

First-Trimester Anaemia as an Independent Predictor of Preterm Birth: A Retrospective Cohort Study of 3,683 Singleton Pregnancies at a Tertiary Maternity Centre in Latvia

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Abstract

Background

Preterm birth (< 37 weeks of gestation) is a leading cause of neonatal mortality and long-term neurodevelopmental morbidity worldwide. First-trimester anaemia, defined by the WHO as haemoglobin (Hb) < 11 g/dL, affects approximately 18–25% of pregnant women in Europe, yet population-specific data from Northern and Eastern European cohorts are absent from the literature. Latvia has published no cohort-level estimate of this association.

Methods

Retrospective cohort study of 3,683 singleton pregnancies with documented first-trimester haemoglobin measurements, delivered at Rīgas Dzemdības nams (Riga Maternity Hospital, Latvia) during 2024. Women were classified as anaemic (Hb < 11 g/dL; n = 200) or non-anaemic (Hb ≥ 11 g/dL; n = 3,483). The primary outcome was preterm birth. Secondary outcomes included NICU admission, premature rupture of membranes (PROM), postpartum haemorrhage (PPH), labour dystocia, and oxytocin administration. Between-group comparisons used Pearson chi-squared tests and Mann-Whitney U tests; binary logistic regression adjusted for maternal age and parity. Statistical significance: two-sided $p < 0.05$. AI-assisted tools were used in manuscript preparation; all data, interpretations, and conclusions were reviewed and approved by the authors.

Results

Anaemia prevalence was 5.4%. Preterm birth occurred in 22.5% of anaemic versus 6.4% of non-anaemic women (crude OR 4.22, 95% CI 2.93–6.07; $p < 0.001$). After adjustment, anaemia remained an independent predictor (aOR 2.44, 95% CI 1.60–3.71; $p < 0.001$). Mean Hb was significantly lower in preterm versus term deliveries (12.34 ± 1.48 vs 12.73 ± 1.18 g/dL; Mann-Whitney U = 393,389.5, $z = -3.79$, $p < 0.001$). A dose-response gradient was confirmed: preterm rates of 6.4% (no anaemia), 20.2% (mild; OR 3.67, 95% CI 2.50–5.39), and 25.8% (moderate; OR 5.06, 95% CI 2.22–11.52). NICU admission was significantly higher in anaemic women (13.0% vs 7.4%; $p = 0.006$).

Conclusions

First-trimester anaemia independently more than doubles the adjusted odds of preterm birth (aOR 2.44) in this contemporary Latvian cohort, consistent with the international meta-analytic estimate (RR 1.65) and, to our knowledge, the first cohort-level estimate from Latvia. A clear dose-response gradient and elevated NICU rates strengthen causal plausibility. These findings support universal first-trimester

haemoglobin screening and early, aggressive treatment of anaemia as a potentially modifiable pathway for reducing preterm birth in European obstetric populations.

Introduction

Preterm birth, defined as delivery before 37 completed weeks of gestation, is a leading cause of neonatal mortality and long-term neurodevelopmental morbidity worldwide, affecting approximately 11% of all live births globally. [1]. In Europe, preterm birth rates range from 5% to 9%, with associated healthcare costs exceeding €6 billion annually [2]. Despite advances in neonatal intensive care, the rate of preterm delivery has not substantially declined over the past two decades, underscoring the urgent need to identify modifiable antepartum risk factors [3].

Anaemia in pregnancy, most commonly caused by iron deficiency, is among the most prevalent nutritional disorders in obstetric populations. The World Health Organization (WHO) defines anaemia in pregnancy as haemoglobin (Hb) < 11 g/dL in the first and third trimesters [4]. While global prevalence reaches approximately 40% of all pregnant women, iron-deficiency anaemia affects an estimated 18–25% of pregnant women in European high-income countries, particularly during the first trimester before iron supplementation achieves therapeutic haemoglobin levels [5, 6].

Several biological pathways link first-trimester anemia to premature labor. Reduced hemoglobin hampers oxygen delivery to the uterus and placenta, causing placental hypoxia that triggers increased production of corticotropin-releasing hormone. This hormone promotes early cervical ripening and enhances myometrial contractions [7]. Iron deficiency simultaneously promotes oxidative stress and pro-inflammatory cytokine production (IL-1 β , IL-6, TNF- α), activating prostaglandin synthesis pathways implicated in preterm labour [8]. These mechanisms operate along a haemoglobin-dependent gradient, providing biological justification for a dose-response relationship.

Population-based studies report odds ratios for preterm birth associated with first-trimester anaemia ranging from 1.35 to 2.42 [9–16], and two major meta-analyses report pooled relative risks of 1.63 and 1.65 respectively [16, 17]. However, data estimates specific to populations in Northern and Eastern Europe are nearly nonexistent, especially given the differences in dietary iron intake, haemoglobin variants, and obstetric practices compared to Western Europe and low-income regions. Latvia, in particular, has not published any cohort-level data on this association [21, 22].

This study was conducted at Rīgas Dzemdzības nams (Riga Maternity Hospital), the largest obstetric centre in Latvia and the Baltic region. Our primary aim was to determine the adjusted odds ratio of preterm birth associated with first-trimester anaemia (Hb < 11 g/dL). Secondary aims were to characterise associated obstetric and neonatal outcomes, construct a dose-response analysis across anaemia severity categories, and contextualise findings within the international literature.

Material and methods

Study design, setting, and ethical approval

This retrospective cohort study was conducted at SIA “Rīgas Dzemdības nams”, a Level III tertiary referral centre and the primary obstetric institution for the Baltic region. Ethical approval and data access were granted by the hospital administration (March 2026), in accordance with institutional protocols and GDPR requirements. RSU Research Ethics Committee approval was obtained (reference: 2-PĒK-4/422/2026, RSU Pētījumu ētikas komiteja, 20.03.2026). Hospital ethics approval was also obtained from SIA “Rīgas Dzemdības nams” (reference: Nr.V-19/2026, 27.03.2026). All records were pseudonymised prior to analysis. Data were extracted from electronic health records and birth registries covering January 1–December 31, 2024.

Study population and eligibility criteria

Eligible participants were women with singleton pregnancies and documented first-trimester haemoglobin measurements. The full screening and exclusion process is summarised in Fig. 1. Women with multiple gestations, major fetal structural anomalies, or missing primary outcome data were excluded. Of 3,683 women meeting eligibility criteria, 19 (0.5%) had missing haemoglobin values and were excluded from the adjusted logistic regression model; all 3,683 were included in unadjusted and chi-squared analyses.

Exposure and outcome definitions

The primary exposure was *first-trimester anaemia*, defined as Hb < 11 g/dL per WHO criteria [4]. A secondary analysis categorised anaemia by severity: mild (Hb 9.0–10.9 g/dL), moderate (Hb 7.0–8.9 g/dL), and severe (Hb < 7.0 g/dL). The primary outcome was *preterm birth*, defined as delivery at < 37 completed weeks of gestation. Secondary outcomes were: NICU admission; premature rupture of membranes (PROM, ICD-10 O42); postpartum haemorrhage (PPH, blood loss ≥ 500 mL); labour dystocia; and intrapartum oxytocin administration.

Statistical analysis

All analyses were performed in SPSS version 29.0 (IBM Corp., Armonk, NY, USA). Continuous variables are reported as mean ± SD with 95% confidence intervals. Normality was assessed using the Kolmogorov-Smirnov (Lilliefors correction) and Shapiro-Wilk tests. Both maternal age and first-trimester haemoglobin were non-normally distributed ($p < 0.001$ for all subgroups); Mann-Whitney U tests were therefore applied for between-group comparisons. Categorical variables were compared using Pearson chi-squared tests. Odds ratios with 95% CIs were calculated from 2×2 contingency tables. Binary logistic regression estimated the adjusted OR of preterm birth, controlling for maternal age and parity. Model fit was assessed with the Hosmer-Lemeshow test. Statistical significance: two-sided $p < 0.05$.

Results

Study population and baseline characteristics

Of 3,683 women with singleton pregnancies, 200 (5.4%) had first-trimester anaemia and 3,483 (94.6%) were non-anaemic. Overall, 269 (7.3%) delivered preterm. Women with anaemia were significantly younger (median 31.0 years, IQR 27–37 vs. 33.0 years, IQR 28–38; $p < 0.001$) and more frequently below age 30 (62.5% vs. 34.7%, $p < 0.001$). Nulliparity did not differ significantly (21.5% vs. 12.7%, $p = 0.161$). Mean first-trimester Hb was significantly lower in women who later delivered preterm (12.34 ± 1.48 g/dL vs. 12.73 ± 1.18 g/dL; Mann-Whitney $U = 393,389.5$, $z = -3.79$, $p < 0.001$). Baseline characteristics are presented in Table 1.

Table 1
Baseline characteristics by first-trimester anaemia status.

Variable	Total (N = 3,683)	Non-Anaemic (n = 3,483)	Anaemic (n = 200)	p-value
Maternal age (years), mean $\pm$ SD	33.6 $\pm$ 7.0	33.78 $\pm$ 7.00	32.0 $\pm$ 6.40	< 0.001
Median (IQR)	33.0 (27–38)	33.0 (28–38)	31.0 (27–37)	
Age < 30 years, n (%)	1,332 (36.2%)	1,207 (34.7%)	125 (62.5%)	< 0.001
Age $\geq$ 30 years, n (%)	2,351 (63.8%)	2,207 (63.4%)	144 (72.0%)	
Nulliparous, n (%)	486 (13.2%)	443 (12.7%)	43 (21.5%)	0.161
1st trimester Hb (g/dL), mean $\pm$ SD	12.69 $\pm$ 1.22	12.73 $\pm$ 1.18	< 11.0 (by definition)	< 0.001
Median Hb (IQR)	12.7 (11.9–13.5)	12.7 (11.9–13.5)	,	
Spontaneous labour, n (%)	1,782 (48.4%)	,	,	,
Induced/caesarean, n (%)	1,901 (51.6%)	,	,	,
Preterm birth, n (%)	269 (7.3%)	224 (6.4%)	45 (22.5%)	< 0.001
<i>Hb = haemoglobin; IQR = interquartile range; SD = standard deviation. Between-group comparisons: chi-squared for categorical variables; Mann-Whitney U for continuous variables (normality violated; Kolmogorov-Smirnov and Shapiro-Wilk $p < 0.001$). ns = not significant.</i>				

Primary outcome: preterm birth

Preterm birth occurred in 45 of 200 (22.5%) anaemic women compared with 224 of 3,483 (6.4%) non-anaemic women (crude OR 4.22, 95% CI 2.93–6.07; $p < 0.001$). Of 269 preterm deliveries, 34 (12.6%) were extremely preterm (< 28 weeks), 28 (10.4%) very preterm (28–32 weeks), and 205 (76.2%) moderate or late preterm (32–37 weeks); mean gestational age at preterm delivery was 33.0 weeks. Spontaneous labour onset occurred in 177 of 269 (65.8%) preterm deliveries (Pearson $\chi^2=35.24$, $df = 1$, $p < 0.001$). Results are presented in Tables 1 and 2.

Table 2
Association between first-trimester anaemia and preterm birth.

Outcome	Non-Anaemic (n = 3,483)	Anaemic (n = 200)	Crude OR (95% CI)	p-value
Preterm birth (< 37 weeks), n (%)	224 (6.4%)	45 (22.5%)	4.22 (2.93–6.07)	< 0.001
Extremely preterm (< 28 weeks), n (%)	32 (0.9%)	2 (1.0%)	,	,
Very preterm (28–32 weeks), n (%)	26 (0.7%)	2 (1.0%)	,	,
Moderate/late preterm (32–37 weeks), n (%)	166 (4.8%)	39 (19.5%)	,	,
Mean Hb, term births (g/dL)	12.73 $\pm$ 1.18	,	Mann-Whitney U = 393,389.5	< 0.001
Mean Hb, preterm births (g/dL)	12.34 $\pm$ 1.48 (all preterm)	,	$z = - 3.79$	< 0.001
<i>OR = odds ratio; CI = confidence interval; Hb = haemoglobin. Crude OR calculated from 2×2 contingency table. Spontaneous preterm denominator = 1,782 spontaneous labours.</i>				

Secondary outcomes

NICU admission was significantly higher in the anaemia group (13.0% vs. 7.4%; $p = 0.006$; OR 1.87, 95% CI 1.19–2.93). Oxytocin use was significantly lower in anaemic women (46.0% vs. 56.0%; $p = 0.007$), likely reflecting the higher rate of spontaneous preterm labour in this group, which does not require augmentation. PROM (16.5% vs. 17.9%; $p = 0.690$), PPH ≥ 500 mL (34.0% vs. 29.2%; $p = 0.170$), labour dystocia (25.5% vs. 30.3%; $p = 0.174$), and severe PPH $> 1,000$ mL (3.5% vs. 3.0%) did not differ significantly between groups. Results are presented in Table 3.

Table 3
Secondary maternal and neonatal outcomes by first-trimester anaemia status.

Outcome	Non-Anaemic (n = 3,483)	Anaemic (n = 200)	OR (95% CI)	p-value
NICU admission, n (%)	258 (7.4%)	26 (13.0%)	1.87 (1.19–2.93)	0.006
PROM (ICD-10 O42), n (%)	624 (17.9%)	33 (16.5%)	0.91 (0.62–1.33)	0.690
PPH ≥ 500 mL, n (%)	1,016 (29.2%)	68 (34.0%)	1.25 (0.91–1.70)	0.170
Severe PPH > 1,000 mL, n (%)	104 (3.0%)	7 (3.5%)	1.18 (0.54–2.58)	,
Labour dystocia, n (%)	1,055 (30.3%)	51 (25.5%)	0.79 (0.57–1.10)	0.174
Oxytocin administration, n (%)	1,950 (56.0%)	92 (46.0%)	0.66 (0.49–0.90)	0.007
<i>NICU = neonatal intensive care unit; PROM = premature rupture of membranes; PPH = postpartum haemorrhage; OR = odds ratio; CI = confidence interval. All p-values from Pearson chi-squared test.</i>				

Logistic regression

After adjusting for maternal age and parity, first-trimester anaemia remained a significant independent predictor of preterm birth (aOR 2.44, 95% CI 1.60–3.71; $p < 0.001$). Increasing maternal age was mildly protective (aOR per year 0.959, 95% CI 0.940–0.979; $p < 0.001$). Nulliparity was not significant after adjustment (aOR 0.95, $p = 0.783$). In the secondary SPSS model, blood loss (aOR 1.001 per mL; $p < 0.001$) and labour dystocia (aOR 0.339; $p < 0.001$) were significant; oxytocin was not (aOR 0.781; $p = 0.080$). The Hosmer-Lemeshow test confirmed adequate model fit ($\chi^2=7.28$, $df = 8$, $p = 0.507$; Nagelkerke $R^2=0.062$). Results are presented in Table 4.

Table 4
Logistic regression: predictors of preterm birth.

Variable	B	SE	Wald χ^2	df	p-value	OR (95% CI)
Panel A, Primary model: anaemia + maternal age + parity (N = 3,664)						
Anaemia (Hb < 11 g/dL)	,	,	,	1	< 0.001	2.44 (1.60–3.71)
Maternal age (per year)	–0.042	0.010	16.80	1	< 0.001	0.959 (0.940–0.979)
Nulliparity	,	,	,	1	0.783	0.95 (0.66–1.37)
Panel B, SPSS model: blood loss + age + labour dystocia + oxytocin (N = 3,646; Nagelkerke R²=0.062)						
Blood loss (per 1 mL)	0.001	0.000	31.21	1	< 0.001	1.001 (1.001–1.001)
Maternal age (per year)	–0.042	0.010	16.80	1	< 0.001	0.959 (0.940–0.979)
Labour dystocia (abnormal)	–1.081	0.204	28.16	1	< 0.001	0.339 (0.228–0.506)
Oxytocin administration	–0.247	0.141	3.064	1	0.080	0.781 (0.592–1.030)
<i>aOR = adjusted odds ratio; SE = standard error. Panel A: logistic regression adjusted for anaemia, maternal age, and parity (N = 3,664). Panel B: SPSS model (N = 3,646). H-L = Hosmer-Lemeshow goodness-of-fit test (p = 0.507). Nagelkerke R²=0.062.</i>						

Dose-response analysis

A monotonic dose-response gradient was observed between anaemia severity and preterm birth rate (Table 5). Relative to the non-anaemic reference (6.4%), preterm rate rose progressively with decreasing haemoglobin: 20.2% in mild anaemia (OR 3.67, 95% CI 2.50–5.39; $p < 0.001$) and 25.8% in moderate anaemia (OR 5.06, 95% CI 2.22–11.52; $p < 0.001$). Both women with severe anaemia (Hb < 7.0 g/dL) delivered preterm, though this subgroup is too small for statistical inference.

Table 5
Anaemia severity and preterm birth rate, dose-response analysis.

Hb category	n	Preterm (n)	Preterm rate	OR (95% CI)	p-value
No anaemia ≥ 11 g/dL [reference]	3,483	224	6.4%	1.00 (reference)	,
Mild anaemia 9.0–10.9 g/dL	178	36	20.2%	3.67 (2.50–5.39)	< 0.001
Moderate anaemia 7.0– 8.9 g/dL	31	8	25.8%	5.06 (2.22– 11.52)	< 0.001
Severe anaemia < 7.0 g/dL	2	2	100%	Insufficient n	,
<i>ORs calculated versus non-anaemic reference group using 2x2 contingency tables. Severe anaemia group (n = 2) excluded from OR calculation (insufficient sample size). Pearson chi-squared test.</i>					

Discussion

Principal findings

This study of 3,683 singleton pregnancies at Latvia's largest obstetric institution demonstrates that first-trimester anaemia (Hb < 11 g/dL) independently more than doubles the adjusted odds of preterm birth (aOR 2.44, 95% CI 1.60–3.71; $p < 0.001$). The finding is robust to adjustment, supported by a significant continuous haemoglobin-outcome relationship ($p < 0.001$), confirmed by a dose-response gradient (OR range 3.67–5.06 for mild to moderate anaemia), and biologically coherent with established mechanistic pathways. To our knowledge, this is the first cohort-level estimate of this association from Latvia.

Contextualisation within the international literature

Our adjusted estimate of aOR 2.44 is consistent with published international data. Cohort studies report ORs of 1.35–2.42 across multiple continents [9–15]; two major meta-analyses report pooled RRs of 1.63 and 1.65 specifically for first-trimester anaemia [16, 17]. Our estimate lies at the upper end of this global range, which may reflect the use of the WHO cutoff (Hb < 11 g/dL) capturing both mild and moderate anaemia, a broader exposure than studies using lower thresholds, as well as haematological characteristics specific to the Latvian population. Latvia's wider preterm birth context has been characterised in recent national registry studies [21, 22], and iron status in Latvian pregnant women has been described by Rezgale et al. [6]; our findings add the first direct estimate of anaemia-specific preterm birth risk to this body of literature.

Biological mechanisms

The biological plausibility of the association is well established. Iron deficiency impairs uteroplacental oxygen delivery, upregulating CRH and precipitating prostaglandin-mediated uterine contractions and cervical ripening [7, 8]. Iron deficiency also promotes systemic oxidative stress and pro-inflammatory

cytokine release (IL-1 β , IL-6, TNF- α), established mediators of preterm labour [18, 19]. At the molecular level, disordered iron metabolism at the maternal-placental-fetal interface, including disrupted hepcidin-ferroportin signalling, has been observed in preterm births in human studies [7]. Furthermore, prenatal iron deficiency has been linked to offspring neurodevelopmental impairment, extending the clinical burden beyond delivery [20, 23]. The dose-response gradient observed in our data, with preterm rates of 6.4%, 20.2%, and 25.8% across no, mild, and moderate anemia categories, aligns with mechanisms functioning along a biological gradient dependent on hemoglobin.

Secondary outcomes

The significantly elevated NICU admission rate among anaemic women (13.0% vs. 7.4%; $p = 0.006$) is the downstream consequence of higher preterm rates, as prematurity is the primary driver of NICU admission. The lower oxytocin rate in anaemic women reflects the higher proportion of spontaneous preterm births in this group, which do not require augmentation. PROM, PPH, and labour dystocia did not differ significantly; however, the anaemia group ($n = 200$) was underpowered to detect modest secondary associations, and these null findings should not be interpreted as evidence of no difference. The inverse association between labour dystocia and preterm birth in the logistic model (aOR 0.339) reflects the well-known clinical reality that dystocia is predominantly a term complication.

Clinical implications

First-trimester haemoglobin screening is standard in Latvian antenatal care. Our findings argue that anaemia detection must trigger immediate, aggressive management rather than deferred supplementation. Specifically: iron supplementation should begin at the time of diagnosis; the aetiology of anaemia should be investigated (particularly thalassaemia trait, prevalent in Baltic populations, which does not respond to iron); women with moderate anaemia (Hb 7–9 g/dL) warrant enhanced surveillance given their 25.8% preterm rate; and even mild anaemia (20.2% preterm rate) represents high population-attributable risk as the most prevalent subgroup. Given Latvia's rapidly declining birth rate (12,571 births in 2024, the lowest in a century), optimising modifiable perinatal risk factors carries particular national demographic urgency [21].

Strengths and limitations

Strengths include the large single-centre cohort with uniform first-trimester haemoglobin measurement, use of the WHO-standard anaemia definition, rigorous non-parametric statistical testing, multivariate adjustment, dose-response analysis, and direct benchmarking against the international literature. This is, to our knowledge, the first such estimate from Latvia.

Limitations are as follows. (1) Retrospective design precludes causal inference and introduces potential selection and information biases. (2) BMI was unavailable, representing the most significant gap as obesity is associated with both anaemia and preterm birth. (3) The aetiology of anaemia was not recorded; distinguishing iron deficiency from thalassaemia trait would substantially strengthen mechanistic conclusions. (4) Data on iron supplementation prescriptions, dietary intake, smoking,

socioeconomic status, and comorbidities were unavailable. (5) The severe anaemia subgroup (n = 2) is too small for inference. (6) Multiparous women with a prior preterm birth before 35 weeks were not identified or excluded; recurrent preterm birth is a strong independent predictor and may have contributed residual confounding. (7) Indicated (iatrogenic) preterm births were not analyzed separately from spontaneous preterm births because these subtypes have different causes. The observed association may mainly be due to spontaneous preterm labor. Future studies should categorize cases by indication. (8) Ferritin levels were not analysed in this study; haemoglobin alone does not capture latent iron deficiency, and a proportion of non-anaemic women may have had depleted iron stores, potentially underestimating the true burden. (9) Data on iron supplementation during pregnancy were unavailable; if supplementation partially corrected haemoglobin before delivery, the first-trimester measurement may underestimate the effect of inadequately treated anaemia. (10) As a single-centre study, findings may not generalise beyond this institution.

Conclusions

First-trimester anaemia (Hb < 11 g/dL) independently more than doubles the adjusted odds of preterm birth (aOR 2.44, 95% CI 1.60–3.71; $p < 0.001$) in this cohort of 3,683 singleton pregnancies at Latvia's largest maternity centre, to our knowledge, the first cohort-level estimate of this association from Latvia. The finding is concordant with the international meta-analytic evidence (RR 1.65), supported by a significant continuous haemoglobin-outcome relationship and a clear dose-response gradient (ORs 3.67 and 5.06 for mild and moderate anaemia), and associated with significantly higher NICU admission rates (13.0% vs. 7.4%; $p = 0.006$). These findings support universal first-trimester haemoglobin screening and early, aggressive treatment of anaemia as a modifiable strategy for reducing preterm birth. Prospective studies incorporating BMI, anaemia aetiology, supplementation data, and stratification by preterm birth indication are warranted.

Declarations

Conflicts of interest:

None declared.

Ethics, Consent to Participate, and Consent to Publish

Ethics approval and consent to participate:

This study was approved by the RSU Research

Consent for publication:

Not applicable.

Competing interests:

The authors declare that they have no competing interests.

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Author Contribution

F.S. conceived the study, collected and analysed the data, and drafted the manuscript. A.M. and D.R. supervised the study design and critically revised the manuscript. All authors reviewed and approved the final manuscript.

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Data availability:

The datasets generated and analysed during this study are available from the corresponding author on reasonable request, subject to applicable ethical and data protection requirements.

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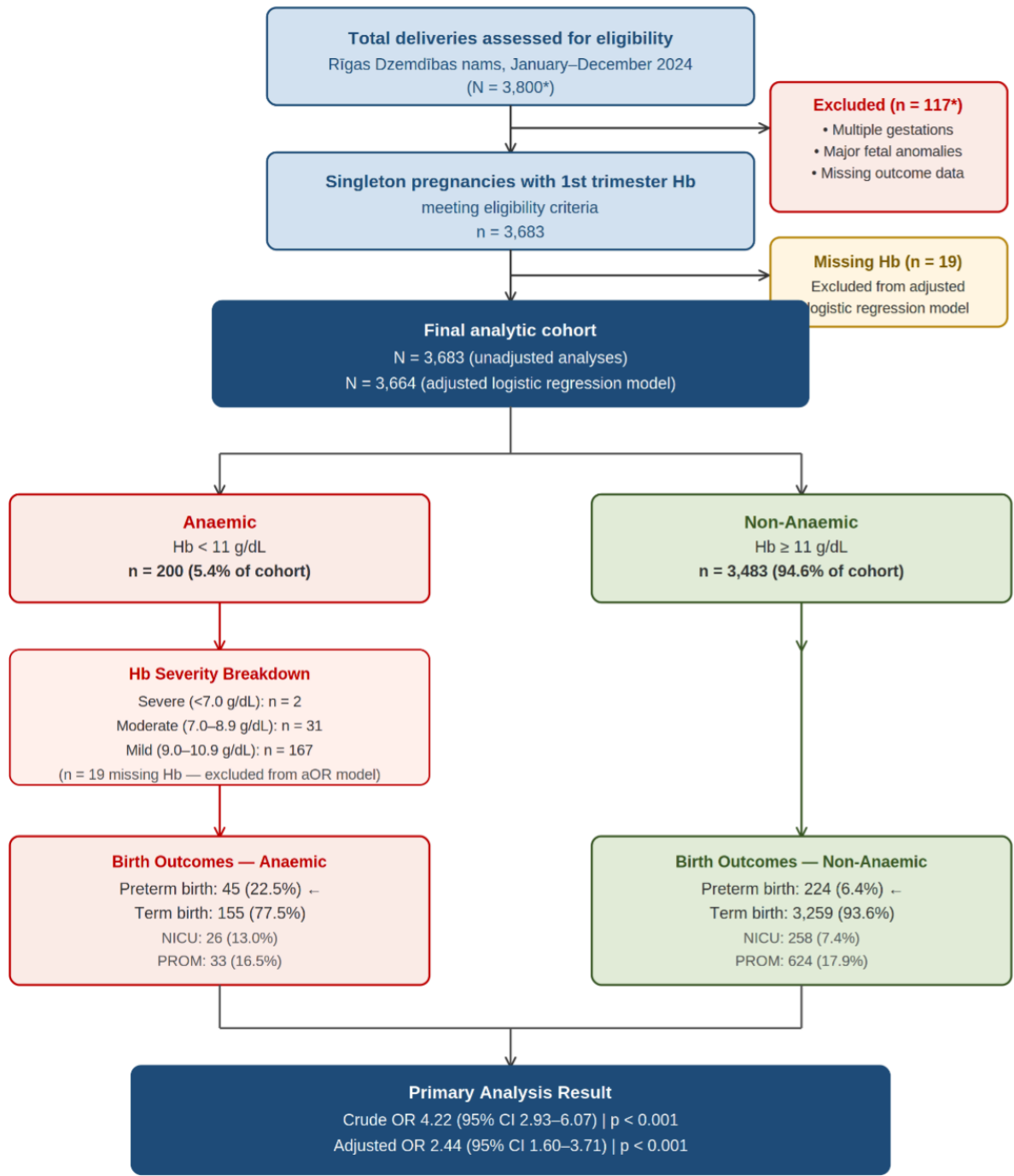
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Figures

Figure 1. CONSORT-Style Patient Inclusion and Allocation Flowchart



* Exact total screened and number excluded to be confirmed from hospital records prior to submission.

Hb = haemoglobin; OR = odds ratio; CI = confidence interval; aOR = adjusted odds ratio; NICU = neonatal intensive care unit; PROM = premature rupture of membranes.

Figure 1

CONSORT-style patient inclusion and allocation flowchart.

Women with singleton pregnancies and documented first-trimester haemoglobin measurements delivered at Rīgas Dzemdības nams, January–December 2024, were screened for inclusion. After exclusion of multiple gestations, major fetal anomalies, and missing outcome data, 3,683 women were included in the

*analytic cohort (unadjusted analyses). Of these, 19 (0.5%) had missing haemoglobin values and were excluded from the adjusted logistic regression model (N=3,664). Women were classified as anaemic (Hb <11 g/dL; n=200) or non-anaemic (Hb ≥11 g/dL; n=3,483). Hb = haemoglobin; OR = odds ratio; aOR = adjusted odds ratio; CI = confidence interval; NICU = neonatal intensive care unit; PROM = premature rupture of membranes. *Exact total screened to be confirmed from hospital records prior to submission.*