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PARITY AND LOW BIRTH WEIGHT AT PELAMONIA HOSPITAL TK.II, MAKASSAR: A CASE-CONTROL STUDY

PARITAS DAN BERAT BADAN LAHIR RENDAH DI RUMAH SAKIT TK.II PELAMONIA, MAKASSAR: STUDI KASUS-KONTROL

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Abstract

Low birth weight (LBW) remains a major maternal and neonatal health concern because it reflects the combined influence of fetal growth, gestational age, maternal health, nutrition, social determinants, and antenatal care. Parity is an important obstetric characteristic, but its association with LBW is complex and may differ between first pregnancies and very high parity. This study aimed to analyze the association between parity and LBW at Pelamonia Hospital TK.II, Makassar, using Spearman's rank correlation, while retaining the odds ratio (OR) as an epidemiological measure of association. This study was a analysis of secondary data from an observational case-control study. The analytic sample comprised 52 mothers, including 13 LBW cases and 39 non-LBW controls (1:3 ratio). High-risk parity was defined as parity 1 or ≥4, while low-risk parity was defined as parity 2–3. Descriptive analysis summarized maternal characteristics. The bivariate association was tested using Spearman's rho at α=0.05. Among LBW cases, 69.2% of mothers had high-risk parity, compared with 33.3% among controls. Spearman's analysis showed a positive, statistically significant, but weak association between parity category and LBW (r_s=0.315; p=0.023). The crude OR was 4.50 (95% CI: 1.163–17.409), indicating higher odds of LBW among mothers in the high-risk parity group. Parity was significantly associated with LBW in this dataset, but the weak correlation and wide confidence interval indicate that parity should be interpreted as one component of a broader multifactorial risk structure rather than as an isolated causal factor.

Keywords : Low Birth Weight, Parity, Case-Control, Maternal Health, Antenatal Care.

Abstrak

Berat badan lahir rendah (BBLR) tetap menjadi masalah kesehatan ibu dan neonatus yang utama karena mencerminkan pengaruh gabungan dari pertumbuhan janin, usia kehamilan, kesehatan ibu, status gizi, determinan sosial, dan perawatan antenatal. Paritas merupakan karakteristik obstetri yang

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penting, namun kaitannya dengan BBLR bersifat kompleks dan dapat berbeda antara kehamilan pertama dengan paritas yang sangat tinggi. Penelitian ini bertujuan untuk menganalisis hubungan antara paritas dan BBLR di Rumah Sakit TK.II Pelamonia, Makassar, dengan menggunakan korelasi peringkat Spearman, serta menggunakan *odds ratio* (OR) sebagai ukuran asosiasi epidemiologis. Studi ini merupakan analisis data sekunder dari penelitian observasional dengan rancangan kasus-kontrol. Sampel analisis terdiri dari 52 ibu, yang mencakup 13 kasus BBLR dan 39 kontrol non-BBLR (rasio 1:3). Paritas risiko tinggi didefinisikan sebagai paritas 1 atau ≥4, sedangkan paritas risiko rendah didefinisikan sebagai paritas 2–3. Analisis deskriptif digunakan untuk merangkum karakteristik ibu. Hubungan bivariat diuji menggunakan koefisien korelasi Spearman (*Spearman's rho*) pada tingkat signifikansi α=0,05. Di antara kasus BBLR, 69,2% ibu memiliki paritas risiko tinggi, dibandingkan dengan 33,3% pada kelompok kontrol. Analisis Spearman menunjukkan hubungan yang positif, signifikan secara statistik, namun lemah antara kategori paritas dan BBLR (r_s=0,315; p=0,023). Nilai *crude* OR adalah 4,50 (IK 95%: 1,163–17,409), yang menunjukkan peluang BBLR yang lebih tinggi pada ibu dengan paritas risiko tinggi. Paritas terbukti berhubungan secara signifikan dengan BBLR dalam kumpulan data ini; namun, korelasi yang lemah dan interval kepercayaan yang lebar menunjukkan bahwa paritas sebaiknya dipandang sebagai salah satu komponen dari struktur risiko multifaktorial yang lebih luas, bukan sebagai faktor penyebab yang berdiri sendiri.

Kata Kunci : Berat Badan Lahir Rendah, Paritas, Kasus-Kontrol, Kesehatan Ibu, Asuhan Antenatal.

1. INTRODUCTION

Low birth weight (LBW), defined by the World Health Organization (WHO) as a birth weight of less than 2,500 g, remains a major global public health problem because it is strongly associated with neonatal morbidity and mortality as well as adverse health consequences later in life (World Health Organization [WHO], 2025). Global progress has been slow: the prevalence of LBW declined only slightly from approximately 15.0% in 2012 to 14.7% in 2020, prompting WHO Member States to extend the global target of a 30% reduction in LBW to 2030 (WHO, 2025). A systematic global analysis estimated that approximately 19.8 million newborns were affected by LBW in 2020, demonstrating the continuing scale of the problem (Okwaraji et al., 2024).

LBW is not a single biological entity. It may result from preterm birth, fetal growth restriction leading to small-for-gestational-age birth, or a combination of both. These pathways have different clinical implications, but both contribute to the broader group of vulnerable newborns at increased risk of death, infection, impaired growth, and neurodevelopmental consequences (Lawn et al., 2023). Accordingly, LBW is increasingly understood as an outcome produced by interconnected maternal, fetal, placental, behavioral, social, and health-service determinants.

In Indonesia, LBW remains an important maternal-child health concern. The 2023 Indonesian Health Survey reported a history of LBW among children aged 0–59 months of approximately 6.1% based on documented birth weight and 6.2% when documented records and maternal recall were combined (Badan Kebijakan Pembangunan Kesehatan [BKPK], 2024). National analyses have also demonstrated that LBW is associated with inadequate antenatal care (ANC), low maternal education, birth spacing, maternal age, nutritional conditions, smoking exposure, socioeconomic context, and access to health services (Safitri et al., 2022; Ekoriano et al., 2025). These findings emphasize that prevention cannot focus on a single obstetric characteristic.

Parity is one maternal characteristic that may influence fetal growth through biological and contextual pathways. Nulliparity has repeatedly been associated with lower birth weight,

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whereas evidence concerning grand multiparity is more heterogeneous. A systematic review and meta-analysis reported increased odds of LBW among nulliparous women, but did not demonstrate a similarly consistent pattern for grand multiparity (Shah & Knowledge Synthesis Group on Determinants of LBW/PT Births, 2010). More recent studies support a non-linear relationship. In a cohort of uncomplicated term singleton pregnancies, neonates born to nulliparous women had lower birth-weight percentiles and higher odds of small anthropometric measurements, while the positive effect of increasing parity appeared to plateau at approximately parity two (Melamed et al., 2024).

Evidence from the Global Network Maternal Newborn Health Registry similarly showed that nulliparity was independently associated with lower birth weight even after adjustment for maternal age, height, education, ANC attendance, hypertensive disorders, and socioeconomic status (Garces et al., 2020). Conversely, large studies of grand multiparity have shown a more complex pattern: some maternal and neonatal complications increase at very high parity, but small-for-gestational-age or LBW outcomes do not consistently rise in a dose-response manner after adjustment for relevant covariates (Alkwai et al., 2023; Peled et al., 2024).

These inconsistencies are biologically plausible because parity is interrelated with interpregnancy interval, maternal nutritional depletion, anemia, hypertensive disorders, smoking exposure, maternal age, and access to ANC. A meta-analysis found that short interpregnancy intervals increase the odds of LBW and other adverse perinatal outcomes (Wang et al., 2022). An umbrella review also identified maternal underweight, anemia, hypertension, and smoking as important risk factors for LBW (Arabzadeh et al., 2024). Adequate ANC may modify these pathways through nutritional counseling, iron-folate supplementation, detection of hypertensive disease, and monitoring of fetal growth (WHO, 2016; Engdaw et al., 2023).

The original dataset from Pelamonia Hospital TK.II, Makassar, showed a higher proportion of high-risk parity (parity 1 or ≥4) among LBW cases than among non-LBW controls. The present manuscript analyzes these data using Spearman's rank correlation, as specified in the revised final research report, to quantify the direction and strength of the relationship between parity category and LBW. Because the source design was case-control, the crude odds ratio is also reported to preserve an epidemiologically meaningful measure of group contrast. This study therefore aimed to analyze the association between parity and LBW among mothers delivering at Pelamonia Hospital TK.II, Makassar.

2. RESEARCH METHOD

LBW is an outcome of impaired fetal growth, shortened gestation, or both. The maternal environment influences fetal growth through placental perfusion, nutritional substrate availability, oxygen delivery, inflammatory processes, and endocrine adaptation. Consequently, maternal factors rarely act in isolation. Recent evidence synthesis has identified hypertension, smoking, maternal underweight, anemia, and inadequate pregnancy care as recurring determinants of LBW across different populations (Arabzadeh et al., 2024).

Parity may affect fetal growth through several pathways. First pregnancies are characterized by a maternal cardiovascular and uteroplacental adaptation that differs from later pregnancies. Epidemiological studies show that firstborn infants tend to be smaller than later-born infants, suggesting that parity is associated with both skeletal growth and body composition (Garces et al., 2020; Melamed et al., 2024). However, the relationship is not linear. The increase in fetal size

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associated with parity appears to diminish after the second pregnancy, and very high parity is influenced by a different set of clinical and social conditions.

Grand multiparity may coincide with older maternal age, anemia, cumulative nutritional depletion, shorter birth spacing, chronic disease, and differences in healthcare utilization. Nevertheless, contemporary studies indicate that grand multiparity itself is not uniformly associated with poorer fetal growth after accounting for these covariates (Alkwai et al., 2023; Peled et al., 2024). This means that combining primiparity and high parity into one 'high-risk' category is useful for screening but may combine biologically different mechanisms.

The conceptual framework used in this study therefore positions parity as the primary exposure, LBW as the outcome, and uteroplacental adaptation, interpregnancy interval, and maternal nutritional depletion as plausible intermediate pathways. Maternal age, anemia, nutritional status, hypertension, smoking, education, and socioeconomic conditions may act as confounders or parallel determinants, while ANC may act as an important protective modifier because it provides opportunities for screening and intervention (WHO, 2016; Safitri et al., 2022; Engdaw et al., 2023). Because these variables were not all available in the source dataset, the present analysis evaluates the crude bivariate association and interprets it within this broader causal framework.

3. RESULT AND DISCUSSION

Respondent Characteristics

A total of 52 maternal records were analyzed. Most mothers were aged 20–30 years (86.5%), had completed senior high school (55.8%), and were housewives (80.8%). These characteristics are relevant to interpretation because education, occupation, and healthcare access may influence nutritional status, ANC utilization, and reproductive behavior.

Table 1. Characteristics of respondents (n=52)

Variable	Category	n	%
Age	20–30 years	45	86.5
	>30 years	7	13.5
Education	Primary school	5	9.6
	Junior high school	13	25.0
	Senior high school	29	55.8
	Higher education	5	9.6
Occupation	Housewife	42	80.8
	Self-employed	5	9.6
	Civil servant	1	1.9
	Honorary worker	2	3.8
	Private employee	2	3.8

Source: Secondary data from the original in 2026.

Parity Distribution and LBW Status

High-risk parity was present in 22 mothers (42.3%) and low-risk parity in 30 mothers (57.7%). Among LBW cases, 9 of 13 mothers (69.2%) had high-risk parity. In contrast, only 13 of 39 mothers (33.3%) in the non-LBW control group had high-risk parity. The distribution therefore showed a visibly greater concentration of high-risk parity among LBW cases.

Table 2. Cross-tabulation of parity category and LBW status

Parity category	LBW n	LBW %	Non-LBW n	Non-LBW %	Total
High risk (1 or ≥4)	9	69.2	13	33.3	22
Low risk (2–3)	4	30.8	26	66.7	30
Total	13	100.0	39	100.0	52

Source: Secondary data from the original in 2026.

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Bivariate Association

Spearman's rank correlation produced r_s=0.315 with p=0.023. Because p<0.05, the association was statistically significant. The positive coefficient indicates that the higher-risk parity category tended to occur with the LBW outcome category; however, the magnitude of 0.315 indicates a weak relationship. The crude OR was 4.50 (95% CI: 1.163–17.409), indicating that the odds of LBW were approximately 4.5 times higher among mothers in the high-risk parity group than among those in the low-risk parity group. The wide confidence interval indicates limited precision, consistent with the small number of LBW cases.

Table 3. Spearman correlation and crude odds ratio for parity and LBW

Analysis	Estimate	95% CI	p-value	Interpretation
Spearman's rho	0.315	—	0.023	Positive, weak, statistically significant
Crude odds ratio	4.50	1.163–17.409	—	Higher odds of LBW in the high-risk parity group

Note: OR is presented as an epidemiological measure of association for the case-control data; Spearman's rho is the primary bivariate correlation statistic

DISCUSSION AND ANALYSIS OF FINDINGS

The main finding of this reanalysis was a statistically significant but weak positive association between parity category and LBW (r_s=0.315; p=0.023). This distinction between statistical significance and effect magnitude is important. The p-value indicates that the observed association is unlikely to be explained solely by random sampling variation under the null hypothesis, while the correlation coefficient indicates that parity accounts for only a limited portion of the pattern in LBW status. This is consistent with contemporary evidence describing LBW as a multifactorial outcome rather than the consequence of a single maternal characteristic (Arabzadeh et al., 2024; WHO, 2025).

The distribution of parity categories was clinically notable: 69.2% of LBW cases were in the high-risk parity group compared with 33.3% of controls. The crude OR of 4.50 supported a substantial contrast between the two groups. Nevertheless, the 95% CI was wide (1.163–17.409), reflecting considerable uncertainty around the point estimate. With only 13 LBW cases, a small change in cell counts could materially alter the OR. Therefore, the estimate should be interpreted as evidence of association in this dataset rather than as a precise population effect or a causal risk estimate.

The result is consistent with evidence concerning first pregnancies. Shah and the Knowledge Synthesis Group on Determinants of LBW/PT Births (2010) reported increased odds of LBW among nulliparous women. Garces et al. (2020) also found lower mean birth weight and gestational-age-adjusted weight among infants of nulliparous women across several low- and middle-income settings, and the association persisted after adjustment for maternal and socioeconomic variables. These findings support the inclusion of parity one as an obstetric marker that may identify women requiring closer fetal-growth surveillance.

More recent evidence adds important nuance. Melamed et al. (2024) reported that, even in uncomplicated term singleton pregnancies, infants of nulliparous women had lower birth-weight percentiles, head circumference, length, ponderal index, and neonatal body mass index than infants of multiparous women. Most anthropometric measures increased with parity until approximately parity two and then plateaued. This pattern suggests that parity is associated with fetal growth in a non-linear manner, which is conceptually different from assuming that every additional birth continuously increases or decreases LBW risk.

One biological explanation involves uteroplacental adaptation. Maternal vascular remodeling and uterine perfusion in a first pregnancy may differ from subsequent pregnancies, potentially influencing placental efficiency and fetal growth. However, the present study did not include placental Doppler measurements, biomarkers, serial fetal-growth assessments, or gestational-age-specific growth indicators. Consequently, uteroplacental mechanisms should be considered literature-

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supported explanations rather than mechanisms directly demonstrated by this dataset (Garces et al., 2020; Melamed et al., 2024).

The high-risk parity category in this study also included parity ≥4, but evidence for very high parity is more heterogeneous. Alkwai et al. (2023) found that grand multiparity was not independently associated with several adverse neonatal outcomes after maternal age was considered. In a multicenter cohort of more than 250,000 deliveries, Peled et al. (2024) found that very high parity was associated with selected maternal and neonatal complications, while the likelihood of small-for-gestational-age birth was not consistently increased. These findings imply that primiparity and grand multiparity may represent different biological and epidemiological pathways even when they are combined operationally into one screening category.

This heterogeneity helps explain why the OR in the present analysis was relatively large while the Spearman correlation remained weak. The OR measures the contrast in odds between two groups, whereas Spearman's rho summarizes the consistency and strength of the monotonic relationship across ranked categories. In a small 2×2 dataset, a marked difference between groups can generate a sizable OR while the overall correlation remains weak. The two statistics therefore answer different questions and should be interpreted together rather than treated as contradictory findings.

Interpregnancy interval is another important pathway. Wang et al. (2022) reported that short interpregnancy intervals were associated with increased odds of LBW, preterm birth, very preterm birth, and small-for-gestational-age outcomes. Among multiparous women, closely spaced pregnancies may limit maternal physiological and nutritional recovery. Because birth spacing was not available in the Jongaya dataset, part of the observed parity–LBW association may reflect unmeasured differences in interpregnancy interval.

Maternal nutritional status and anemia are also plausible confounders or mediators. Arabzadeh et al. (2024) found consistent evidence linking maternal underweight and anemia with LBW. Repeated pregnancies, particularly when closely spaced, may intensify iron and energy depletion in some women, but the magnitude of this effect depends on diet, supplementation, socioeconomic status, and access to pregnancy care. Therefore, explanations based solely on 'uterine exhaustion' or parity itself would be biologically oversimplified without direct nutritional and hematological data.

Smoking exposure can independently impair fetal growth. A meta-analysis of 55 cohort studies reported an increased risk of LBW among women who smoked during pregnancy and demonstrated a dose-response relationship with cigarette exposure (Di et al., 2022). Household second-hand smoke is also relevant in many communities, including Indonesia. Smoking was not recorded in the source dataset, so residual confounding by active or passive exposure cannot be excluded.

Hypertensive disorders are another major concern because they may reduce uteroplacental blood flow and impair fetal growth. The umbrella review by Arabzadeh et al. (2024) identified maternal hypertension as one of the strongest maternal factors associated with LBW. The absence of information on chronic hypertension, gestational hypertension, preeclampsia, placental disorders, and multiple pregnancy in this dataset limits the extent to which the observed association can be attributed specifically to parity.

ANC has the potential to modify many of these risks. WHO recommends a minimum of eight ANC contacts to improve maternal and fetal assessment, identify complications, provide nutritional counseling and micronutrient supplementation, and support timely referral (WHO, 2016). A systematic review and meta-analysis found that ANC utilization was associated with lower odds of LBW (Engdaw et al., 2023). In Indonesia, Safitri et al. (2022) reported that inadequate ANC was independently associated with LBW. Thus, women with parity-based risk markers may still have favorable birth outcomes when modifiable risks are detected and managed effectively.

Socioeconomic and educational factors should also be considered. Safitri et al. (2022) identified low maternal education as a determinant of LBW in Indonesia, while Ekoriano et al. (2025) demonstrated that rural residence, smoking, poor nutrition, maternal age, and birth spacing were significantly associated with LBW in a large national dataset. In the present sample, most mothers had

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completed senior high school and were housewives, but these variables were not entered into a multivariable model. Their descriptive distribution therefore cannot be interpreted as evidence that education or occupation was unrelated to LBW.

Age matching in the original study was a methodological strength because it reduced variation due to maternal age extremes. At the same time, this design choice limits generalizability to adolescent mothers and women older than 35 years, who may have different obstetric risk profiles. The findings are therefore most applicable to women within the matched reproductive-age range represented in the source sample.

From a clinical and public-health perspective, parity should be used as a screening marker rather than interpreted deterministically. Primiparous women may benefit from intensified counseling on nutrition, ANC adherence, danger signs, and birth preparedness. Women with higher parity may require additional assessment of birth spacing, anemia, chronic disease, nutritional status, and postpartum family-planning needs. Such an approach is consistent with WHO's emphasis on comprehensive maternal care and with current evidence that LBW prevention requires coordinated action across multiple maternal and health-system determinants (WHO, 2016, 2025).

Methodologically, Spearman's rank correlation was used in this reanalysis to comply with the analytical framework of the revised final report. Because both primary variables were ultimately dichotomous after categorization, Spearman's rho provides a measure of bivariate association but does not control confounding. For a case-control study intended for etiological inference, multivariable logistic regression would be more informative because it could estimate adjusted odds ratios for parity after controlling for anemia, nutritional status, hypertension, birth spacing, smoking, ANC, gestational age, and other relevant covariates. Future research should therefore use a larger sample, retain parity as separate categories where possible, and apply multivariable modeling.

The study has several limitations. The sample was small, particularly the LBW case group; the analysis relied on secondary data; several clinically important covariates were unavailable; parity one and parity ≥4 were combined despite potentially different mechanisms; and the case-control design does not estimate population incidence or absolute risk. In addition, LBW was analyzed as a binary outcome without information on prematurity versus fetal growth restriction. These limitations are important when interpreting both the weak Spearman coefficient and the wide OR confidence interval. Nevertheless, the findings provide a locally relevant epidemiological signal that is broadly compatible with international evidence on parity—especially first pregnancy—and fetal growth.

Study Limitations

This study was limited by its small sample size, secondary-data design, and the absence of several potential confounders, including gestational age, hemoglobin concentration, maternal nutritional status, hypertensive disorders, smoking exposure, multiple pregnancy, birth spacing, and detailed ANC quality. The operational grouping of parity 1 and parity ≥4 also combines two biologically distinct groups. Furthermore, Spearman's rho is a bivariate statistic and does not provide adjusted effect estimates. These limitations restrict causal interpretation and external generalizability.

4. CONCLUSION

Parity was significantly associated with LBW in the Pelamonia Hospital TK.II dataset. Mothers in the high-risk parity category were more frequently represented among LBW cases, and Spearman's rho showed a positive, statistically significant, but weak relationship (r_s=0.315; p=0.023). The crude OR of 4.50 (95% CI: 1.163–17.409) indicated higher odds of LBW in the high-risk parity group, although the wide confidence interval demonstrated limited precision.

These findings support the use of parity as one component of maternal risk stratification rather than as an isolated causal determinant. Antenatal services should integrate parity history with assessment of birth spacing, maternal nutrition, anemia, hypertension, smoking exposure, gestational age, and fetal growth. Future studies should separate primiparity, multiparity, and grand multiparity, recruit larger samples, and use multivariable logistic regression to estimate adjusted associations.

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CONFLICT OF INTEREST

The authors declare no conflict of interest related to this manuscript.

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