DETERMINANTS OF PRETERM BIRTH AMONG WOMEN REFERRED FROM COMMUNITY HEALTH FACILITIES FOR DELIVERY: A COMPARATIVE CROSS-SECTIONAL STUDY

Jaya Koirala,[1] Pradish Poudel,[2] Kumi Takahashi,[3] Aashma Dahal,[1] Bibechana Sapkota,[1] Pratikshya Sharma Dahal,[1] Sagun Kharel,[1] Janaki Chaudhary[1]

[1]Madan Bhandari Academy of Health Sciences, Hetauda, Nepal, [2]Department of Global Health and Social Medicine, Harvard Medical School Boston, Massachusetts, USA, [3]Institute of Biomedical Sciences, Tokushima University, Japan

ABSTRACT

Preterm birth (PTB) is a major global health concern and a leading cause of neonatal morbidity, mortality, and long-term developmental challenges, particularly in resource-limited settings. This study aimed to compare factors associated with preterm birth among pregnant women referred from the community to a referral centre and a district hospital for delivery. A comparative cross-sectional study was conducted from 1st January to 30th June 2023 at a tertiary referral hospital and a district hospital in southern India. A total of 334 pregnant women referred from community health facilities (health posts, primary health care centre, and community health centre) to a referral centre and a district hospital for delivery were enrolled in the study, with 167 participants recruited from each facility using purposive sampling. Data on socio-demographic, obstetric, and newborn factors, including preterm birth, were collected using a pretested structured interview schedule. Statistical analysis included descriptive statistics, Chi-square tests, and binary logistic regression, with significance set at $p < 0.05$. Preterm birth was more frequent in the district hospital (40.1%) than in the referral centre (33.5%), particularly among primiparous women. Women aged 26–30 years had a higher risk of PTB, while rural residence, private employment, and higher socioeconomic status were protective. Overall, PTB was influenced by maternal age, parity, occupation, residence, socioeconomic status, and facility-related factors. Determinants of PTB vary across health facilities, reflecting the influence of maternal, socioeconomic, and contextual factors on neonatal outcomes. Strengthening antenatal care, improving referral pathways, and addressing social and economic disparities are essential to reduce preterm births and improve newborn health in resource-limited settings.

KEYWORDS

Determinants, district hospital, laboring women, preterm birth, referral centre

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CORRESPONDING AUTHOR

Dr. Jaya Koirala, PhD
Lecturer,
Department of Nursing,
Madan Bhandari Academy of Health Sciences,
Hetauda, Nepal
Email: drjayakoiraladahal@gmail.com
Orcid No: https://orcid.org/0000-0003-0308-3684
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INTRODUCTION

Preterm birth (PTB), defined as delivery before 37 completed weeks of gestation, is a major global health concern and a leading cause of neonatal illness, death, and long-term developmental challenges.[1] Globally, approximately 15 million babies are born preterm each year, accounting for about 35.0% of neonatal deaths in low- and middle-income countries.[2,3] The global PTB rate is around 10.6%, with significant variation between countries (5.0-18.0%),[4] and most cases occur in Sub-Saharan Africa and South Asia India alone reports over 3.5 million PTB annually, representing more than 23.0% of the global burden, with regional prevalence ranging from 6.0% to 28.0%.[5-7]

PTB increases the risk of serious early complications, such as respiratory distress, infections, intraventricular hemorrhage, and temperature instability,[8] as well as long-term issues including neurodevelopmental delay, stunted growth, and chronic diseases.[9,10] Despite national programs like the India Newborn action plan and improvements in institutional deliveries, PTB remains a leading cause of neonatal mortality, contributing to nearly one-third of neonatal deaths.[11] Maternal factors such as age, parity, anemia, malnutrition, socioeconomic status, and inadequate antenatal care continue to influence PTB and newborn outcomes.[12,13]

Although some studies have identified determinants of PTB in India, there is limited evidence comparing immediate neonatal outcomes among mothers referred to different levels of healthcare facilities.[14] Understanding how maternal, socioeconomic, and facility-related factors affect PTB at tertiary referral centre versus district hospitals is essential for improving maternal and neonatal care.

To address this gap, the present study was conducted to assess and compare the socio-demographic and maternal determinants of PTB between a tertiary referral centre and a district hospital in northern South India. Examining these variations is crucial for developing context-specific strategies to improve neonatal health outcomes across different levels of the healthcare system.

MATERIALS AND METHODS

Study design and setting: A cross-sectional comparative study was conducted between 1st January and 30th June 2023 at two public healthcare facilities in northern South India: a tertiary-level referral hospital and a secondary-level district hospital.

Participant enrollment: A total of 334 pregnant women referred from community health facilities (health posts, primary health care centre, and community health centre) to a referral centre and a district hospital for delivery were enrolled in the study, with 167 participants recruited from each facility using purposive sampling. Eligible participants were women aged 20 years and above who had undergone spontaneous vaginal delivery, with or without episiotomy, and were admitted to the labour or postnatal wards. Women with chronic medical conditions, such as cardiac, renal, or endocrine disorders, as well as pregnancy-related complications, including gestational diabetes mellitus and pregnancy-induced hypertension, were excluded from the study.

The sample size was determined a priori based on statistical assumptions to ensure adequate study power. The purpose and procedures of the study were explained to all eligible participants, and written informed consent was obtained prior to enrollment.

Sample size: Sample size formula for testing the difference between two population proportions for a quantitative, randomized controlled trial was used.[15]

$$n = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right)(p_1q_1 + p_2q_2)}{(p_1 - p_2)^2}$$

Where,

95% confidence level, $z_{1-\frac{\alpha}{2}} = 1.96$

80% power, $z_{1-\beta} = 0.84$

$p_1 = 1.2$ and $p_2 = 7.2$ were taken from a study[16]

n =167 women

A total required sample size = 334 women, 167 in the referral centre group, and 167 in the District Hospital group were enrolled in this study.

Ethical consideration: Ethical approval letter was secured from the Institutional Ethics Committee of KLE Academy of Higher Education and Research (KAHER), Belagavi, India, along with administrative permission from both study sites (Approval No. Ref. No. KAHER/EC/21–22/015). Participation was voluntary, and confidentiality and anonymity of participants were ensured throughout data collection and analysis.

Data collection: Data were gathered through a pretested structured interview schedule conducted in the maternity and postnatal wards, ensuring that women felt comfortable and their privacy was mantained. The interview tool collected information on three main areas: socio-demographic details (including age, religion, marital status, education, occupation, household income, place of residence, dietary habits, and use of tobacco or alcohol), pregnancy-related and obstetric factors (such as parity, antenatal care visits, and hemoglobin levels), and newborn outcomes, with particular attention to PTB. The interview schedule and patient case file checklist, were validated by 10 obstetricians and gynecologists to ensure clarity, relevance, and appropriateness. Data were double-entered into Microsoft Excel and cross-checked to minimize entry errors. The cleaned dataset was then imported into SPSS-20.0 for statistical analysis.

Data analysis: All data were checked for completeness and then imported from Microsoft Excel into SPSS-20 for analysis. Descriptive statistics were used to summarize the socio-demographic and clinical characteristics of the participants. Associations between categorical independent variables such as age, occupation, residence, monthly family income, anemia status, dietary pattern, type of marriage, antenatal care (ANC) visits, hemoglobin level during pregnancy, and parity and the dependent variable, PTB, were examined using the Chi-square test. Binary and multivariate logistic regression analyses were performed to identify significant predictors of PTB. The results are presented as adjusted (ORs) with 95% confidence intervals (CI). A p-value of <0.05 was considered statistically significant.

RESULTS

Socio-demographic characteristics of participants: Table 1 presents the socio-demographic characteristics of the participant women. The majority of women were aged 20–25 years (67.4%), with a higher proportion in the referral centre group (73.7%) compared to the district hospital group (61.1%). Most participants identified as *Hindu* (78.1%). Approximately one-third of the women had completed pre-university course (PUC) education (35.3%), including 40.1% in the referral centre group and 30.5% in the district hospital group. Agricultural occupation was more common among women in the referral centre group (26.3%) than in the district hospital group (19.2%). Non-consanguineous marriages were predominant among the participants. Most women resided in rural areas and reported consuming a mixed diet.

Only a small proportion reported smoking (12.6% vs. 6.6%) or alcohol use (6.6% vs. 3.6%) in the referral centre and district hospital groups, respectively. Monthly family income greater than Indian Currency Rupees (ICR) 20,000 was reported by more than half of participants (53.3% and 61.1%, respectively), with no statistically significant difference observed between the groups. The comparison of socio-demographic variables between the referral centre and district hospital groups was conducted using the chi-square test, which did not indicate any statistically significant associations (Table 1).

Table 2 presents the previous obstetric history of the study participants. The majority of participants were primiparous (n =170), with 52.1% in the tertiary care centre group and 47.9% multiparous. Most mothers had fewer than four antenatal care visits (n =26), accounting for 9.6% in the tertiary care centre group and 6% in the district hospital group. Chi-square analysis showed no statistically significant differences between the two groups in parity or antenatal care attendance, indicating comparable obstetric profiles.

PTBs were relatively uncommon (9.0% and 3.0%, respectively). Chi-square analysis showed no significant difference between the two groups (χ^2 =1.697, df =3, p =0.638), indicating that the distribution of birth terms was similar across both settings (Table 2).

Table 3 presents the maternal factors associated with preterm birth. In the tertiary care centre group, women aged 26–30 years had significantly higher odds of PTB (OR =3.76; 95% CI: 1.12–12.67, p =0.033), while in the district hospital group, women aged 31–35 years showed slightly elevated odds (OR =1.02; 95% CI: 0.39–2.69).

Women education, place of residence, and dietary patterns influenced risk. In the referral centre group, women with secondary education, those living in rural areas, and those consuming a vegetarian diet with eggs had higher odds of PTB. In the district hospital group, women with primary or no formal education and those following a pure vegetarian diet showed higher or slightly elevated odds, while rural residence was associated with lower risk.

Other important factors included low family income, moderate anaemia, and occupation.

Table 1: Demographic characteristics of participants (n=334)

Sociodemographic information		Total n (%)	Referral centre n1 (%)	District hospital n2 (%)	p- Value
Age of Mothers	20 – 25	225 (67.4)	123 (73.7)	102 (61.1)	0.67
	26 – 30	46 (13.8)	16 (9.6)	30 (18)	
	31 – 35	53 (15.9)	23 (13.8)	30 (18)	
	36 ≥	10 (3)	5 (3)	5 (3)	
Religion	*Hindu*	261 (78.1)	136 (81.4)	125 (74.9)	0.306
	Muslim	54 (16.2)	22 (13.2)	32 (19.2)	
	Others	19 (5.7)	9 (5.4)	10 (6)	
Education	Illiterate and primary	11 (3.3)	5 (3)	6 (3.6)	0.204
	Secondary	39 (11.7)	21 (12.6)	18 (10.8)	
	PUC	118 (35.3)	67 (40.1)	51 (30.5)	
	Bachelor	99 (29.6)	48 (28.7)	51 (30.5)	
	Postgraduate	67 (20.1)	26 (15.6)	41 (24.6)	
Occupation	Housewives	79 (23.7)	38 (22.8)	41 (24.6)	0.478
	Agriculture	76 (22.8)	44 (26.3)	32 (19.2)	
	Private service	72 (21.6)	33 (19.8)	39 (23.4)	
	Government services	15 (4.5)	9 (5.4)	6 (3.6)	
	Others	92 (27.5)	43 (25.7)	49 (29.3)	
Type of Marriage	Consanguineous	51 (15.3)	22 (13.2)	29 (17.4)	0.287
	Non consanguineous	183 (84.7)	14 (86.8)	138 (82.6)	
Residence	Urban	92 (27.5)	43 (25.7)	49 (29.3)	0.592
	Semi urban	99 (29.6)	48 (28.7)	51 (30.5)	
	Rural	143 (42.8)	76 (45.5)	67 (40.1)	
Dietary pattern	Pure vegetarian	75 (22.5)	38 (22.8)	37 (22.2)	0.638
	Mixes diet	139 (41.6)	73 (43.7)	66 (39.5)	
	Vegetarian consume egg	120 (35.9)	56 (33.5)	64 (38.3)	
Smoking habit	Yes	32 (9.6)	21 (12.6)	11 (6.6)	0.063
	No	302 (90.4)	146 (87.4)	156 (93.4)	
Alcoholic habit	Yes	17 (5.1)	11 (6.6)	6 (3.6)	0.213
	No	317 (94.9)	156 (93.4)	161 (96.4)	
Monthly family Income in Rupees	<5000	41 (12.3)	20 (12)	21 (12.6)	0.385
	5000 – 9999	21 (6.3)	11 (6.6)	10 (6)	
	10000 – 19999	81 (24.3)	47 (28.1)	34 (20.4)	
	20000+	191 (57.2)	89 (53.3)	102 (61.1)	

p value obtained from Chi square test

Table 2: Pregnancy information of participants by health facility (n = 334)

Pregnancy related information		Referral centre n (%)	District hospital n (%)	Total (n)	p- Value
Parity	Primi	83 (49.70)	87 (52.10)	170 (50.90)	0.66
	Multi	84 (50.30)	80 (47.90)	164 (49.10)	
ANC visits	≥4 ANC visits	151 (90.40)	157 (94.00)	308 (92.22)	0.22
	<4 ANC visits	16 (9.60)	10 (6.00)	26 (7.78)	
Hb level of mothers	Normal Hb level	125 (74.90)	117 (70.10)	242 (72.46)	0.54
	Moderate anemic	9(5.40)	11 (6.60)	20 (5.99)	
	Mild anemic	27(16.20)	35 (21.00)	62 (18.56)	
	Severe anemic	6(3.60)	4 (2.40)	10 (2.99)	

Significant: $p > 0.05$, ANC: Antenatal care visit, Hb: Hemoglobin

Table 3: Determinants of PTB among participants in labor and postnatal wards (referral center vs. district hospital) (n=334)

Demographic characteristics	Determinants of preterm birth Referral center OR (95% CI)	p- value	District hospital OR (95% CI)	p- value
Age of mothers				
20 – 25	1		1	
26 – 30	3.76 (1.12, 12.67)	0.033*	0.72 (0.27, 1.97)	0.527
31 – 35	0.85 (0.25, 2.85)	0.792	1.02 (0.39, 2.69)	0.973
≥36	0.42 (0.02, 7.68)	0.561	0.14 (0.01, 1.54)	0.108
Religion				
Hindu	1		1	
Muslim	0.74 (0.22, 2.48)	0.623	0.62 (0.22, 1.71)	0.353
Others	0.16 (0.01, 1.77)	0.135	1.37 (0.3, 6.22)	0.683
Education level of mothers				
Postgraduate level	1		1	
Secondary	2.54 (0.59, 10.88)	0.21	1.7 (0.44, 6.6)	0.441
PUC level	0.99 (0.3, 3.24)	0.98	1.36 (0.49, 3.77)	0.557
Bachelor level	1.12 (0.32, 3.95)	0.856	0.9 (0.33, 2.46)	0.839
Illiterate and primary level	-	-	1.14 (0.15, 8.57)	0.903
Residence				
Urban	1			
Semi urban	1.34 (0.44, 4.03)	0.608	0.46 (0.17, 1.2)	0.111
Rural	1.88 (0.67, 5.24)	0.229	0.25 (0.1, 0.64)	0.004*
Occupation				
Government service	1			
Agriculture	0.69 (0.22, 2.18)	0.53	0.45 (0.15, 1.37)	0.159
Private service	1.12 (0.34, 3.7)	0.85	0.2 (0.06, 0.6)	0.005*
House wife	1.24 (0.2, 7.62)	0.816	0.29 (0.04, 2.42)	0.255
Others	0.6 (0.19, 1.91)	0.384	0.32 (0.11, 0.9)	0.031*
Dietary pattern				
Mixed diet	1			
Pure vegetarian	0.64 (0.21, 1.98)	0.442	2.19 (0.83, 5.79)	0.114
Vegetarian but consume egg	1.21 (0.52, 2.83)	0.663	1.02 (0.44, 2.37)	0.969
Monthly family income				
20000+	1			
5000 – 9999	5.38 (1.07, 27.16)	0.042*	0.28 (0.05, 1.55)	0.144
10000 – 19999	1.38 (0.54, 3.52)	0.5	1.08 (0.42, 2.76)	0.878
Less than 5000	0.42 (0.09, 1.93)	0.267	0.8 (0.24, 2.68)	0.716
Hb level during labour				
Normal Hb	1			
Moderate anaemia	1.91 (0.39, 9.37)	0.425	2.36 (0.51, 10.8)	0.27
Mild anaemia	1.05 (0.37, 2.98)	0.925	1.12 (0.46, 2.76)	0.803
Severe anaemia	0.77 (0.06, 10.1)	0.844	0.96 (0.1, 9.29)	0.973
Total ANC visits				
4≥ ANC visits	1			
<4 ANC visits	0.1 (0.01, 1.01)	0.051	2.59 (0.57, 11.8)	0.218
Parity				
Primi	1			
Multi	0.73 (0.33, 1.61)	0.433	0.74 (0.36, 1.52)	0.411
Smoking habit				
Yes	1			
No	1.79 (0.54, 5.97)	0.344	1.46 (0.35, 6.1)	0.607
Alcoholic habits				
Yes	1			
No	0.42 (0.06, 3.01)	0.387	1.97 (0.31, 12.4)	0.471
Type of marriage				
Non consanguineous	1			
Consanguineous	1.75 (0.78, 3.93)	0.175	0.4 (0.13, 1.24)	0.111

In the referral centre group, women earning INR. 3,150–6,300 per month had significantly higher odds of preterm birth (OR =5.38; 95% CI: 1.07–27.16, p =0.042), and moderate anaemia increased risk in both groups. Private sector employment and "others" occupations in the district hospital group were protective. Smoking and alcohol showed variable effects, and consanguineous marriage in the referral centre group was linked to higher odds of preterm birth (Table 3).

Fig. 1 shows that, most of the neonate were born at full term in both facilities, accounting for 63.2% overall, with a higher proportion in the referral centre (66.5%) compared to the district hospital (59.9%). In contrast, the district

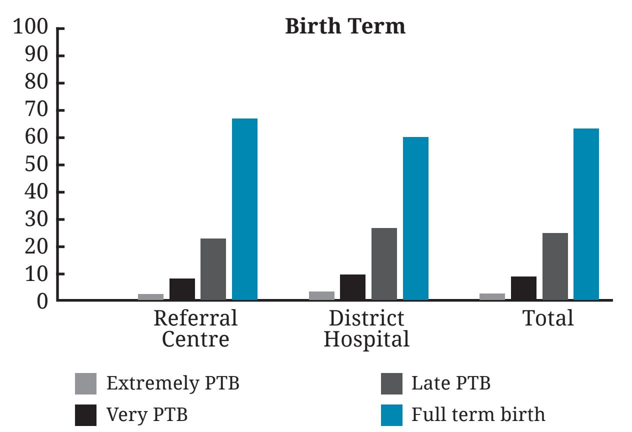

Fig. 1: Term of birth

Hospital showed a slightly higher proportion of PTBs across all categories, including late preterm (26.9% vs 22.8%), very preterm (9.6% vs 8.4%), and extremely PTBs (3.6% vs 2.4%), indicating comparatively more preterm deliveries in the district hospital.

DISCUSSION

Demographic characteristics: In this study, most participants were aged 20–25 years (67.4%), with a slightly higher proportion in the referral centre (73.7%) compared to the district hospital (61.1%). The majority were Hindu (78.1%), and approximately one-third had completed pre-university Course education (35.3%), with a higher proportion in the referral centre (40.1%) than in the district hospital (30.5%). Agriculture was the most common occupation (26.3%). Most participants resided in rural areas, followed a mixed diet, and were in non-consanguineous marriages. A small proportion reported smoking (12.6% vs. 6.6%) and alcohol consumption (6.6% vs. 3.6%). More than half of the participants had a monthly family income above NPR 20,000 (53.3% vs. 61.1%). Chi-square analysis showed no statistically significant differences between the two groups ($p > 0.05$), indicating that the socio-demographic characteristics were comparable.

PTB: In this study, maternal age (26–30 years) (OR = 3.76) and low family income (5,000–9,999 INR) (OR = 5.38) were associated with higher odds of PTB, consistent with findings from a 2016 study in India. Women with a monthly income of 10,001–15,000 INR also had increased odds of PTB (OR = 2.2) compared to other income groups.[17]

Women with moderate anemia had higher odds of PTB, with OR = 1.91 (95% CI: 0.39–9.37; p = 0.425) in the referral centre and OR = 2.36 (95% CI: 0.51–10.8; p = 0.27) in the district hospital. These findings are supported by previous studies in India, where moderate maternal anemia was associated with higher odds of PTB compared to mild anemia (OR = 1.58; 95% CI: 0.43–5.73), although not statistically significant.[18] Similarly, a 2014 study in India reported that 50% of PTBs occurred among women with severe anemia, while 22% had mild to moderate anemia.[19] A 2022 study from Telangana, India, found that anemic women were nearly twice as likely to deliver preterm (OR = 1.96; p = 0.04).[20] In 2025, a study from Pakistan also reported that maternal anemia was significantly associated with preterm labour (OR = 4.29).[21]

Urban residence was associated with higher odds of PTB in the district hospital, which contrasts with findings from a 2025 study in Ethiopia, where urban residence was significantly associated with lower odds of preterm birth (OR = 0.21; 95% CI: 0.07–0.60).[22] Lack of antenatal care (ANC) follow-up markedly increased the odds of PTB (OR = 5.00; 95% CI: 1.68–14.77), similar to a 2021 study in Africa, which reported higher odds of PTB among women with inadequate ANC utilization.[23] Women with fewer than four ANC visits also had higher odds of PTB in the district hospital (OR = 2.59; 95% CI: 0.57–11.8; p = 0.218), consistent with findings from a 2025 study in Ethiopia.[22]

Alcohol consumption was associated with increased risk of PTB. In this study, women who consumed alcohol in the referral centre had higher odds of PTB (OR =10.42; 95% CI:0.06–3.01; p =0.387), although this finding was not statistically significant. A 2019 study in Japan reported that heavy alcohol intake (≥300 g ethanol/week) during the second and third trimesters increased the risk of PTB fourfold (OR = 4.52; 95% CI: 1.68–12.2).[24] Similarly, studies from Denmark (2004) and Canada (2024) reported a higher prevalence of PTB among women who consumed alcohol during pregnancy.[25-27]

Higher odds of PTB were also observed among women from low-income families (OR =5.38; 95% CI: 1.07–27.16) in the referral centre. Similar findings were reported in a 2021 study from the Netherlands, where low socioeconomic status was associated with higher odds of PTB (OR =1.17; 95% CI: 1.09–1.25; p <0.0001).[27] A similar trend was observed with maternal smoking, consistent with a 2020 study in the USA.[28] In this study, the odds of PTB were also higher among women following a strict vegetarian diet, which aligns with a 2020 study from Australia reporting increased odds of PTB among women adhering to vegetarian dietary patterns.[29]

In conclusion, this study identified multiple determinants of PTB, including maternal age, family income, anemia, place of residence, antenatal care utilization, dietary practices, and alcohol consumption. These findings highlight the importance of targeted maternal health interventions to reduce the risk of PTB among vulnerable women populations.

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REFERENCES

1. Liu L, Oza S, Hogan D *et al*. Global, regional, and national causes of under-5 mortality in 2000-2015: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet* 2016; 388: 3027-35. DOI: 10.1016/S0140-6736(16)31593-8.
2. Chawanpaiboon S, Vogel JP, Moller AB *et al*. Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. *Lancet Glob Health* 2019; 7: e37–46. DOI: 10.1016/S2214-109X(18)30451-0.
3. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: when? where? why? *Lancet* 2005; 365: 891–900. DOI: 10.1016/S0140-6736(05)71048-5.
4. Cao G, Liu J, Liu M, Li Y *et al*. Global, regional, and national incidence and mortality of neonatal preterm birth, 1990–2019. *J Amer Med Assoc Pediatr* 2022; 176: 787–94. DOI: 10.1001/jamapediatrics.2022.1622.
5. Ohuma EO, Moller AB, Bradley E *et al*. National, regional, and global estimates of preterm birth in 2020, with trends from 2010: a systematic analysis. *Lancet* 2023; 402: 1261–71. DOI: 10.1016/S0140-6736(23)00878-4.
6. Blencowe H, Cousens S, Oestergaard MZ *et al*. National, regional, and worldwide estimates of preterm birth rates in 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. *Lancet* 2012; 379: 2162–72. DOI: 10.1016/S0140-6736(12)60820-4.
7. Liu L, Oza S, Hogan D *et al*. Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet* 2016; 388: 3027–35. DOI: 10.1016/S0140-6736(16)31593-8.
8. Cheong JLY, Burnett AC, Treyvaud K *et al*. Early environment and long-term outcomes of preterm infants. *J Neural Transm (Vienna)* 2020; 127: 1–8. DOI: 10.1007/s00702-019-02121-w.
9. Gete F, Aziz Ali S, Ho MS *et al*. Long-term health outcomes of preterm birth: a narrative review. *Front Pediatr* 2025; 13: 1565897. DOI: 10.3389/fped.2025.1565897.
10. Zivaljevic J, Jovandaric MZ, Babic S *et al*. Complications of preterm birth: the importance of care for the outcome - a narrative review. *Medicina (Kaunas)* 2024; 60: 1014. DOI: 10.3390/medicina60061014.
11. WHO. Newborn mortality. Geneva: World Health Organization; 2024 Mar 14. Available from: https://www.who.int/news-room/fact-sheets/detail/newborn-mortality. (Accessed on: January 2026)
12. Zhurabekova G, Oralkhan Z, Balmagambetova A *et al*. Socioeconomic determinants of preterm birth: a prospective multicenter hospital-based cohort study in Kazakhstan. *BMC Pregnancy Childbirth* 2024; 24: 769. DOI: 10.1186/s12884-024-06879-x.
13. Alcock S, Leal M, Beukes J *et al*. Maternal age and parity influences on health outcomes: a multivariable regression analysis of mothers and infants. *BMC Pregnancy Childbirth* 2025; 25: 1094. DOI: 10.1186/s12884-025-24050-3.
14. Salatas C, Hobbs M, Bloomfield FH *et al*. Investigating the factors associated with preterm birth using evidence from the Growing Up in New Zealand cohort: a retrospective geospatial study. *Health Place* 2023; 82: 103020. DOI: 10.1016/j.healthplace.2023.103020.
15. Charan J and Biswas T. How to calculate sample size for different study designs in medical research? *Indian J Psychol Med* 2013; 35: 121-6.
16. Gwelo AS, Mbishi JV. Determinants of adverse neonatal outcomes among postnatal women in Dar es Salaam, Tanzania. *African Health Sci* 2019; 19: 1924-32.
17. Tellapragada C, Eshwara VK, Bhat P *et al*. Risk factors for preterm birth and low birth weight

among pregnant Indian women: a hospital-based prospective study. *J Prev Med Public Health* 2016; 49: 165–75. DOI: 10.3961/jpmph.16.022.

18. Devi T and Singh H. Prevalence and risk factors associated with preterm birth in India: systematic review and meta-analysis. 2020 Apr 28. DOI: https://doi.org/10.22541/au.158758076.655341
19. Rani KU, Gupta J, Gupta R, Aggarwal KC. Maternal anaemia and its severity: an independent risk factor for preterm delivery and adverse neonatal outcome. *Int'l J Reprod Contracept Obstet Gynecol* 2014; 3: 325–30.
20. Reddy KM, Ravula SR, Palakollu S, Betha K. Prevalence of preterm birth and perinatal outcome: a rural tertiary teaching hospital-based study. *J Family Med Prim Care* 2022; 11: 3909–13.
21. Batool R, Tariq S, Anjum H *et al*. Association between iron deficiency anemia and preterm labour among pregnant women in the population under study. *J Neonatal Surg* 2025; 14: 421–6.
22. Kassie A, Assefa M, Demilew W *et al*. Determinants of preterm birth among newborns delivered at public referral hospitals in Bahir Dar City, Northwest Ethiopia, 2024. *BMC Public Health* 2025; 25: 2905. DOI: 10.1186/s12889-025-24024-0.
23. Alamneh TS, Teshale AB, Worku MG *et al*. Preterm birth and its associated factors among reproductive-aged women in sub-Saharan Africa: evidence from the recent demographic and health surveys of sub-Saharan African countries. *BMC Pregnancy Childbirth* 2021; 21: 770. DOI: 10.1186/s12884-021-04108-9.
24. Ikehara S, Kimura T, Kakigano A, Sato T, Iso H; Japan Environment Children's Study Group. Association between maternal alcohol consumption during pregnancy and risk of preterm delivery: the Japan Environment and Children's Study. *Brit J Obstet Gynaecol* 2019; 126: 1117–24. DOI: 10.1111/1471-0528.15899.
25. Albertsen K, Andersen AM, Olsen J, Grønbaek M. Alcohol consumption during pregnancy and the risk of preterm delivery. *Am J Epidemiol* 2004; 159: 155–61. DOI: 10.1093/aje/kwh034.
26. Popova S, Dozet D, Temple V, Riddell C, Yang C. A population-based study on women who used alcohol during pregnancy and their neonates in Ontario, Canada. *Children (Basel)* 2024; 11: 993. DOI: 10.3390/children11080993.
27. Burgos Ochoa L, Bertens LCM, Garcia-Gomez P, Van Ourti T, Steegers EAP, Been JV. Association of neighbourhood socioeconomic trajectories with preterm birth and small-for-gestational-age in the Netherlands: a nationwide population-based study. *Lancet Reg Health Eur* 2021; 10: 100205. DOI: 10.1016/j.lanepe.2021.100205.
28. Liu B, Xu G, Sun Y *et al*. Maternal cigarette smoking before and during pregnancy and the risk of preterm birth: a dose-response analysis of 25 million mother-infant pairs. *PLoS Med* 2020; 17: e1003158. DOI: 10.1371/journal.pmed.1003158.
29. Gete DG, Waller M, Mishra GD. Pre-pregnancy dietary patterns and risk of preterm birth and low birth weight: findings from the Australian Longitudinal Study on Women's Health. *Am J Clin Nutr* 2020; 111: 1048–58. DOI: 10.1093/ajcn/nqaa057.