RISK FACTORS OF EARLY AND LATE PRETERM BIRTH

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ABSTRACT

Preterm birth (PTB) is one of the major causes of morbidity in newborn. The aim of this study was to estimate the prevalence and to compare the associated risk factors of early and late PTB. This was a hospital-based cross sectional study conducted in 2016/2017. Women, 271, having PTB at 28-33+6 weeks period of gestation was taken as early PTB and 34-36+6 were taken as late PTB. Data was collected using semi-structured questionnaire, patients' record book, adopting face- to - face interview technique and clinical examination. The annual prevalence of PTB was 7.25% of which 11% were <28+0 weeks, early PTB was 32% and late PTB was 57%. Mother with school education were 2.0 times more likely to have early preterm births than those having higher education (P-value: 0.005, COR: 2.061,95% CI:1.234-3.441). Mothers with positive history of PTB in any of previous pregnancy was 10.7 times more likely to have early PTB in current pregnancy (P-value: <0.001, COR: 10.677, 95% CI: 2.792 – 40.746). Both variables were found to have independent risk on early PTB in logistic regression analysis (education: P-value: 0.027, aOR: 2.973, 95% CI: 1.132- 3.047; previous history of PTB: P-value: 0.002, aOR: 9.191, 95% CI: 2.308 - 36.596). Early and late PTB have differential risk factors. Mothers with positive history of PTB and having lower level of education were more likely to have early PTB.

KEYWORDS

Early preterm births, Late preterm births, Risk factors

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INTRODUCTION

Preterm birth (PTB) is defined as childbirth occurring at less than 37 completed weeks (259 days of gestation), counting from the last day of last menstrual period in women with regular menstrual cycles.[1] PTB is classified into early (<34 weeks) and late PTB (34-36^{+6} weeks).[2] Over 60% of 15 million global PTB occurred in sub-Saharan Africa and South Asia.[3] The prevalence of PTB in Nepal ranged from 17% – 19.5%.[4,5]

The risk factors are socio-economic, environmental, lifestyle and obstetric factors.[6] Not all the babies born preterm are equally immature. Hence, early and late preterm babies need to be managed differently. For the differential management of the problem, we need to distinguish the risk factors early and late PTB. With our best knowledge there are very limited studies to compare risk factors of early versus late PTB. This study compared the epidemiological and obstetric risk factors of early and late PTB.

MATERIALS AND METHODS

A cross sectional study was conducted among women with preterm birth (28-36^{+6}) week period of gestation) at Department of Obstetrics and Gynecology, a tertiary level referral center located in the capital city of Nepal. The study was conducted for 1 year from April 2016 to April 2017 and all the cases in the study period meeting selection criteria were enrolled. The objective of the study was to calculate the prevalence rate and compare the risk factors associated with early and late PTB.

PTB occurring from 28 to 33^{+6} weeks of POG were classified as early and those from 34 to 36^{+6} weeks were classified as late based on Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) in 2005 AD.[2]

The patients without detail antenatal record, IUFDs and unconfirmed POG cases were excluded. The independent epidemiological variables included were: maternal age, maternal ethnic group, maternal body mass index, maternal occupation and maternal education status. Similarly, the obstetrical variables were: parity, malpresentation, previous preterm birth, multiple pregnancies and inter pregnancy interval.

Semi-structured tool was designed to collect data which was pretested in 10% of samples. The data from pretesting was excluded at the final analysis. Confirmation of period of gestation was done by calculating from last menstrual period (LMP) by Naegeli's Formula. LMP was considered reliable if she had history of regular cycle, specially last three cycles preceding the current pregnancy. Among those with irregular cycles, period of gestation was calculated according to first trimester USG or first trimester per vaginal examination and if not present then period of gestation was calculated according to BALLARD SCORE of the baby and if it suggests preterm then only the case was included for the study. Data was collected using face to face interview technique from postnatal ward. Patients' chart and hospital record books were also consulted for detailed information required for the study.

Data was cleaned and entered in MS Excel 10 and analyzed using SPSS 19. Frequency, percentage, mean and standard deviation; chi-square test, odds ratio were calculated as appropriate. Results with p value of less than 0.05 were taken as significant.

The proposal was ethically cleared from Institutional Review Board, Institute of Medicine. Informed consent was obtained from each participant. Confidentiality of the response was maintained throughout the study.

RESULTS

A. Prevalence of Preterm Birth in TUTH during Study Period: Out of total 4838 births (including twins), 351 were PTB resulting into 7.25 % prevalence of PTB in TUTH in 2016/017. Out of total 351 preterm births, 37 (11%) were extremely preterm (<28+0 weeks) who were excluded in the study, 114 (32%) were early and remaining 200 (57%) were late PTB. In the early and late PTB 22 and 21 cases respectively were excluded due to unconfirmed gestational age. Ninety-two cases of early and 179 cases of late PTB were included in the study.

B. Distribution Epidemiological and Obstetrical Variables among Participants: Epidemiological Variables: The maximum numbers of women were in age group 20-24 years and 25-29 years in both groups. Similarly, 6.0% percentage of participants was elderly gravida in this study. The mean age of mothers in early preterm birth category was 26.72±4.80 years and that of late preterm birth was 25.91±4.86 years.

Similarly, most of women were from Indo-Aryan ethnic group contributing to 70% of participants. Majority (80%) of women had BMI < 25 kg/m^2. Most women were in moderate occupation group in both early and late preterm category (69.6% and 64.3%). Most of both early and late preterm groups had school level of education.

Table 1: Distribution of Epidemiological Variables among Participants (n=271)

Epidemiological Variable	Categories	Early Preterm Birth		Late Preterm Birth		Total	
		n	%	n	%	n	%
Maternal Age	<20	6	6.5	11	6.1	17	6%
	20 - 24	28	30.4	69	38.5	97	36%
	25 - 29	33	36	57	32	90	33%
	30 - 34	19	20.6	33	18.4	52	19%
	≥ 35	6	6.5	9	5	15	6%
Maternal Ethnicity	Indo – Aryan	68	73.9	123	68.7	191	70%
	Tibeto – Burman	24	26.1	56	31.3	80	30%
Maternal BMI	<25	71	77.2	147	82.1	218	80%
	≥25	21	22.8	32	17.9	53	20%
Maternal occupation	Sedentary	16	17.4	50	27.9	66	24%
	Moderate	64	69.6	115	64.3	179	66%
	Heavy	12	13	14	7.8	26	10%
Maternal Education	School Education	56	60.9	77	43	133	49%
	Higher Secondary	27	29.3	56	31.3	83	31%
	Bachelor and above	9	9.8	46	25.7	55	20%

Most of the women (58%) were primiparous. Likewise, 94% of the births were having cephalic presentation. The percentage of multiple pregnancies in both early and late PTB was around 15%. All multiple births were twins in this study. Among early PTB slightly more than one quarter (28.2%) were having inter pregnancy interval <2 years. The same for late PTB were 18.7%.

Bivariate analysis of epidemiological risk factors was done using chi–square test for categorical variables. Out of all epidemiological variables, mothers with only school level education were 2 times more likely to have early preterm birth in comparison to those having higher level of education which was statistically significant.(P value: 0.005 OR 2.061 95%CI 1.234-3.441).

Mothers with history of prior PTB in any of her previous pregnancy had more number of early PTB in current pregnancy than late preterm birth (30.8% vs. 4%). Mothers who had prior PTB were 10.6 times more likely to have early PTB in the current pregnancy than those with no history of prior PTB and this was the only obstetrical variable which was statistically significant (P-value: <0.001, OR: 10.667 95%CI:2.792-40.746) * In case of history of preterm birth and inter pregnancy interval only multiparous women were analysed.

Table 2: Distribution of Obstetric Variables among Participants (n=271)

Obstetric Variable	Categories	Early Preterm Birth		Late Preterm Birth		Total	
		n	%	n	%	n	%
Parity of Mother	Primi Parity	53	57.6	104	58.1	157	58%
	Multiparity	39	42.4	75	41.9	114	42%
Fetal Presentation	Cephalic	84	91.3	171	95.5	255	94%
	Non cephalic	8	8.7	8	4.5	16	6%
History of Preterm Birth*	Present	12	30.8	3	4	15	13%
	Absent	27	69.2	72	96	99	87%
Multiple Pregnancy	Yes	14	15.2	28	15.6	42	15%
	No	78	84.8	151	84.4	229	85%
Inter Pregnancy Interval*	<2 years	11	28.2	14	18.7	25	22%
	≥2 years	28	71.8	61	81.3	89	78%

*:n=114

Table 3: Bivariate Analysis of Epidemiological Risk Factors in Early and Late Preterm Birth (N=271)

Risk Factors		Early n (%)	Late n (%)	P - Value	Odds Ratio	95% CI
Maternal Age (in years)	<20 and >35	12 (13)	20 (11.2)	0.651	1.193	0.555-2.561
	20 – 35	80 (87)	159 (88.8)			
Maternal Ethnic Group	Indo - Aryan	68 (73.9)	123 (68.7)	0.374	1.290	0.735– 2.264
	Tibeto - Burman	24 (26.1)	56 (31.3)			
Maternal BMI (kg/m^2)	≥25	21 (22.8)	32 (17.9)	0.331	1.360	0.730-2.525
	<25	71 (77.2)	147 (82.1)			
Maternal Occupation	Moderate to Heavy	76 (82.6)	129 (72.1)	0.056	1.841	0.980-3.458
	Sedentary	16 (17.4)	50 (27.9)			
Maternal Education	School Education	56 (60.9)	77 (43.0)	0.005	2.061	1.234-3.441
	Higher Secondary and above	36 (39.1)	102 (57.0)			

Table 4: Bivariate Analysis of Obstetric Risk Factors in Early and Late Preterm Birth (N=271)

Risk Factors	Categories	Early n (%)	Late n(%)	P - Value	Odds Ratio	95% CI
Parity of Birth	Multiparity	39 (42.4)	75 (41.9)	0.938	1.020	0.613-1.690
	Primiparity	53 (57.6)	104 (58.1)			
Fetal Presentation	Non-cephalic	8 (8.7)	8 (4.5)	0.162	2.040	0.739- 5.618
	Cephalic	84 (91.3)	171 (5.5)			
*History of Preterm Birth(n=114)	Present	12 (30.8)	3 (4)	<0.001	10.667	2.792-40.746
	Absent	27 (69.2)	72 (96)			
Multiple Pregnancy	Yes	14 (15.2)	28 (15.6)	0.927	0.968	0.482-1.945
	No	78 (84.8)	151 (84.4)			
*Inter Pregnancy Interval (n=114)	<2 years	11 (28.2)	14 (18.7)	0.243	1.712	0.691-4.242

Logistic regression analysis of risk factors of early and late PTB was done. Those variables with p-value ≤0.200 on bivariate analysis were analysed to see the independent effects of epidemiological and obstetric factors under study.

School level of education and history of preterm birth in any of the previous pregnancy were independently associated with occurrence of early PTB than late preterm birth. Women with school level education had 2.97 times risk of having early preterm birth than those with higher secondary and above education level (P-value: 0.027 aOR: 2.973 95%CI: 1.132-7.808).

Women with previous history of preterm birth had 9.19 times risk of having early preterm birth than those with no previous history of preterm birth (P-value: 0.002 aOR: 9.191 95%CI: 2.308-36.596). However, fetal presentation and occupation had no any statistical significance.

DISCUSSION

A. Prevalence of Preterm Birth: This study revealed 7.25% PTB of the total births. This rate of PTB in this study lies within range estimated by World Health Organization of 5% to 18%.[3] This finding is slightly higher than study done by Morgan CS *et al* in European countries. [9]

Table 5: Logistic Regression Analysis of Risk Factors of Early and Late PTB (N=271)

Variables	Categories	Adjusted OR	Adjusted 95% Confidence Interval		P-value
			Lower	Upper	
Occupation	Moderate to heavy	0.427	0.130	1.402	0.161
	Sedentary	1			
Education	School Education	2.973	1.132	7.808	0.027
	Higher secondary and above	1			
Presentation	Non – cephalic Presentation	0.392	0.390	3.922	0.426
	Cephalic Presentation	1			
History of Preterm Birth	Previous History of preterm birth	9.191	2.308	36.596	0.002
	No History of Preterm Birth	1			

This might be because of better health system in reference study.

This finding is lesser than estimated by WHO in 2010 [4] and study done by Shrestha S *et al.*[5] This could be because the present study is done at tertiary care center located in capital city. Also, the reference studies were done nearly a decade back.

Early PTB comprises 32% and late 57% of total preterm birth. Remaining 11% were <28+0 weeks. This finding is lower than the findings from study in USA[2] and by McIntire DD.[10]

B. Epidemiological Risk Factors of Early and Late PTB: Mothers in the extreme age group (<20 years and ≥35 years) had 1.19 times risk of having early PTB than those within age group 20-35 years. Finding from this study is supported by the Oklahoma State Department of Health in 2010 [7] and study in London by Khalil A *et al* in 2013 [12] and the findings are in contrast with findings from a study in China by Lu L *et al.*[8] The possible reason for differences in this finding could be because of larger sample size in reference studies. Additionally, the present study has very less extreme aged participants.

Similarly, Indo- Aryan women had 1.29 times risk of having early PTB than women with Tibeto-Burman ethnicity. Difference in early and late PTB across different ethnic group was observed in study by John Hopkins Bloomberg School of Public Health (P value: <0.001) [13] and Oklahoma State Department of Health (P value: <0.001).[7]

Likewise, mothers with BMI ≥25 kg/m^2 had 1.36 times risk of early PTB in comparison to those with BMI<25 kg/m^2. This is opposed by studies in Oklahoma[12] and Malawi in 2014. [11]

Women with moderate to heavy work occupation had 1.84 times more risk of having early PTB in comparison to sedentary worker. Maternal occupation had statistically significant impact in a study from Denmark. [9]

Mothers with school level education were two times more likely to have early PTB than having higher level of education (P-value: 0.005 OR 2.061 95%CI 1.234-3.441). This was significant on Logistic regression analysis. (P- value: 0.037 aOR: 1.777 95%CI: 1.036-3.047). Thus, maternal education has independent risk on early and late PTB.

C. Obstetrical Risk Factors of Early and Late PTB: In multiparous women, there was similar occurrence of early and late PTB (42.4% and 41.9%). Supporting to this finding is a systematic review of forty-one studies by Shah PS *et al.*[14] and opposed by study in John Hopkins University.[13]

Among non-cephalic presentation, most had early preterm birth than late preterm birth (8.7% vs. 4.5%). All non-cephalic presentations were breech presentation in both groups. Likewise, Cammu H *et al* showed incidence of breech at 32 week was 14.1%, at 36 week was 8.0%.[18] Another study showed the percentage of breech presentation is around 15% at 32 weeks while in the present study it was around 8.7% in 28-33+6 weeks and 4.5% at 34-36+6 weeks.[15] This difference could be due to inclusion of all pregnant cases in reference study.

Similarly, mothers with history of prior preterm birth PTB in any of previous pregnancy had earlier PTB in current pregnancy than late preterm birth (30.8% vs. 4%). Mothers who had prior PTB were 10 times more likely to have early PTB in the current pregnancy than those with no history of prior preterm birth (P-value: <0.001, OR: 10.667 95%CI:2.792-40.746). This finding was significant even in logistic regression analysis after controlling for other risk factors (P-value: 0.003 aOR: 9.191 95%CI: 2.308-36.596). In support to this study it was

verified in a study in Oklahoma by Oklahoma State department of Health in 2010 [7] and in a study in California by Yang J *et al* from 2005 to 2011.[16]

Percentage of multiple pregnancies in both early and late PTB is around 15% (15.2% and 15.6%). The risk of early and late PTB in case of multiple pregnancies was almost similar. Among women who had inter pregnancy interval <2 years, there were more cases of early preterm birth than late preterm birth (28.2% vs. 18.7%). This is in opposition to the findings study in Missouri Department of Health by De Franco *et al*.[17]

Our study was conducted in hospital which might not represent the actual burden of preterm birth in Nepal. Thus, we recommend conducting similar study in community setting which could reflect the exact status of the disease and the risk factors.

In conclusion, lower maternal education and positive history of preterm birth are independent risk factors causing early preterm birth.

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