A Comparative Study of Risk Factors and Neonatal Outcome between Preterm and Term Birth in a Tertiary Care Hospital

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ABSTRACT

Background

Preterm birth is childbirth occurring at less than 37 completed weeks of pregnancy or before 259 days of gestation. These births lead to increased mortality and morbidity due to various short-term and long-term consequences. Identification of risk factors and early intervention are essential steps to decrease prevalence and ultimately reduce the associated neonatal mortality and morbidity.

Objective

To compare the risk factors and neonatal outcomes of preterm and term births in a tertiary care hospital.

Method

A comparative cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Dhulikhel Hospital from March 2024 to March 2025. A convenient sample of 160 participants (80 preterm and 80 term births) were enrolled using a non-probability sampling method. Data were collected through structured interviews and analysed using SPSS version 25. The Chi square test was applied to identify statistically significant characteristics, which were then analysed using multivariate logistic regression to explore the association of risk factors between preterm and term births.

Result

Factors found to be statistically significant on the Chi square test included maternal infection, irregular calcium consumption, previous history of preterm birth, exposure to indoor pollution, maternal comorbidities, and hospital admission of the neonate. Multivariate logistic regression analysis showed that women with Urinary tract infection (p= 0.008, AOR = 2.53), previous history of preterm birth (p = 0.02, AOR = 2.12), and hypertension (p = 0.018, AOR = 10.48) were significantly associated with the risk of preterm birth. Preterm babies had an increased risk of hospital admission (p = 0.003, AOR = 4.57).

Conclusion

Urinary tract infection, hypertension, and a prior history of preterm birth are major maternal risk factors for preterm delivery. Preterm neonates exhibit increased morbidity and are more likely to require hospital admission.

KEY WORDS

Comparative study, Neonatal outcome, Preterm birth, Risk factors, Tertiary care hospital

INTRODUCTION

Preterm birth is defined as childbirth occurring before 259 days of gestation or less than 37 completed weeks of pregnancy, counting from the first day of the woman's last menstrual period.[1] Globally, approximately 15 million (11.1%) babies are born prematurely each year, with 13.3% of these births occurring in South Asia alone.[2] In Nepal, the incidence of preterm birth is around 14.5%.[3] Preterm birth is a critical concern, despite recent improvements in maternal and child health in Nepal, and remains a major cause of neonatal morbidity and mortality, accounting for an estimated 35% of neonatal deaths worldwide.[4,5]

The global burden of preterm birth is particularly high in low- and middle-income countries (LMICs) due to restricted access to specialised care, poor prenatal health services, and socioeconomic factors.[6] The factors contributing to preterm birth are numerous, including maternal health conditions like preeclampsia and various infections such as urinary tract infections, maternal age extremes, and multiple gestations.[7-9] Socioeconomic and environmental factors, such as poor nutrition, insufficient prenatal care, and high stress levels, also influence the risk of preterm birth.[10] Studies have revealed that, high rates of neonatal deaths and hospital admissions occur due to preterm deliveries. Very few studies have been conducted in Nepal, to assess the risk factors linked to preterm births.[8] Early identification of these risk factors and appropriate management are crucial for reducing mortality and morbidity and achieving Sustainable Development Goal-3.

This study aimed to identify and compare risk factors and neonatal outcomes between preterm and term births at a tertiary care hospital of Nepal.

METHODS

This is a Hospital-based comparative Cross-sectional observational study, conducted in the Department of Obstetrics and Gynaecology, Dhulikhel Hospital, from March 2024 to March 2025.

The calculated sample size (N1) was 185 based on an anticipated population proportion of preterm birth (14%) and a 5% absolute error. Since this exceeded the total preterm deliveries observed in the preceding year (n=100), the finite formula was used, yielding a total sample size (N) of 65. Ultimately, a convenient sample of total 160 participants were enrolled using a Nonprobability sampling method, comprising 80 preterm and 80 term births.

The dependent variable of the study was preterm birth. Independent variables were socio-demographic factors, pregnancy related factors, nutritional status, behavioral and environmental factors, and outcome of the newborn.

Written and informed consent was obtained from all participating mothers. An interview was conducted by researcher herself, using a self-structured Case Performa. Data collected included socio-demographic factors, pregnancy-related factors, nutritional status, behavioral and environmental factors, and outcome of the newborn. Ethical clearance was obtained from the institutional review committee of Kathmandu University School of Medical Sciences.

The study group included women who delivered newborns between 28 weeks and 36 weeks + 6 days of gestation during the study period. The compare group included an equal number of women who delivered newborns at term. Exclusion criteria included women with stillbirth, those delivering a baby with a congenital anomaly and those who did not give consent for the study.

Collected data were checked for completeness and entered into an EXCEL worksheet. Data were analysed using SPSS software version 25.0. Frequency and proportion were calculated for categorical variables. The association of risk factors was tested using the Chi square test, with a P-value less than 0.05 considered statistically significant. Characteristics that were statistically significant were further analysed with multivariate logistic regression, calculating both unadjusted odds ratio (UOR) and adjusted odds ratio (AOR) to determine the level of association with preterm births.

RESULTS

The analysis was conducted on 160 mothers, after exclusion of two cases, one case with a congenital anomaly and consent was not obtained in another case. Among the 80 preterm births, 58% were late preterm (34 to less than 37 weeks), 31% were 32-33 weeks, and 11% were 28-31 weeks of gestation.

Table 1 shows that exposure to indoor pollution ($p = 0.03$) was associated with preterm birth significantly whereas other sociodemographic characteristics like age, women's education and occupation, husband's education and occupation, intensive physical work, tobacco smoking, alcohol consumption in pregnancy, exposure to passive smoking, height of women and early pregnancy body mass index were not associated with preterm birth ($p \geq 0.05$).

Table 2 shows calcium consumption ($p = 0.03$), maternal comorbidity ($p = 0.004$), maternal infection in pregnancy ($p = 0.03$) and previous history of preterm birth ($p = 0.004$) had significant association with preterm birth. However, gravida, parity, birth interval, initiation of ANC visit, frequency of ANC visit, anti-helminthic treatment, iron consumption, TD immunization were not associated with preterm birth (p value ≥ 0.05).

Table 3 shows perinatal outcome of one hundred sixty participant. Need of admission either in NICU or in neonatal ward had significant association with preterm birth ($p = 0.0004$). However, gender, birth weight, complications in

Table 1. Comparison of socio demographic characteristics between preterm and term

Characteristics	Preterm N (%)	Term N (%)	Chi square value	P-value
Age				
Less than 20 years	13 (76.47)	4 (23.53)	5.72	0.22
20-24 years	20 (44.44)	25 (55.56)		
25-29 years	22 (47.83)	24 (52.17)		
30-34 years	17 (45.95)	20 (54.05)		
35 years and more	8 (53.33)	7 (46.67)		
Women's education				
Uneducated	8 (44.44)	10 (55.56)	8.08	0.15
Primary	10 (43.48)	13 (56.52)		
Lower secondary	12 (44.44)	15 (55.56)		
Secondary	16 (42.11)	22 (57.89)		
Higher secondary	24 (57.14)	18 (42.86)		
University	10 (83.33)	2 (16.67)		
Husband's education				
Uneducated	4 (36.36)	7 (63.64)	6.83	0.23
Primary	5 (55.56)	4 (44.44)		
Lower secondary	9 (37.5)	15 (62.5)		
Secondary	21 (53.85)	18 (46.15)		
Higher secondary	17 (42.5)	23 (57.5)		
University	24 (64.86)	13 (35.14)		
Women's occupation				
Business	4 (26.67)	11 (73.33)	9.22	0.06
Farmer	16 (61.54)	10 (38.46)		
Homemaker	41 (48.24)	44 (51.75)		
Working on daily wage	2 (25)	6 (75)		
Self employed	17 (65.38)	9 (34.62)		
Husband's occupation				
Business	13 (40.63)	19 (59.38)	8.19	0.08
Farmer	20 (51.28)	19 (48.72)		
Foreign employment	5 (29.41)	12 (70.59)		
Working on daily wage	15 (48.39)	16 (51.61)		
Self employed	27 (65.85)	14 (34.15)		
Intensive physical work				
Yes	27 (62.79)	16 (37.21)	3.18	0.07
No	53 (45.3)	64 (54.7)		
Tobacco smoking				
Yes	7 (70)	3 (30)	0.96	0.32
No	73 (48.67)	77 (51.33)		
Alcohol consumption in pregnancy				
Yes	9 (60)	6 (40)	0.29	0.58
No	71 (48.97)	74 (51.03)		
Exposure to indoor pollution				
Yes	33 (40.74)	48 (59.26)	4.6	**0.03**
No	47 (59.49)	32 (40.51)		
Exposure to passive smoking				
Yes	22 (57.89)	16 (42.11)	0.86	0.35
No	58 (47.54)	64 (52.46)		
Height of women				
Normal (145 cm or higher)	65 (49.62)	66 (50.38)	0	1
Short (less than 145 cm)	15 (51.72)	14 (48.28)		
Early pregnancy BMI				
Normal	46 (47.42)	51 (52.58)	4.5	0.11
Overweight/obese	19 (45.24)	23 (54.76)		
Underweight	15 (71.43)	6 (28.57)		

Table 2. Comparison of clinical factors between preterm and term birth.

Characteristics	Preterm N (%)	Term N (%)	Chi square value	p-value
Gravida				
Primigarvida	36 (56.25)	28 (43.75)	2.07	0.35
Multigravida	42 (46.67)	48 (53.33)		
Grand multigravida	2 (33.33)	4 (66.67)		
Parity				
Primiparus	40 (57.97)	29 (40.03)	3.37	0.18
Multiparus	38 (44.71)	47 (55.33)		
Grand multiparus	2 (33.33)	4 (66.67)		
Birth interval				
Primigravida	36 (56.25)	28 (43.75)	5.29	0.07
Less than two years	14 (63.64)	8 (36.36)		
Two years or more	30 (40.54)	44 (59.46)		
Initiation of ANC visit				
Within four months	65 (47.1)	73 (52.9)	2.58	0.11
After four months	15 (68.18)	7 (31.82)		
Frequency of ANC visit				
Less than four times	14 (58.33)	10 (41.67)	0.44	0.51
Four times or more	66 (48.53)	70 (51.47)		
Maternal comorbidities				
Hypertension	22 (64.71)	12 (35.29)	9.01	**0.004**
Diabetes mellitus	5 (41.67)	7 (58.33)		
Thyroid disorder	7 (46.67)	8 (53.33)		
Anemia	9 (75)	3 (25)		
Asthma	2 (66.67)	1 (33.33)		
No	35 (41.67)	49 (58.33)		
Maternal infection in pregnancy				
Urinary tract infection	22 (64.71)	10 (31.25)	10.5	**0.03**
Acute gastroenteritis	2 (66.67)	1 (33.33)		
Acute respiratory tract infection	5 (45.45)	6 (54.55)		
Vaginitis	7 (77.78)	2 (22.22)		
No	44 (41.9)	61 (58.1)		

Anti-helminthic treatment				
Yes	73 (51.77)	68 (48.23)	0.95	0.32
No	7 (36.84)	12 (63.16)		
Calcium consumption				
Regular	46 (42.99)	61 (57.01)	6.55	**0.03**
Irregular	31 (63.27)	18 (36.73)		
No	3 (75)	1 (25)		
Iron consumption				
Regular	64 (48.12)	69 (51.88)	1.58	0.45
Irregular	13 (56.52)	10 (43.48)		
No	3 (75)	1 (25		
TD immunization				
One dose	41 (45.05)	50 (54.95)	1.63	0.2
Two doses	39 (56.52)	30 (43.48)		
Previous history of preterm birth				
Yes	13 (59.09)	9 (40.91)	8.25	**0.004**
No	67 (48.55)	71 (51.45)		

Table 3. Chi square test showing association of outcome with preterm birth

Characteristics	Preterm N (%)	Term N (%)	Chi square value	p-value
Gender				
Male	48 (53.33)	42 (46.67)	0.63	0.43
Female	32 (45.71)	38 (54.29)		
Birth weight				
AGA	51 (48.11)	55 (51.89)	2.11	0.34
SGA	25 (58.14)	18 (41.86)		
LGA	4 (36.36)	7 (63.64)		
Complications in neonate				
Respiratory distress syndrome	22 (95.65)	1 (4.35)	42.6	0.06
TTN	0 (0)	6 (100)		
Congenital heart disease	1 (100)	0 (0)		
Hypoxic ischemic encephalopathy	4 (57.14)	3 (42.86)		
Meconium aspiration syndrome	3 (25)	9 (75)		
Neonatal sepsis	5 (50)	5 (50)		
Neonatal jaundice	13 (68.42)	6 (31.58)		
Hypoglycemia	5 (71.43)	2 (28.57)		
Hyponatremia	1 (50)	1 (50)		
Hypothermia	2 (100)	0 (0)		
Admission in (NICU/Neonatal ward)				
Yes	56 (62.92)	33 (37.08)	12.3	**0.0004**
No	24 (33.8)	47 (66.2)		
Outcome				
Discharge	76 (48.72)	80 (51.28)	2.31	0.13
Mortality	4 (100)	0 (0)		

neonate and outcome till discharge did not show significant association.

The characteristics shown significant association during chi square test were further analysed with multivariate logistic regression and both unadjusted odds ratio (UOR) as well as Adjusted Odds Ratio (AOR) were calculated to identify the level of association with preterm births.

Table 4 shows after adjustment, urinary tract infection (AOR = 2.53, p = 0.008), previous history of preterm birth (AOR = 2.12, p = 0.02), and hypertension (AOR = 10.48, p = 0.018) remained significant predictors. Preterm infants had 4.57 times higher odds of hospital admission (p = 0.003).

Table 4. Multivariate logistic regression analysis

Characteristics	UOR	p-value	AOR	p-value
Calcium consumption				
Regular	Ref		Ref	
Irregular	2.29	**0.02**	4.81	0.14
No	3.97	0.23	9.97	0.12
Maternal infection in pregnancy				
No	Ref		Ref	
Urinary tract infection	3.06	**0.009**	2.53	**0.008**
Acute gastroenteritis	2.77	0.41	13.74	0.08
Acute respiratory tract infection	1.15	0.82	2.91	0.34
Vaginitis	4.85	0.05	13.07	0.05
Previous history of preterm birth				
No	Ref		Ref	
Yes	3.94	**0.003**	2.12	**0.02**
Exposure to indoor pollution				
No	Ref		Ref	
Yes	0.47	**0.02**	0.48	0.15
Maternal comorbidities				
No	Ref		Ref	
Hypertension	4.37	**0.002**	10.48	**0.018**
Diabetes mellitus	3.37	0.117	3.13	0.305
Thyroid disorder	2.43	**0.025**	1.56	0.564
Anemia	14.11	0.56	2.19	0.497
Asthma	8.95	0.68	17.84	0.13
Admission in (NICU/Neonatal ward)				
No	Ref		Ref	
Yes	3.32	**< 0.005**	4.57	0.003

DISCUSSIONS

The present study aimed to explore the risk factors and neonatal outcomes of preterm birth using 160 participants at Dhulikhel hospital. The study found that factors like urinary tract infection, hypertension and previous history of preterm birth were associated with risk of preterm birth and preterm baby has higher likelihood of requiring hospital admission.

The finding that women with urinary tract infection had higher odds of preterm birth (p = 0.008, AOR = 2.53) was consistent with the study of Wang et al. and of Baer et al. which showed significant association between urinary tract infection during pregnancy and the risk of preterm birth.[11,12] This study also highlights that early detection and treatment of urinary tract infection in pregnant women are essential for mitigating the risk of preterm birth. This association is biologically plausible, as bacterial colonisation in the urinary tract may cause inflammation, activating the maternal-fetal immune response and culminating in the production of proinflammatory cytokines, which stimulate uterine contractions and premature rupture of membranes.

The study found that a previous history of preterm birth significantly increased the odds of recurrence (p = 0.02, AOR = 2.12), finding was similar with the studies of Carr-Hill et al. and Satija et al.[13,14] This persistence of risk may be due to factors like cervical insufficiency, structural abnormalities of the uterus, chronic infections, or maternal hypertension that continue to influence subsequent pregnancies.[13,14]

Maternal hypertension exhibited a heightened risk of preterm birth (p = 0.018, AOR = 10.48). This is supported by studies from Bramham et al., Delker et al. and Perejon et al.[15-17] Hypertension is known to damage small blood vessels in the placenta, causing utero-placental insufficiency or increasing the risk of abruptio placenta, often necessitating early delivery.

In our study, irregular calcium consumption and exposure to indoor pollution showed significance in the Chi square test (p = 0.03 for both) but they were not statistically significant after adjusting for confounders in the logistic regression analysis.

In contrast to study done by Gurung et al. maternal age, education, parity, and iron consumption were not found to be significantly associated with preterm birth in this study (p ≥ 0.05).[8] This difference may be attributable to the smaller sample size and the specific population distribution of the study location.

Regarding outcomes, preterm babies had significantly increased odds of hospital admission (p = 0.003, AOR = 4.57). This aligns with the studies done by Richter et al. and Kuppusamy et al. showing higher hospitalization rates for preterm infants due to immature organ systems, which predispose them to complications like respiratory distress and feeding difficulties.[18,19] Other neonatal outcomes like gender, birth weight, and mortality till discharge were not significantly associated, possibly due to the small sample size and short follow-up period.

This study was limited by its relatively small sample size and cross-sectional design, which prevents causal inference. As it was hospital-based, results may not be generalisable to the wider population. Additionally, only immediate neonatal outcomes were assessed, without follow-up for long-term complications.

CONCLUSION

Urinary tract infection, hypertension, and a previous history of preterm birth are major maternal risk factors for preterm delivery. Preterm neonates demonstrate significantly higher morbidity and require hospital admission more frequently. Early identification and appropriate management of these risk factors are essential to improving neonatal outcomes.

It is recommended that antenatal care services should include routine screening for infections and hypertension, particularly among women with a history of preterm birth. Strengthening neonatal care facilities and establishing follow-up systems for at-risk mothers and infants can further reduce preterm-related morbidity and mortality.

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