

Patterns of Facility Utilization and Birth Outcomes in Low-Risk Pregnancies: A Comparison of Primary and Higher-Level Health Facilities in Urban Indonesia

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Abstract

Background Global cesarean section (CS) rates have nearly doubled in the past two decades, with many countries exceeding the 10–15% threshold recommended by the WHO as medically necessary. While CS can be life-saving in certain obstetric emergencies, its unnecessary use increases maternal and neonatal risks and burdens health systems. In Indonesia, the influence of delivery facility type on CS rates among low-risk pregnancies remains underexplored.

Methods We conducted a cross-sectional analytical study using routinely collected maternal health data from a primary health care facility (Puskesmas) and a secondary-level referral hospital in Surabaya, Indonesia, from January 2023 to December 2024. All singleton pregnancies with a recorded Kartu Skor Poedji Rochjati (KSPR) score and documented delivery outcomes were eligible. Descriptive analyses were performed on the full cohort, while comparisons of CS and low birth weight (LBW) outcomes were restricted to women classified as low risk. Pearson's Chi-square test and multivariable logistic regression were used to compare outcomes and estimate adjusted odds ratios (aOR) with 95% confidence intervals (CI).

Results Despite being classified as low risk, most women delivered in secondary or tertiary facilities rather than in primary care. Maternal and neonatal outcomes did not significantly differ between facility types; however, delivery in tertiary facilities was independently associated with higher odds of CS (aOR 2.22; 95% CI 1.06–4.63) compared to primary facilities. No significant association was found between facility type and LBW.

Conclusion Facility level—not only clinical risk profile—appears to influence intervention rates in low-risk pregnancies. Strengthening the capacity, quality, and public trust in primary-level maternity care could help align service utilization with the intended referral system, reduce unnecessary interventions, and preserve higher-level resources for women with genuine obstetric risks.

Background

Over the last two decades, global cesarean section (CS) rates have nearly doubled—from around 12% in 2000 to over 21% by 2015—with some regions such as Latin America seeing rates above 40% (1). While CS can be life-saving in cases of obstetric complications, its routine or non-medically indicated use is associated with increased maternal and neonatal risks, including endometriosis (2), placenta accreta(3) and also contributes to escalating healthcare costs (4). Clinical guidelines estimate that CS rates beyond 10–15% may reflect overuse rather than need (5). In Indonesia and similar low-middle income settings, ensuring that CS is reserved for genuine clinical need—especially in low-risk pregnancies—is critical but under-examined.

The place of antenatal care (ANC) and delivery—primary healthcare centers (*Puskesmas*) versus higher-level hospitals—not only determines clinical management options but may also influence delivery mode due to infrastructure, provider availability, and referral patterns. Fragmented ANC and poor integration between facility tiers can undermine quality care and lead to defaults toward CS in

higher-level settings(6) This study examines differences in caesarean section (CS) rates and birth outcomes among low-risk pregnancies delivered in *Puskesmas* and hospital settings. It explores maternal characteristics by facility type, compares the prevalence of CS and low birth weight (LBW) between the two settings, and evaluates the association of these outcomes with selected predictors.

Method

Study design and setting

A cross-sectional analytical study was conducted using routinely collected maternal health data from two sources in Surabaya, Indonesia: (1) a primary health care facility (*Puskesmas*) and (2) a secondary-level referral hospital. The datasets were synchronized and merged in SPSS version 27 (IBM Corp., Armonk, NY, USA) with a binary indicator variable for facility type. Consecutive sampling was applied, meaning all available pregnancy records from routine service registers and electronic medical records between January 2023 and December 2024 were included if they met eligibility criteria.

Inclusion criteria were singleton pregnancies with a recorded Kartu Skor Poedji Rochjati (KSPR) score at the first antenatal care visit and documented delivery outcomes. Both low- and high-risk pregnancies (per KSPR classification) were included in the descriptive analysis to characterize the overall population. For analyses addressing the primary study objectives—comparison of cesarean section and low birthweight outcomes—only women classified as low-risk were analyzed. Records missing delivery mode or birthweight data were excluded from all analyses.

Study population

The target population comprised pregnant women classified as low obstetric risk according to the *Kartu Skor Poedji Rochjati* (KSPR), a standardized Indonesian antenatal risk scoring system that identifies high-risk pregnancies based on maternal history, clinical findings, and obstetric factors (7). For brevity, KSPR will be used throughout the manuscript. Women with documented high-risk features at booking—including obesity, previous uterine surgery, gestational hypertension, preeclampsia, or gestational diabetes mellitus (GDM)—were excluded from the low-risk analytic subgroup.

Statistical analysis

Descriptive statistics were computed for all study variables. Categorical variables were summarized as frequencies and column percentages. Because the *Puskesmas* and hospital groups had unequal sample sizes, proportions rather than raw counts were emphasized in descriptive comparisons. Comparisons between *Puskesmas* and hospital groups were assessed using Pearson's Chi-square test for categorical variables. All descriptive analyses were performed on the full dataset.

For the primary analysis, we conducted a subset analysis restricted to women classified as low risk according to the KSPR criteria. In this subset, bivariable comparisons were performed between facility groups, followed by multivariable binary logistic regression to estimate adjusted odds ratios (aOR) and 95% confidence intervals (CI) for each outcome. The two outcomes of interest were: (1) Caesarean section delivery (vs. vaginal birth) and (2) low birth weight (vs. birth weight ≥ 2500 g). Predictors included in the regression models were antenatal care (ANC) site, birth facility type, maternal age category, parity, and mid-upper arm circumference (MUAC). Reference categories were set as: *Puskesmas* for ANC site, primary facility for birth facility type, MUAC >23.5 cm, age <20 years, and nulliparous status for parity. All statistical tests were two-tailed, and p-values <0.05 were considered statistically significant. Analyses were conducted using SPSS version 27 (IBM Corp., Armonk, NY, USA).

Results

Table 1 Baseline maternal sociodemographic, clinical characteristics, and outcomes by facility type

Characteristic	Puskesmas (n= 641)	Hospital (n= 245)	χ^2	p-value
Age				
<20 y.o	45 (7 %)	7 (2.9 %)	15.423	<0.001*
21-34 y.o	487 (75.9 %)	170 (69.5 %)		
>35 y.o	109 (17.1 %)	68 (27.6 %)		
Parity				
Nulliparous	172 (27.4 %)	54 (22.0 %)	2.998	0.223
Primiparous	192 (30.6 %)	76 (28.4 %)		
Multiparous	263 (41.9 %)	115 (46.9%)		
BMI				
Underweight	41 (6.9 %)	3 (1.3 %)	51.899	<0.001*
Normal	257 (43 %)	65 (27.3 %)		
Overweight	183 (30.6 %)	72 (30.3 %)		
Obesity	117 (19.6 %)	98 (41.2 %)		
MUAC				
<23.5	78 (12.9 %)	10 (8 %)	2.305	0.129
>23.5	529 (87.1 %)	115 (92 %)		
Anemia				
Normal	374 (72.5 %)	178 (72.7 %)	3.640	0.303
Mild	116 (22.5%)	49 (20 %)		
Moderate	26 (5 %)	17 (6.9 %)		
Severe	0 (0.0%)	1 (0.4 %)		
Gestational Diabetes Mellitus (GDM)				
Yes	1 (0.2 %)	18 (7.3 %)	43.677	<0.001*
No	640 (99.8 %)	227 (92.7 %)		
Albuminuria				
Yes	79 (12.3 %)	68 (27.8 %)	97.977	<0.001*
No	433 (67.6%)	76 (31 %)		
History of Uterine Surgery				
Yes	80 (12.5 %)	128 (14.5 %)	157.106	<0.001*
No	561 (87.5 %)	116 (47.5 %)		
Gestational Hypertension (GHt)				
Yes	16 (2.5 %)	72 (29.4 %)	143.287	<0.001*
No	625 (97.5 %)	173 (70.6 %)		
Preeclampsia/Eclampsia				
Yes	30 (4.7 %)	25 (10.2 %)	9.289	0.002*
No	611 (95.3 %)	220 (89.8 %)		
KSPR				
Low risk	229 (35.7 %)	34 (13.9 %)	40.535	<0.001*
High risk	412 (64.3 %)	211 (86.1 %)		
Delivery at the same place as ANC				
Yes	128 (20.0 %)	245 (100 %)	465.747	<0.001*
No	452 (79.5 %)	0 (0.0 %)		
Birth Facility Type for Labour				
Primary	131 (20.4 %)	0 (0.0 %)	177.773	<0.001*
Secondary	336 (61.4 %)	245 (100 %)		
Tertiary	114 (17.8 %)	0 (0.0 %)		
Mode Delivery				
Caesarean section (CS)	265 (45.3 %)	172 (72.2 %)	49.600	<0.001*

Characteristic	<i>Puskesmas</i> (n= 641)	Hospital (n= 245)	χ^2	<i>p-value</i>
Vaginal Birth (VB)	320 (54.7 %)	67 (27.8 %)		
Low Birth Weight (LBW)				
Yes	65 (10.2 %)	29 (12.3 %)	0.805	0.370
No	574 (89.8 %)	207 (87.7 %)		
BMI (Body mass index). ANC (Antenatal Care). MUAC (Middle Upper Arm Circumference)				

Among 886 participants, 641 (72.3%) received antenatal care (ANC) at *Puskesmas* and 245 (27.7%) at hospitals (Table 1). Age distribution differed significantly between groups ($p < 0.001$), with the hospital group having a higher proportion of mothers aged >35 years (27.6% vs. 17.1%) and a lower proportion aged <20 years (2.9% vs. 7.0%).

Parity distribution was not significantly different between groups ($p = 0.223$). BMI categories differed significantly ($p < 0.001$), with obesity more common in the hospital group (41.2% vs. 19.6%) and underweight more common in the *Puskesmas* group (6.9% vs. 1.3%).

No significant difference was found in MUAC distribution ($p = 0.129$) or anemia severity ($p = 0.303$). However, gestational diabetes mellitus (GDM) was more prevalent in the hospital group (7.3% vs. 0.2%, $p < 0.001$). Similarly, albuminuria, history of uterine surgery, gestational hypertension, and preeclampsia/eclampsia were significantly more frequent in the hospital group (all $p < 0.01$).

KSPR risk classification also differed ($p < 0.001$), with high-risk pregnancies more common in the hospital group (86.1% vs. 64.3%). All hospital deliveries occurred at the same facility as ANC, while most *Puskesmas* patients delivered elsewhere ($p < 0.001$).

Regarding facility type for delivery, all hospital group deliveries occurred in secondary-level facilities, whereas *Puskesmas* patients delivered across primary (20.4%), secondary (61.4%), and tertiary (17.8%) facilities ($p < 0.001$). Caesarean section rates were higher in the hospital group (72.2% vs. 45.3%, $p < 0.001$), while low birth weight prevalence did not differ significantly ($p = 0.370$).

Table 2 Birth outcomes among low-risk pregnancies by facility type

Outcome (in low risk pregnancy)	<i>Puskesmas</i> (n= 229)	Hospital (n= 34)	(χ^2)	p-value
Birth Facility Type				
Primary	56 (24.6 %)	0 (0.0 %)	24.155	<0.001*
Secondary	123 (53.5 %)	34 (100%)		
Tertiary	50 (21.9 %)	0 (0.0 %)		
Delivery Mode				
Caesarean section (CS)	96 (41.6 %)	18 (54.8 %)	1.937	0.164
Vaginal Birth (VB)	133 (58.4 %)	16 (45.2 %)		
Low Birth Weight (LBW)				
Yes	20 (8.7 %)	6 (16.1 %)	1.718	0.190
No	209 (91.3 %)	28 (83.9 %)		

In the subset of low-risk pregnancies ($n = 263$), facility type for delivery differed significantly between groups ($p < 0.001$) (Table 2). All hospital patients delivered in secondary-level facilities, whereas *Puskesmas* patients delivered in primary (24.6%), secondary (53.5%), and tertiary (21.9%) facilities.

Mode of delivery did not differ significantly ($p = 0.164$), although caesarean section was more frequent among hospital patients (54.8% vs. 41.6%). Similarly, the prevalence of low birth weight was higher in the hospital group (16.1% vs. 8.7%) but did not reach statistical significance ($p = 0.190$).

Table 3 Multivariable Logistic Regression Results for low risk pregnancy outcome

Predictor	Caesarean section (CS)				Low Birth Weight (LBW)			
	Adjusted OR	95% CI Lower	95% CI Upper	p-value	Adjusted OR	95% CI Lower	95% CI Upper	p-value
ANC site								
<i>Puskesmas</i> (Ref)	-	-	-	-	-	-	-	-
Hospital	0.549	0.165	1.833	0.517	0.439	0.081	2.386	0.341
Birth Facility Type								
Primary (Ref)	-	-	-	-	-	-	-	-
Secondary	0.997	0.00	0.00	-	0.946	0.258	3.467	0.933
Tertiary	2.217	1.062	4.628	0.034*	0.459	0.136	1.547	0.209
MUAC								
>23.5 (Ref)	-	-	-	-	-	-	-	-
<23.5	0.797	0.308	2.061	0.640	1.483	0.313	7.036	0.620
Age								
<20 (Ref)	-	-	-	-	-	-	-	-
21-34	0.645	0.199	2.094	0.466	1.362	0.273	6.785	0.706
Parity								
Nullipara (Ref)	-	-	-	-	-	-	-	-
Primipara	1.176	0.524	2.639	0.694	0.825	0.246	2.771	0.756
Multipara	1.132	0.503	3.548	0.764	0.964	0.314	2.966	0.950

Multivariable binary logistic regression (Table 3) adjusting for ANC site, birth facility type, MUAC, age, and parity showed that, among low-risk pregnancies, delivering in a tertiary facility was associated with higher odds of caesarean section compared with primary facilities (adjusted OR = 2.217, 95% CI 1.062–4.628, $p = 0.034$). No other predictors were significantly associated with either caesarean section or low birth weight.

Discussion

In this study, we compared maternal characteristics and birth outcomes between *Puskesmas* and hospital settings, with a specific focus on low-risk pregnancies. In the full cohort, significant differences in maternal age distribution, BMI, and antenatal complications were observed, with hospitals managing a higher proportion of women aged >35 years, those with obesity, and those with conditions such as gestational diabetes, albuminuria, or hypertensive disorders. These differences align with the intended role of hospitals in the Indonesian referral system, where higher-level facilities are designed to manage complex or high-risk pregnancies (8).

When the analysis was restricted to low-risk pregnancies, the characteristics of women became more comparable across facility types. However, an interesting pattern emerged regarding their choice of delivery location: even without identifiable medical risk factors, most low-risk women delivered in secondary facilities, and a notable proportion in tertiary hospitals, rather than primary care settings. This trend may reflect perceptions of higher safety and better resources in larger hospitals. For instance, studies suggest that women often prefer hospitals due to better availability of medications, improved care for both mother and baby, cultural norms around childbirth, or limited confidence in the capacity of primary care facilities to manage delivery. (9–11). Such utilization patterns may contribute to overburdening higher-level facilities and reducing efficiency in the referral system (12).

In terms of outcomes, caesarean section rates remained higher in hospitals (54.8%) compared to *Puskesmas* (41.6%) among low-risk women, although this difference was not statistically significant ($p=0.164$). Low birth weight prevalence was also slightly higher in hospital deliveries (16.1% vs. 8.7%), but again without significant difference. Multivariable analysis indicated that tertiary facility delivery was independently associated with increased odds of caesarean section (aOR 2.22; 95% CI 1.06–4.63) compared to primary facilities, whereas ANC site, MUAC, age, and parity were not significant predictors for either outcome. These results suggest that facility level—not just patient risk profile—may influence intervention rates. Although we cannot always predict complications that may arise during normal labor—such as obstructed labor, fetal distress, or abnormal presentation—that could ultimately require a caesarean section, awareness of these potential risks is essential for planning safe deliveries. (13).

The persistence of higher CS rates in tertiary facilities, even for low-risk women, may be influenced by the greater availability of surgical capacity, differing clinical practices, and possibly defensive medicine. International literature has documented that higher-level hospitals often have lower thresholds for intervention, particularly when specialist obstetric care is readily available(14). While this may be beneficial in emergencies, it raises concerns about the potential overuse of caesarean delivery in populations where vaginal birth is safe and recommended. A study showed that Indonesian women generally preferred vaginal delivery, promotional messaging about enhanced recovery after caesarean (ERACS) framed CS as an “advanced” procedure offering comfort and faster recovery, influencing some to view it as equal or superior to vaginal birth. Changes in delivery preferences near birth were often driven by obstetricians’ recommendations, with many women reporting insufficient information on the risks and benefits of each mode and feeling disappointed when their actual birth did not match their preferences (15).

These findings have important implications for maternal health policy and service delivery. Strengthening public confidence in primary-level birth facilities—through adequate staffing, equipment, and training—may encourage low-risk women to utilize these settings. Concurrently, standardized clinical guidelines and consistent monitoring across all facility levels are needed to ensure that caesarean sections are performed only for clear medical indications. Reducing unnecessary utilization of secondary and tertiary facilities for low-risk births could improve system efficiency, lower healthcare costs, and ensure that higher-level resources remain available for women who truly require specialized care.

Strengths and Limitations

This study focuses exclusively on low-risk pregnancies, reducing confounding from maternal comorbidities and allowing clearer assessment of facility type and ANC site in relation to birth outcomes. Including both primary and higher-level facilities provides insight into service utilization patterns across the referral network. The use of multivariable logistic regression allowed adjustment for ANC site, maternal age, parity, MUAC, birth facility type.

Several limitations should be acknowledged. Facility-based research in low- and middle-income countries (LMICs) is often constrained by variations in record-keeping systems, non-standardized variable definitions, and inconsistent data-entry practices. In this study, hospital data export restrictions and incomplete primary care records reduced the available sample size, necessitating a complete-case analysis. These limitations may have reduced statistical power, particularly for less common outcomes. Additionally, as an observational study, residual confounding from unmeasured factors—such as socioeconomic status or patient preference—cannot be ruled out. This study also lacked data on complications arising during caesarean sections in low-risk pregnancies. Future research

would benefit from standardized, interoperable data systems and prospective data collection to enhance robustness and comprehensiveness.

Conclusion

This study found that, despite being classified as low risk, most women in our cohort delivered in secondary and tertiary facilities rather than in primary care settings. While maternal and neonatal outcomes did not significantly differ by facility type, delivery in tertiary facilities was associated with higher odds of caesarean section. These patterns suggest that factors beyond clinical risk—such as patient preference, perceived quality, and health system organization—are shaping delivery site choices and intervention rates. Strengthening the capacity, quality, and public trust in primary-level maternity care could help align service utilization with the intended referral system, optimize resource use, and ensure that higher-level facilities remain accessible for women with genuine obstetric risks.

Abbreviation

CS: Caesarean Section

ANC: Antenatal Care

KSPR: *Kartu Skor Poedji Rochjati* (Poedji Rochjati Score Card)

aOR: Adjusted Odds Ratio

CI: Confidence Interval

MUAC: Mid-Upper Arm Circumference

y.o.: Years Old

BMI: Body Mass Index

GDM: Gestational Diabetes Mellitus

GHT: Gestational Hypertension

VB: Vaginal Birth

LBW: Low Birth Weight

LMIC: Low- And Middle-Income Countries

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Authors Contribution

AR: Conceptualization, Methodology, Formal analysis, Writing – original draft, Project administration.

NC: Data curation, Validation, Writing – review & editing.

QA: Investigation, Resources, Data curation.

BP: Supervision, Visualization, Writing – review & editing.

EG: Supervision, Writing – review & editing.

All authors have read and approved the final manuscript.

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Data Availability

Data is provided within the manuscript.

Declaration

Ethics approval and consent to participate

This study was approved by the Airlangga University Dental Medicine Health Research Ethical Clearance Commission (Approval No. 0118/HRECC.FODM/II/2025, issued on February 6, 2025) and also Haji General Hospital Health Research Ethical Clearance Commission. The study was conducted in accordance with the principles of the Declaration of Helsinki. Given the retrospective design that relied solely on existing medical records, written informed consent was not applicable, and the requirement for informed consent was formally waived by the Ethics Committee.

Consent for Publication

Not Applicable

Competing Interest

The authors declare that they have no competing interests.

References

1. Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: Global and regional estimates. *BMJ Glob Health*. 2021 Jun 15;6(6).
2. Zhang P, Sun Y, Zhang C, Yang Y, Zhang L, Wang N, et al. Cesarean scar endometriosis: Presentation of 198 cases and literature review. Vol. 19, *BMC Women's Health*. BioMed Central Ltd.; 2019.
3. Alavi SM, Arjmandnia MH, Feizollahjani M, Noori E, Yousefi M. Placenta Accreta Spectrum; Risk Factors, Complications, Advantages and Disadvantages to Decrease Maternal Morbidity and Mortality. *Journal of Obstetrics, Gynecology and Cancer Research*. 2024 Sep 1;9(5):516–21.
4. Haider MR, Rahman MM, Moinuddin M, Rahman AE, Ahmed S, Khan MM. Ever-increasing Caesarean section and its economic burden in Bangladesh. *PLoS One*. 2018 Dec 1;13(12).
5. World Health Organization. WHO Statement on Caesarean Section Rates. 2015.
6. Fabbro MRC, Wernet M, Baraldi NG, de Castro Bussadori JC, Salim NR, Souto BGA, et al. Antenatal care as a risk factor for caesarean section: a case study in Brazil. *BMC Pregnancy Childbirth*. 2022 Dec 1;22(1).
7. Sihotang J, Hidayatullah A. Kartu Skor Pedji Rochyati in the Indonesian Maternal Referral System. *Journal of Obstetrics & Gynecology Science* [Internet]. 2024;32(1):44–53. Available from: <https://e-journal.unair.ac.id/MOG/>
8. Ryan LM, Mahmood MA, Mufiddah I, Yulianti M, Laurence CO. Concomitant illnesses in pregnancy in Indonesia: A health systems analysis at a District level. *PLoS One*. 2022 Dec 1;17(12 December).
9. Bhattacharyya S, Srivastava A, Roy R, Avan BI. Factors influencing women's preference for health facility deliveries in Jharkhand state, India: A cross sectional analysis. *BMC Pregnancy Childbirth*. 2016;16(1).
10. Efendi F, Ni'Mah AR, Hadisuyatmana S, Kuswanto H, Lindayani L, Berliana SM. Determinants of facility-based childbirth in Indonesia. *Scientific World Journal*. 2019;2019.
11. Konlan KD, Baku EK, Japiong M, Dodam Konlan K, Amoah RM. Reasons for Women's Choice of Elective Caesarian Section in Duayaw Nkwanta Hospital. *J Pregnancy*. 2019;2019.
12. Murray SF, Pearson SC. Maternity referral systems in developing countries: Current knowledge and future research needs. *Soc Sci Med* [Internet]. 2006;62(9):2205–15. Available from: <https://www.sciencedirect.com/science/article/pii/S0277953605005514>
13. Abebe FE, Gebeyehu AW, Kidane AN, Eyassu GA. Factors leading to cesarean section delivery at Felegehiwot referral hospital, Northwest Ethiopia: A retrospective record review. Vol. 13, *Reproductive Health*. BioMed Central Ltd.; 2016.
14. Glantz JC. *Obstetric Variation, Intervention, and Outcomes: Doing More but Accomplishing Less*. 2012.
15. Zahroh RI, Hazfiarini A, Martiningtyas MAD, Ekawati FM, Emilia O, Cheong M, et al. Rising caesarean section rates and factors affecting women's decision-making about mode of birth in Indonesia: a longitudinal qualitative study. *BMJ Glob Health*. 2024 Jun 18;9(6).