9]. Additionally, many studies have shown other risk factors for PTL such as extremes of maternal age such as young or old maternal age, short inter-pregnancy intervals, low maternal body-mass index (BMI), twin pregnancy, pre-existing chronic diseases such as, hypertensive disorders of pregnancy, diabetes and infections [10]. From these findings, the question has emerged regarding what are the risk factors for PTL in Egypt.

Objective

The current study was conducted in order to identify possible epidemiological risk factors contributing to the occurrence of preterm

birth among women attending El Shatby Maternity University Hospital.

Methods

This case control study included 400 women who were admitted for delivery in El Shatby Maternity Hospital in Alexandria. They were divided into two groups according to the gestational age. Group One included two hundred women who delivered preterm babies (from 22 weeks to less than 37 completed weeks of gestation). Group Two included 200 women who delivered full term babies (equal to or more than 37 completed weeks of gestation).

Excluded were women who had a gestational age less than 22 weeks or more than 37completed weeks, multiple gestations, and premature rupture of membrane, severe congenital anomalies, and intrauterine fetal deaths. The research was reviewed by the Alexandria Institutional Review Board and was classified as exempt from the Egyptian Department of Health and Ethics regulation for protection of human subjects. The exemption permits epidemiological researchers to use both interview surveys and existing patient's records data that is maintained in such a manner that subjects cannot be identified directly or through identifiers linked to the subjects.

Data were collected using a face to face interview using a survey of a predesigned questionnaire about the socio-demographic characteristics, past medical history, gynecological history and detailed obstetric history. As well, a review of admission records of all included women was done. Data were collected between May to October 2013. Cases were matched with controls regard to BMI. Statistical analysis was performed using SPSS (version 18) statistical software to compute odds ratios (OR) and 95% confidence intervals to estimate the strength of precision of the association between the risk factors and the occurrence of PTB. Significance was considered present if the p value was < 0.05.

The variables found to be significantly related to preterm birth by the initial univariate analysis were further analyzed using a multiple logistic regression analysis.

Results

Table 1 shows the sociodemographic characteristics of the study participants. All the maternal sociodemographic characteristics differed to some extent between women who gave birth to preterm babies and those women who did not. In comparison to women in Group Two who gave birth to full term babies, women in Group One who gave birth to preterm babies were more likely to be married, less educated, housewives obtaining inadequate level of prenatal care, and married to less educated husbands. The odds ratio of having preterm labor among women with less education women was 1.53.

Slightly more than half (53%) of the cases in Group One were housewives as compared to 47% of women in Group Two. However, this difference was not statistically significant (p = 0.54). There were more extended families among the women in Group One (20%) than in Group Two (10.5%). The difference was statistically significant (p=0.008). As regard crowding index (number of family members divided by number of rooms), the difference between women who

gave birth to preterm babies and those who did not was statistically significant (p<0.001).

Table 2 shows the distribution for women in Group One and in Group Two with reference to their health problems In El Shatby Maternity Hospital babies between May to October 2013.

A significantly higher percentage of women in Group One had histories of infertility compared to women in Group Two (p = 0.010). Less than one tenth of women in Group One (8%) had a history of uterine abnormalities(mainly Mullerian duct anomalies) as compared to a minority of women in Group Two (1%). This difference was statistically significant (p<0.001). A statistically significant difference was found between the two groups regarding their history of cervical incompetence (p=0.007). Nearly 24.5% of women in Group One were subjected to a previous gynecological operation compared with 8% of women in Group Two. The difference was statistically significant (p<0.001). Gynecological operations included cervical circulage, myomectomy, uterine septum resection, dilatation and curettage (D&C), cervical cautery, and other operations. When evaluating primigravida and multigravida in general, 21% (nearly one fifth) of women in Group One were primigravida, compared to only 4.5% of women in Group Two. This difference was statistically significant (p <0.001). A higher percentage of cases in Group one were either delivered once or four times or more. A significantly shorter duration of inter-pregnancy interval was associated with a higher probability

Table 1: Maternal and husband sociodemographic characteristics of women who gave birth to preterm babies (Group One) and the women who gave birth to full term babies (Group Two) in El Shatby Maternity Hospital between May to October 2013

Socio demographic Characteristics	Female with preterm birth (n=200)		Females with full term birth (n=200)		p
	n	%	n	%	
Age at birth (in years)					
Less than 20	30	15.0	0	0.0	
20 to <30	61	30.5	120	60.0	
30 to < 40	59	29.5	76	38.0	<0.001
40 to < 50	50	25.0	4	2.0	
Marital status					
Married	197	98.5	199	99.5	0.623
Widow	3	1.5	1	0.5	
Level of maternal education					
®Lower education	115	57.5	94	47.0	0.036
Higher education	85	42.5	106	53.0	
Employment of mother					
Housewives	106	53.0	112	56.0	0.547
Working	94	47.0	88	44	
Husband level of education					
®Lower education	107	53.5	68	34.0	<0.001
Higher education	93	46.5	132	66.0	
Type of family					
Un-extended	160	80.0	179	89.5	0.008
Extended	40	20.0	21	10.5	
Crowding index					
Min. - Max.	1.0 – 3.50		0.50 - 2.50		<0.001
Mean ± SD	1.94 ± 0.72		1.53 ± 0.55		

®lower education include being illiterate, read and write, primary and preparatory education.

of preterm labor as the difference between cases in the two groups, which was statistically significant (p <0.001).History of preterm labor was reported by 22.5% of women in Group One compared to only 10.5% of women in Group Two. This difference was statistically significant (p < 0.001).

Lack of adequate level of prenatal care was significantly associated with a higher risk of preterm labor. The differences between the two groups regarding the number, place of prenatal care visits and ultrasound scan during pregnancy were statistically insignificant.

Table 3 shows the distribution according to history of obstetric complications in the course of the current pregnancy. Nearly one fifth (19.5%) of the women in Group One were diagnosed as gestational diabetes in the current pregnancy, as compared to only 4.5% of the women in Group Two. This difference was statistically significant (p<0.001). A significantly higher percentage of women in Group One suffered from hypertensive disorders of pregnancy and anemia compared to the women in Group Two. In comparing the two groups, women in Group One had a more significant history of

Table 2: Distribution of Group One women who gave birth to preterm babies and Group Two women who gave birth to full term babies according to maternal health conditions that include past gynecological problems, past obstetric history in El Shatby Maternity Hospital babies between May to October 2013.

Maternal health conditions	Group One Women with preterm birth (n=200)		Group Two Women with full term birth (n=200)		p
	n	%	n	%	
Gynecological problems					
History of infertility					
Yes	15	7.5	4	2.0	0.010
No	185	92.5	196	98.0	
Uterine abnormalities					
Yes	16	8.0	2	1.0	< 0.001
No	184	92.0	198	99.0	
Cervical incompetence					
Yes	12	6.0	2	1.0	0.007
No	188	94.0	198	99.0	
Past history of gynecological operations					
Yes	49	24.5	16	8.0	< 0.001
No	151	75.5	184	92.0	
Past obstetric history					
Gravidity					
Primigravida	42	21.0	9	4.5	<0.001
Multigravida	158	79.0	191	95.5	
Parity					
once	65	41.1	67	35.1	<0.001
2 – 3 times	51	32.3	106	55.5	
≥4 times	42	26.6	18	9.4	
Last inter-pregnancy interval					
< 1 year	28	17.7	16	8.4	<0.001
1 – 2 years	92	58.2	78	40.8	
History of preterm labor					
Yes	45	22.5	21	10.5	<0.001
No	155	77.5	179	89.5	
Adequate level of prenatal care of the current pregnancy					
Yes	148	74.0	183	91.5	<0.001
No	52	26.0	17	8.5	

Table 3: Distribution of Group One women who gave birth to preterm babies and Group Two women who gave birth to full term babies according to history of obstetric complications in the course of the current pregnancy in El Shatby Maternity Hospital between May to October 2013.

History of obstetric complications in the course of the current pregnancy	Group One Women with preterm birth (n=200)		Group Two Women with full term birth (n=200)		p
	n	%	n	%	
Gestational diabetes					
Yes	39	19.5	9	4.5	0.001
No	161	80.5	191	95.5	
Hypertensive disorders					
Yes	91	45.5	29	14.5	0.001
No	109	54.5	171	85.5	
Antepartum hemorrhage					
Yes	67	33.5	24	12.0	0.001
No	133	66.5	176	88.0	
Anemia					
Yes	105	52.5	68	34.0	0.001
No	95	47.5	132	66.0	
UTI					
Yes	63	31.5	10	5.0	0.001
No	137	68.5	190	95.0	

antepartum hemorrhage and urinary tract infection (p<0.001) than women in Group Two. In regard to the sex of the newborn, there was no statistical significant difference between the two groups of women. In terms of needing to be admitted to the Neonatal Intensive Care Unit (NICU) newborns of women in Group One were admitted more than babies of women in Group Two with the difference between the two groups being statistically significant (p = 0.05.)

Factors of preterm labor

All variables that achieved statistical significance by the initial univariate analysis were further placed in a single model and were analyzed using a multiple logistic regression model. After controlling for potential confounders of other risk factors the adjusted odds ratio was calculated. The list of variables which remained significant in this final model is presented in Table 4. According to this model, the following predictors significantly increased the risk of preterm delivery: First, epidemiologic risk factors associated with high probability of PTL (adjusted OR>10.5) were being primigravida has more than 32 times probability to get PTL than being multigravida (OR =32.464), with hypertensive disorders of pregnancy (OR=14.241), antepartum hemorrhage during the course of the current pregnancy (OR = 13.181), previous history of preterm birth (OR =11.708).

Risk factors found to be linked with moderate probability of PTL (OR =10.5-4.5) were past history of gynecological operation (OR = 7.171), history of urinary tract infection during the course of the current pregnancy (OR = 4.732),

Risk factors associated with low probability of PTL (adjusted OR<0.5) were low level of father education (OR = 3.425), gestational diabetes (OR = 3.128), high maternal age at the time of birth (OR = 0.894), and high crowding index (OR = 0.513).

Discussion

Considering maternal age, the results of the present study show that extremes of reproductive age (<20y and ≥ 40y) were associated with increased risk of PTB. Our finding is similar to Shrim et al, who found that teenage mothers carry an increased risk of adverse pregnancy outcomes including an increased risk of delivering earlier than mothers between 20 to 39 years old. Moreover, there is more likelihood of having higher rates of extreme prematurity [11].

In the present study, the association between preterm and history of one or more gynecological problems was investigated. It was found that significantly more women who gave birth to preterm babies, compared to women who gave birth to full term babies, had past history of gynecological disease. Regarding infertility, our results reflect those of Berkowitz [12,13]. Who found that about twice as many cases of preterm women reported a history of infertility, and they had used fertility medication previously. Yet, De Haas et al found that a history of infertility was not a risk factor for PTB [14]. The difference between our results and De Haas may be related to the possible limitation of the women in this study being able to remember and recall infertility problems, since the generally accepted definition of infertility as an inability to conceive after a year of trying is not known by many women, so that some of them start seeking advice only a few months after marriage if no pregnancy has occurred.

Concerning the gravidity, the present work showed that preterm women significantly exceeded full term women in regard to being primigravida. In line with the results of the present study, Etuk and Ekanem, Nigerian researchers, found that nulliparity is associated with highly significant increases in the incidence of PTB. This may have been the case because young adolescents were the ones commonly involved and were ignorant about good antenatal care [15]. The significant association between primigravidity and PTB in the present study may be explained by the presence of other factors common in primigravida (e.g. preeclampsia, accidental hemorrhage and young age) interacting to increase the risk of PTB.

Table 4: Multivariate Analysis of Risk Factors of Preterm labor.

	OR*	S.E.	P	95% C.I.
Gravidity[*]	32.464	0.655	0.001	1.025, 1.335
Hypertensive disorders of pregnancy	14.241	0.705	0.001	1.111, 2.400
Ante-partum hemorrhage	13.181	0.496	0.001	1.866, 3.576
previous history of preterm birth	11.708	1.019	0.016	2.975, 3.538
History of gynecological Operation	7.171	0.399	0.001	1.404, 2.165
urinary tract infection	4.732	0.442	0.001	1.025, 1.335
Father education[**]	3.425	0.273	0.020	1.111, 2.400
Gestational diabetes	3.128	0.421	0.001	1.304, 2.100
Maternal age (in years)	0.894	.025	0.001	1.739, 2.715
Crowding Index	0.513	0.362	0.001	0.875, 1.970

OR= odds ratio, CI = confidence interval
*Odds ratio adjusted for educational level of the mother
Model Chi Square =318.483 P <0.05
[*]Primi gravida as reference category
** Lower education as reference category
SE: Standard Error.

In the current work, there was an inverse relationship between the interval between pregnancies and the risk of PTB. This result was in agreement with some previous studies that found that the risk of preterm delivery was 30%-90% more in women whose inter pregnancy interval was less than 6 months, compared with women with intervals of more than 12 months [16,17]. On the other hand, some researchers have reported that inter-pregnancy interval does not seem to significantly affect the incidence of PTB [18].

In regard to a history of preterm birth, our study showed significant difference between the two groups of women, reflective of Iams et al., who found that the risk of PTB was increased among women who have had a previous PTB [19]. In relation to the present study, there was a significant difference between the two groups of women in terms of adequate level of prenatal care. Vintzileos reported that lack of prenatal care was associated with a 2.8-fold increased PTB rate among both black and white women [20]. The difference between Group One and Group Two women regarding the number, place of prenatal care visits, and ultrasound scan during pregnancy were statistically insignificant. These results correspond to those of Healy et al., who reported that higher number of antenatal care visits did not influence the rate of PTB where rates of PTB remained high in African-American women despite early entry into prenatal care [21].

The present study found that the most frequent complications associated with the pregnancy were hypertensive disorder, urinary tract infection, anemia, and antepartum hemorrhage; whereas the less frequent ones were gestational diabetes and threatened abortion.

The current study showed that near half (45.5%) of mothers of preterm neonates had preeclampsia compared to less than a fifth (14.5%) of mothers of full-term neonates. Other studies have also reported that preeclampsia was a significant risk factor for PTB [22, 23].

In the present study, one third (33.5%) of mothers of preterm neonates had antepartum hemorrhage. Moreover, APH was identified to have a significant association with PTB. This result was in agreement previous studies which revealed that APH is associated with a high risk of PTB [24, 25].

Regarding the gender of neonates, the present study did not identify a significant gender difference between preterm and full-term neonates, which is consistent with some studies [26]. However, Wen et al. [27], found that males were more likely to be born at 33-36 weeks of gestation, but that there was no sex differences were below 33 weeks of gestation.

Conclusion

First, the following criteria were found to be associated with a high probability of PTB (OR > 10.5): being primigravida, hypertensive disorders of pregnancy, antepartum hemorrhage, and previous history of preterm birth. Second, the following criteria were found to be associated with a moderate probability of PTB (OR>4.5-10.5): past history of gynecological operations and a history of urinary tract infection. Lastly, the following criteria were found to be associated with a low probability of PTB (OR= 0.5-4.5): low level of father education, gestational diabetes, extreme maternal age, and high crowding index.

Recommendations

Mothers should be motivated to seek adequate level of antenatal care with counseling to ensure appropriate inter pregnancy intervals, which should be neither less than two years nor more than 10 years. Additionally, there is a need to, encourage the use of family planning methods that could be an effective measure to solve the problems of extreme maternal age and high gravidity. It is necessary to continue the current practice of screening for and treating disease conditions either gynecological or chronic medical disorders that could complicate pregnancies. More research on larger populations is necessary for risk assessment and long term consequences of preterm birth. One limitation of this study relates to the small number of participants.

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