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THE ASSOCIATION BETWEEN BIRTH WEIGHT AND PARITY AND MODE OF DELIVERY AT SITTI KHADIJAH GENERAL HOSPITAL, GORONTALO CITY

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ABSTRACT

Maternal and newborn health is one of the main indicators of the quality of health services in a country. Efforts to improve maternal and neonatal health continue globally. This study aims to determine the association between birth weight and parity and delivery type at Sitti Khadijah General Hospital, Gorontalo City. This quantitative study used a cross-sectional method. The population was 325 mothers giving birth between February and March 2025. A sample of 163 mothers was selected using a purposive sampling technique. The research instrument was a secondary data observation sheet used to record variables from medical records, namely birth weight, parity, and delivery type. The chi-square test was used to test the association between variables. The results showed significant associations between birth weight and mode of delivery (Fisher's Exact Test, p = 0.012) and between parity and mode of delivery (Fisher's Exact Test, p = 0.040) at Sitti Khadijah General Hospital, Gorontalo City. Improved antenatal care services, early detection of pregnancy risk factors, and health education for pregnant women are expected to help reduce childbirth complications and improve the health of mothers and babies.

Keywords: *Birth weight, parity, type of delivery, mother giving birth, cesarean section.*

INTRODUCTION

Maternal and newborn health are among the main indicators of the quality of healthcare services in a country. Efforts to improve maternal and neonatal health continue to be implemented globally to reduce maternal and infant mortality (WHO, 2023). Enhancing the quality of childbirth services is therefore essential to achieving this goal (Noer et al., 2025). One important aspect of these efforts is ensuring that childbirth is safe and performed according to appropriate medical indications. According to the World Health Organization (WHO, 2023) ,there are two main modes of delivery: normal vaginal delivery and delivery by cesarean section (CS). Vaginal birth is a physiological process in which the infant passes through the birth canal, whereas cesarean section involves a surgical procedure performed when medically indicated to protect the health and safety of both mother and infant.

Globally and nationally, the rate of delivery by cesarean section continues to increase. WHO (2023) reported that the global CS rate increased from approximately 12% in 2000 to 21% in 2022 and is projected to reach 29% by 2030 without effective intervention. In Indonesia, the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia) showed that the proportion of cesarean deliveries increased to 25.9%, while

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normal deliveries accounted for 73.2% (Kemenkes RI, 2024). This increase is influenced by various factors, including medical indications and non-medical factors such as maternal age, socioeconomic status, and improved access to healthcare services.

In Gorontalo Province, the proportion of deliveries by cesarean section reached 33.3%, exceeding the national average, while normal deliveries accounted for 65.5% (Kemenkes RI, 2024). Sitti Khadijah General Hospital in Gorontalo City, as one of the referral hospitals in the region, has also experienced an increase in the number of cesarean deliveries. Based on hospital medical record data, 1,172 cesarean deliveries and 599 normal deliveries were recorded in 2025 (RS Sitti Khadijah Gorontalo, 2026). This high proportion indicates that CS has become a relatively dominant mode of delivery, highlighting the need to examine the factors associated with its occurrence. Birth weight and parity were selected because they represent complementary aspects of obstetric assessment relevant to delivery planning. Birth weight reflects fetal size, which may be associated with mechanical difficulties and neonatal complications during childbirth, particularly in cases of low birth weight or macrosomia. Parity, meanwhile, provides information about a woman's previous childbirth experience and may be relevant to labor progression and delivery planning. These variables were also available in the hospital medical records, allowing their associations with mode of delivery to be examined. Although other maternal and obstetric factors may also influence delivery mode, this study specifically focused on birth weight and parity.

The mode of delivery is influenced by various maternal and fetal factors, including birth weight and parity. Birth weight is a key measure of fetal growth and is associated with the likelihood of complications during childbirth. Newborns with low birth weight or macrosomia may face an increased risk of delivery-related complications, which can lead to a greater need for cesarean delivery in certain clinical circumstances (Huang et al., 2025; WHO, 2023). In addition, parity may influence the course of labor. Primiparous women generally have a higher risk of prolonged labor than multiparous women, whereas women with a history of previous childbirth may have a greater opportunity for normal delivery in the absence of complications (Armawa et al., 2025).

Although previous studies have investigated birth weight and parity in relation to mode of delivery, evidence examining both variables within the same study population remains limited in the local context of Sitti Khadijah General Hospital, Gorontalo City. This study addresses this local evidence gap by simultaneously examining the associations of birth weight and parity with mode of delivery among women giving birth at a referral hospital. By evaluating these two variables within the same population, the study provides locally relevant evidence that may inform obstetric risk assessment and delivery planning. Its contribution lies in the combined assessment of these variables in this specific hospital setting rather than in claiming that their individual associations have not been studied previously.

Information on estimated fetal weight and maternal parity may contribute to antenatal risk assessment and individualized delivery planning. Fetal weight estimation can help identify pregnancies in which fetal growth or suspected macrosomia warrants

closer clinical evaluation; however, its accuracy and predictive value should be considered alongside other maternal and fetal findings (Modzelewski et al., 2022; Sgayer et al., 2024). Similarly, parity and previous obstetric history may contribute to the assessment of the likelihood of cesarean delivery, but these factors should not be interpreted in isolation from maternal characteristics, fetal condition, and obstetric complications (Mekonnen & Coenen, 2026; Vries et al., 2022). Therefore, birth weight and parity may provide useful contextual information for clinical risk assessment, while the final mode of delivery should be determined by a comprehensive assessment of the mother and fetus and established obstetric indications. These findings may contribute to more informed clinical decision-making regarding delivery planning. However, the choice of delivery mode should remain based on a comprehensive assessment of maternal and fetal conditions and established medical indications. This approach may support appropriate use of cesarean delivery while prioritizing maternal and neonatal safety. The Ministry of Health of the Republic of Indonesia (Kemenkes RI., 2024) also emphasizes the importance of local data-based research to support efforts to reduce maternal and infant mortality.

A preliminary study involving 10 mothers who gave birth at Sitti Khadijah General Hospital in Gorontalo City in January 2026 found that 6 infants (60%) had low birth weight, 3 infants (30%) had normal birth weight, and 1 infant (10%) had high birth weight. Regarding parity, 7 mothers (70%) were multiparous and 3 mothers (30%) were primiparous. The modes of delivery consisted of 6 normal deliveries (60%) and 4 cesarean section deliveries (40%). In light of these preliminary findings, the present study aimed to examine the associations of birth weight and parity with mode of delivery among women giving birth at Sitti Khadijah General Hospital, Gorontalo City. The findings are expected to provide evidence that may contribute to improving the quality of obstetric and midwifery services.

RESEARCH METHOD

This research adopted a quantitative, analytical observational design using a cross-sectional approach. It was conducted at Sitti Khadijah General Hospital in Gorontalo City in April 2026, using medical records of women who had given birth in February and March 2025. The study population comprised 325 women who delivered at the hospital during this period. Sample size determination followed Arikunto's guideline (Arikunto, 2019), which suggests sampling 10–15%, 20–25%, or a larger proportion of the population when the population exceeds 100. Considering the population size, a sampling fraction of 50% was applied, resulting in 162.5 participants, which was rounded to 163. Purposive sampling was subsequently used to select medical records based on predetermined inclusion and exclusion criteria. Records were eligible if they documented singleton deliveries and contained complete information on birth weight, parity, and mode of delivery. Records with missing data or those that failed to satisfy the eligibility criteria were excluded from the analysis.

Secondary data were extracted from the medical records of women who delivered

at Sitti Khadijah General Hospital in Gorontalo City. Data collection was performed using a structured observation sheet designed around the study variables: birth weight, parity, and mode of delivery. Medical records that met the eligibility criteria were examined, and the relevant information was documented according to the predefined categories for each variable. The data were subsequently reviewed to ensure completeness and consistency. Records with missing or inconsistent information that could not be verified were excluded. After verification, the data were coded and entered into statistical software for analysis. Access to medical records followed hospital procedures and applicable research ethics requirements, with patient confidentiality protected throughout the study. The independent variables comprised birth weight and parity. Birth weight was classified into three categories: low birth weight (less than 2,500 g), normal birth weight (2,500–4,000 g), and high birth weight (greater than 4,000 g). Parity was grouped into primipara, multipara, and grand multipara. The dependent variable was mode of delivery, classified as normal vaginal delivery or cesarean section.

Univariate analysis was performed to summarize the frequency and percentage distributions of each variable. For the bivariate analysis, the chi-square test was initially considered. However, because some cells had expected frequencies below five, Fisher's exact test was used to assess the associations between the study variables. Statistical significance was set at $\alpha = 0.05$, and p-values below 0.05 were interpreted as indicating statistically significant associations.

RESULTS AND DISCUSSION

Result

Respondents' Characteristics

Table 1 presents the demographic characteristics of the 163 respondents, including age, educational attainment, and occupation. The distribution of respondents across these characteristics is summarized by frequency and percentage.

Table 1. Distribution of Respondents' Characteristics

Characteristic	Frequency	Percentage
Age		
< 20 years	6	3.7
20–35 years	131	80.4
> 35 years	26	15.9
Education		
Elementary School	10	6.1
Junior High School	23	14.1
Senior High School	70	43.0
Higher Education	60	36.8
Occupation		
Housewife	109	66.9
ASN/TNI/POLRI	19	11.6
Temporary Worker	14	8.6
Private-Sector Employee	21	12.9
Total	163	100.0

Sumber: Primary Data (2026)

As presented in Table 1, most respondents were aged 20–35 years, accounting for 131 women (80.4%). This distribution indicates that the majority of participants gave birth during the commonly recognized optimal reproductive age range. Maternal age was categorized as younger than 20 years, 20–35 years, and older than 35 years, reflecting differences in reproductive health and potential obstetric risks. Pregnancy among women younger than 20 years may carry additional risks because their reproductive systems may not yet be fully mature, potentially increasing the likelihood of anemia, prolonged labor, and low birth weight. In comparison, the 20–35-year age group is generally regarded as the optimal reproductive period, when physical maturity and reproductive function are more likely to support a pregnancy with fewer complications. Conversely, women older than 35 years are classified as being of advanced maternal age, a period associated with declining reproductive function and potentially greater risks of hypertension, diabetes, preeclampsia, and cesarean delivery (Kemenkes RI, 2022; Prawirohardjo, 2022; WHO, 2022).

Based on Table 1, the distribution of respondents according to educational level showed that the largest proportion of respondents had completed senior high school, with 70 respondents (43.0%). This finding is consistent with the study by Rahmadani & Rupilu (2025), which reported that respondents with a senior high school/vocational high school education constituted the largest group, totaling 81 respondents (54.4%).

Based on Table 4, the distribution of respondents by occupation indicated that most respondents were housewives, accounting for 109 respondents (66.9%). This finding is also in line with the study conducted by Rahmadani & Rupilu (2025), which found that the majority of respondents were housewives, totaling 77 respondents (51.7%).

Univariate Analysis

Table 2 presents the distribution of the 163 respondents according to birth weight, maternal parity, and mode of delivery. The data are summarized using frequencies and percentages to describe the characteristics of each study variable.

Table 2. Distribution of Birth Weight, Parity, and Mode of Delivery

Variable	Frequency	Percentage
Birth Weight		
Low	30	18.4
Normal	127	77.9
High	6	3.7
Parity		
Primipara	67	41.1
Multipara	87	53.4
Grand multipara	9	5.5
Mode of Delivery		
Cesarean section (CS)	97	59.5
Normal vaginal delivery	66	40.5
Total	163	100.0

Sumber: Primary Data (2026)

Table 2 presents the distribution of birth weight categories among the respondents. Most mothers delivered infants with normal birth weight, comprising 127 respondents (77.9%). This proportion is comparable to the findings reported by Islam et al. (2024), in which 86.9% of respondents delivered infants with normal birth weight. Regarding parity, multiparous women represented the largest group, with 87 respondents (53.4%). A similar pattern was reported by Rahmadani & Rupilu (2025), who found that multiparous women accounted for 58.4% of their study participants. In terms of delivery mode, cesarean section was more common than normal vaginal delivery, accounting for 97 respondents (59.5%). This finding is consistent with Islam et al. (2024), who reported that cesarean deliveries represented 53.8% of all births in their study population.

Bivariate Analysis

Table 3 summarizes the relationship between birth weight and mode of delivery among the 163 respondents. It presents the distribution of cesarean section and normal vaginal delivery across the three birth weight groups. Fisher's Exact Test was applied to assess whether the observed relationship between birth weight and mode of delivery was statistically significant.

Table 3. Association Between Birth Weight and Mode of Delivery

Birth Weight	Mode of Delivery				Total		*p-value*
	Cesarean Section		Normal Delivery				
	n	%	n	%	n	%	
Low	24	14,7	6	3,7	30	18,4	
Normal	68	41,7	59	36,2	127	77,9	0,012
High	5	3,1	1	0,6	6	3,7	
Total	97	59,5	66	40,5	163	100,0	

Sumber: Primary Data (2026)

As shown in Table 3, the largest group of respondents who underwent cesarean section delivered infants with normal birth weight, comprising 68 respondents (41.7%). In comparison, the lowest proportion was found among women who delivered infants with high birth weight through normal vaginal delivery, representing only 1 respondent (0.6%). Fisher's Exact Test was selected because two cells (33.3%) had expected counts below 5, which could compromise the reliability of the Pearson chi-square approximation. The analysis yielded a p-value of 0.012, indicating a statistically significant association between birth weight and mode of delivery. The magnitude of this association, assessed using Cramér's V, was 0.229, with a 95% percentile bootstrap confidence interval of 0.110–0.357. This result suggests a relatively weak association between the two variables.

Table 4 presents the association between maternal parity and mode of delivery among the 163 respondents. The table summarizes the frequency and percentage of cesarean section and normal vaginal delivery across the primiparous, multiparous, and

grand multiparous groups, along with the results of Fisher's Exact Test to assess the statistical significance of the association.

Table 4. Association Between Parity and Type of Delivery

Parity	Mode of Delivery				Total		*p-value*
	Cesarean Section		Normal Delivery				
	n	%	n	%	n	%	
Primipara	32	19,6	35	21,5	67	41,1	
Multipara	59	36,2	28	17,2	87	53,4	0,040
Grand Multipara	6	3,7	3	1,8	9	5,5	
Total	97	59,5	66	40,5	163	100,0	

Sumber: Primary Data (2026)

Based on Table 4, the largest proportion of respondents who underwent cesarean section (CS) had multiparous parity, totaling 59 respondents (36.2%). In contrast, the smallest proportion was observed among respondents who had a normal delivery and were grand multiparous, totaling 3 respondents (1.8%). The analysis was performed using Fisher's Exact Test because one cell (16.7%) had an expected frequency of less than 5, thus violating the assumptions of the chi-square test. Fisher's Exact Test showed a statistically significant association between parity and mode of delivery ($p = 0.040$). The effect size, measured using Cramér's V, was 0.200 (95% percentile bootstrap confidence interval [CI]: 0.075–0.364), indicating a relatively weak association.

Discussion

Birth Weight

Based on the study findings, of the 163 respondents, the majority of infants had a normal birth weight, totaling 127 infants (77.9%). Meanwhile, 30 infants (18.4%) had low birth weight (LBW), and 6 infants (3.7%) had high birth weight (macrosomia). The high proportion of infants with normal birth weight may be related to the characteristics of the respondents, particularly maternal age, as the majority of mothers were aged 20–35 years (80.4%). This age group is considered a healthy reproductive period, during which maternal physiological conditions are generally optimal for supporting fetal growth. Asikin et al. (2021) identified maternal age as a relevant factor in the occurrence of low birth weight (LBW), reporting a greater likelihood of LBW among mothers younger than 20 years and those older than 35 years. Furthermore, most participants in the present study had completed senior high school or attained a higher level of education. Educational attainment may help women obtain and understand information about maternal nutrition, antenatal care, and healthy practices during pregnancy (Prawirohardjo, 2022; WHO, 2021).

The World Health Organization (WHO, 2023), classifies birth weight of 2,500–4,000 grams as normal, while infants weighing less than 2,500 grams are categorized as having LBW. Conversely, macrosomia refers to a birth weight exceeding 4,000 grams. Birth weight serves as an important measure of newborn health and provides information

about fetal growth and development throughout pregnancy The Indonesian Ministry of Health also states that normal birth weight reflects good maternal nutritional status, optimal antenatal care, and a lower risk of complications during pregnancy (Kemenkes RI, 2023).

The results of the present study align with those reported by Islam et al. (2024) , who reported that 86.9% of infants were born with normal birth weight. Similarly, Mansor et al. (2024) found that most infants had normal birth weight, while LBW accounted for only a small proportion of all births. However, the LBW and macrosomia cases identified in this study may be related to several contributing factors, such as maternal age at the extremes of the reproductive period, nutritional status, socioeconomic circumstances, and pregnancy-related illnesses or complications.

In the researchers' view, the predominance of infants with normal birth weight indicates that most mothers experienced pregnancy under favorable conditions and received adequate antenatal care. However, the continued occurrence of LBW and macrosomia suggests that factors such as maternal nutritional status, comorbidities, birth spacing, and obstetric complications still require attention. Therefore, efforts to improve the quality of antenatal care (ANC), provide nutritional education during pregnancy, and ensure early detection of high-risk pregnancies should be continuously strengthened to maintain and further increase the proportion of infants born with normal birth weight.

Parity

The distribution of parity among the 163 participants showed that multiparous women formed the largest group, comprising 87 respondents (53.4%). Primiparous women accounted for 67 respondents (41.1%), while grand multiparous women represented the smallest group, with 9 respondents (5.5%). These findings indicate that most mothers who delivered at Sitti Khadijah Hospital, Gorontalo City, had previous childbirth experience. This suggests that the majority of respondents had undergone childbirth before and were therefore physiologically more prepared to experience subsequent deliveries. These findings may also be related to the respondents' age characteristics, as most were aged 20–35 years, an age range in which women generally have more than one child. Meanwhile, only a small proportion of respondents were aged >35 years, which may be associated with the relatively low number of grand multiparous mothers.

According to obstetric theory, parity refers to the number of pregnancies carried to a viable gestational age and resulting in childbirth, regardless of whether the infant was born alive or dead. Parity is classified as primiparity (one delivery), multiparity (two to four deliveries), and grand multiparity (five or more deliveries) (Prawirohardjo, 2022). Multiparous mothers generally have a more elastic birth canal, a more responsive cervix, and more effective uterine contractions because they have previously experienced the process of childbirth. Therefore, multiparous mothers tend to experience a faster and smoother labor process than primiparous mothers (Asrinah et al., 2023).

The findings of this study are consistent with those of Rahmadani & Rupilu (2025),

who reported that multiparous respondents constituted the largest group, accounting for 58.4%. Wijesiriwardhana et al. (2025), also explained that parity influences maternal adaptation during pregnancy and fetal growth, with mothers who have previous pregnancy experience tending to demonstrate better physiological preparedness than those experiencing pregnancy for the first time.

The relatively large proportion of multiparous women observed in this study may reflect a tendency among families in Gorontalo City to have more than one child. This family pattern may help explain why multiparous mothers accounted for a substantial share of women seeking delivery care at the hospital. In addition, previous childbirth experience may make multiparous mothers more aware of the importance of choosing a safe healthcare facility for delivery. Such experience may also contribute to greater physical and psychological preparedness, potentially allowing the labor process to proceed more smoothly than among mothers giving birth for the first time.

Mode of Delivery

Based on the study findings, of the 163 respondents, the majority underwent cesarean section (CS) delivery, accounting for 97 respondents (59.5%), while 66 respondents (40.5%) had normal vaginal deliveries. These findings indicate that the rate of CS delivery at Sitti Khadijah Hospital in Gorontalo City was higher than that of normal delivery. The relatively high rate of cesarean section (CS) in this study may be related to the maternal characteristics of the participants. Although most women were aged 20–35 years, some were older than 35 years, an age group associated with an increased likelihood of pregnancy-related complications. Conditions such as hypertension, gestational diabetes, and placenta previa may contribute to the need for cesarean delivery when clinically indicated.

According to Prawirohardjo (2022), cesarean section is an operative method of childbirth that involves incisions in the abdominal and uterine walls and is performed when vaginal delivery may compromise maternal or fetal safety. Common indications include fetal distress, cephalopelvic disproportion, preeclampsia, placenta previa, breech presentation, and a previous cesarean delivery. WHO (2023) also emphasizes that cesarean section is an effective procedure for saving the lives of mothers and newborns when medically indicated; however, its use should be limited to cases that genuinely require operative intervention.

The present findings are comparable to those reported by Islam et al. (2024) who reported that the majority of deliveries were performed by cesarean section (53.8%). Armawa et al. (2025), also reported that the increasing rate of CS is influenced by maternal and fetal factors, including a history of previous CS, pregnancy complications, and fetal conditions. In addition, Szücs et al. (2025) reported that the increasing rate of CS in ASEAN countries is associated with improved access to healthcare services, enhanced early detection of obstetric complications, and changes in maternal healthcare practices.

The researchers posit that the high proportion of cesarean deliveries observed in

this study may be partly related to Sitti Khadijah Hospital's role as a referral center that frequently manages high-risk pregnancies. In addition to maternal age and pregnancy complications, previous delivery history, fetal conditions, and increased utilization of healthcare services may also contribute to the high rate of CS. Therefore, the quality of antenatal care (ANC) and the appropriate application of medical indications should continue to be strengthened to ensure that the choice of delivery method remains focused on maternal and neonatal safety.

Association Between Birth Weight and Mode of Delivery at Sitti Khadijah General Hospital, Gorontalo City

Among the respondents who underwent cesarean section (CS), the largest group consisted of mothers who delivered infants with normal birth weight, comprising 68 respondents (41.7%). These findings indicate that although an infant's birth weight falls within the normal range, the decision to perform a CS is not determined solely by birth weight but also by maternal and fetal conditions. The high rate of CS in this group may be attributable to other obstetric factors, such as a history of previous cesarean section, preeclampsia, premature rupture of membranes, fetal distress, and other medical indications requiring operative intervention.

In obstetric practice, cesarean delivery is indicated when vaginal birth may compromise maternal or fetal safety; therefore, the decision to perform a cesarean section should not be based on infant birth weight alone. Indications for the procedure include a history of previous CS, cephalopelvic disproportion, fetal distress, preeclampsia, and other obstetric complications (Prawirohardjo, 2022). WHO (2023) also emphasizes that the mode of delivery should be selected based on clear medical indications to achieve the best possible outcomes for both the mother and the newborn.

This study also identified six respondents (3.7%) with low birth weight (LBW) infants who underwent normal vaginal delivery, indicating that LBW is not an absolute indication for CS. Vaginal delivery may still be performed when both maternal and fetal conditions are stable, there are no signs of fetal distress, the fetal presentation is favorable, and labor is conducted under appropriate healthcare supervision. In contrast, 24 respondents (14.7%) with LBW infants and 5 respondents (3.1%) with macrosomic infants underwent CS because these conditions may increase the risk of complications, including hypoxia, asphyxia, cephalopelvic disproportion, shoulder dystocia, and birth trauma (WHO, 2023; Prawirohardjo, 2022).

The Fisher's Exact Test showed a statistically significant association between birth weight and mode of delivery ($p = 0.012$). This finding is consistent with Islam et al. (2024), who also reported a significant association between birth weight and mode of delivery. From a clinical perspective, fetal size and the underlying conditions associated with abnormal birth weight may influence delivery planning. Macrosomia may increase the risk of cephalopelvic disproportion, shoulder dystocia, and obstructed labor, whereas low birth weight may be associated with prematurity or fetal growth restriction. As discussed by Choudhari & Magi (2024), some fetuses with growth restriction may not

tolerate labor, making careful intrapartum assessment important. However, low birth weight alone does not necessarily indicate cesarean delivery. The decision depends on the overall maternal and fetal condition, gestational age, fetal presentation, fetal status, and other obstetric indications.

According to the researchers' interpretation, the association between birth weight and mode of delivery may reflect healthcare providers' clinical considerations in minimizing risks to both mothers and infants. Infants with LBW may be delivered by CS when accompanied by fetal distress or pregnancy complications, whereas macrosomic infants are at greater risk of mechanical complications during labor and may therefore require operative delivery. On the other hand, infants with normal birth weight may also be delivered by CS when maternal or fetal indications are present. Therefore, monitoring fetal growth through high-quality antenatal care (ANC) is essential to support the selection of the safest mode of delivery for both the mother and the infant.

Association Between Parity and Mode of Delivery at Sitti Khadijah General Hospital, Gorontalo City

The results showed that among the 163 respondents, 59 multiparous mothers (36.2%) underwent cesarean section (CS), while 35 primiparous mothers (21.5%) and 3 grand multiparous mothers (1.8%) delivered vaginally. The relatively high rate of cesarean section (CS) among multiparous mothers may be associated with the respondents' demographic characteristics, particularly the predominance of women aged 20–35 years and those whose primary occupation was homemaking. At this age, many women have experienced previous childbirth and are therefore classified as multiparous. In addition, some may have had a history of previous cesarean delivery, which can increase the likelihood of CS in subsequent pregnancies.

According to obstetric theory, parity refers to the number of deliveries experienced by a woman at a viable gestational age and is classified as primiparity, multiparity, and grand multiparity (Prawirohardjo, 2022). Multiparous mothers generally have a more elastic birth canal, a more responsive cervix, and more effective uterine contractions due to their previous childbirth experience. However, in the presence of a previous CS, preeclampsia, premature rupture of membranes, fetal malpresentation, or other obstetric complications, cesarean delivery may remain the safer option. WHO (2023) also identifies a history of cesarean delivery as one of the major factors contributing to repeat cesarean births in subsequent pregnancies.

Among primiparous mothers, 35 respondents (21.5%) successfully underwent vaginal delivery. These findings indicate that although primiparous women have no previous childbirth experience and may be at greater risk of prolonged labor, vaginal delivery can still be achieved when maternal and fetal conditions are favorable. This outcome may be associated with the characteristics of the respondents, as the majority were aged 20–35 years, considered the optimal reproductive age range, and had attained at least a senior high school education. These factors may contribute to better awareness of the importance of antenatal care (ANC), maintaining maternal health during

pregnancy, and following healthcare providers' recommendations. WHO (2021) emphasizes that optimal antenatal care plays an important role in the early identification of risk factors and in improving maternal preparedness for childbirth.

Meanwhile, among grand multiparous mothers, 3 respondents (1.8%) were able to undergo vaginal delivery. Although grand multiparity is considered a high-risk pregnancy condition, vaginal delivery may still be possible when both maternal and fetal conditions are stable and no medical indication for surgery is present. According to (Prawirohardjo, 2022), grand multiparous women generally have a more elastic birth canal, which may facilitate cervical dilatation and labor progression. Previous childbirth experience may also contribute to greater physical and psychological preparedness for delivery (Asrinah et al., 2023), although grand multiparity remains associated with increased risks of postpartum hemorrhage, uterine atony, and placenta previa.

Bivariate analysis showed that 32 primiparous respondents (19.6%) and 6 grand multiparous respondents (3.7%) underwent CS, while 28 multiparous respondents (17.2%) had vaginal deliveries. The Fisher's Exact Test yielded a p-value of 0.040 ($p < 0.05$), indicating a statistically significant association between parity and mode of delivery at Sitti Khadijah General Hospital, Gorontalo City. These findings suggest that previous childbirth experience may influence the labor process, although the final mode of delivery remains dependent on the clinical conditions of both the mother and fetus.

The findings of the present study are in agreement with those of Rahmadani & Rupilu (2025) who identified a statistically significant association between parity and cesarean delivery at Marthen Indey Level II Hospital in Jayapura. Similarly, Armawa et al. (2025) found that parity and previous delivery history influenced the likelihood of successful vaginal delivery and cesarean section. Wijesiriwardhana et al. (2025) also reported that parity affects physiological adaptation during pregnancy, which may subsequently influence labor outcomes. This finding differs from the study by Anwar et al. (2022), which reported no statistically significant association between maternal parity and cesarean section at Bhayangkara Hospital, Banda Aceh ($p = 0.483$). The difference between these findings may reflect variations in sample characteristics, parity classification, and the distribution of delivery modes across the study populations. Clinically, parity may be relevant to obstetric risk assessment because both first-time delivery and a history of multiple deliveries may be associated with different maternal and obstetric considerations. However, parity alone does not determine the mode of delivery, which also depends on maternal condition, fetal status, previous obstetric history, and the presence of specific obstetric indications. Thus, the significant finding indicates an association between parity and mode of delivery, not a direct causal effect of parity on cesarean delivery.

The contribution of this study lies in examining the associations of birth weight and parity with mode of delivery within the same population at Sitti Khadijah General Hospital, a referral hospital in Gorontalo City. By examining these two obstetric characteristics together, this study provides context-specific evidence on delivery patterns among women with diverse obstetric risk profiles. The role of maternal and fetal

characteristics in successful vaginal birth after cesarean (VBAC) was explored by Armawa et al. (2025), emphasizing the importance of clinical factors in determining delivery outcomes. Recent research by Liu et al. (2025) also provides a relevant perspective on maternal and fetal health in relation to birth outcomes, although its findings should be interpreted in the context of its specific study population and research focus. Unlike these studies, the present study examines birth weight and parity in relation to mode of delivery within one local hospital population. These findings may inform further research and support obstetric risk assessment and delivery planning; however, birth weight and parity should be considered alongside other maternal, fetal, and clinical factors rather than used as sole determinants of delivery mode.

The findings have potential implications for antenatal risk assessment and delivery planning. The association between maternal and fetal characteristics and successful vaginal birth after cesarean (VBAC) was investigated by Armawa et al. (2025), highlighting the relevance of clinical factors in delivery outcomes. In the present study, birth weight and parity may be considered alongside maternal age, gestational age, fetal presentation, previous cesarean delivery, comorbidities, and other clinical findings to support individualized counseling, appropriate monitoring, timely referral, and preparation for potential obstetric complications. However, neither birth weight nor parity alone should determine the mode of delivery; decisions should be based on a comprehensive maternal and fetal assessment and current evidence-based obstetric guidelines. Although this study provides locally relevant evidence from a referral hospital in Gorontalo City, further research involving multiple facilities and broader clinical variables is needed before the findings can be generalized to other healthcare settings.

CONCLUSION

The analysis revealed meaningful statistical associations of birth weight and parity with delivery mode among women giving birth at Sitti Khadijah General Hospital in Gorontalo City. Infants with normal birth weight constituted the largest birth-weight category, while multiparous women represented the largest parity group. Cesarean section was more frequent than vaginal delivery among the study participants. These findings indicate that birth weight and parity are relevant characteristics to consider in obstetric assessment; however, the observed associations do not establish a causal relationship or demonstrate that either factor independently determines the mode of delivery. Clinical decisions should therefore be based on a comprehensive assessment of maternal and fetal conditions, obstetric history, and established clinical indications. Further studies incorporating additional clinical variables and multiple healthcare facilities are needed to clarify these associations and assess their applicability to broader populations.

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REFERENCES

Anwar, C., Safitri, F., & Aisyah. (2022). Hubungan umur dan paritas ibu dengan tindakan sectio caesarea di Rumah Sakit Bhayangkara Banda Aceh. *Journal of Healtcare Technology and Medicine*, *8*(1), 441–448. https://doi.org/10.33143/jhtm.v8i1.2018

Arikunto, S. (2019). *Prosedur Penelitian*. Rineka Cipta.

Armawa, S., Sulistyono, A., Akbar, M. I. A., & Etika, R. (2025). Maternal and fetal characteristics associated with successful Vaginal Birth After Cesarean (VBAC). *Majalah Obstetri & Ginekologi Indonesia*, *33*(2), 105–112. https://doi.org/10.20473/mog.V33I22025.105-112

Asikin, Z., Nurdin, S., & Ahmad, Z. (2021). Hubungan bblr dan pola asuh gizi dengan kejadian stunting di Desa Tabumela Kecamatan Tilango Kabupaten Gorontalo. *Madu Jurnal Kesehatan*, *10*(2), 1–8. https://doi.org/10.31314/mjk.10.2.1-8.2021

Asrinah, Putri, S. S., Sulistyorini, D., Muflihah, I. S., & Sari, D. N. (2023). *Asuhan Kebidanan Masa Persalinan*. CV. Graha Ilmu.

Choudhari, G., & Magi, S. F. Z. (2024). Comparison of immediate neonatal outcome of low birth weight babies in normal vaginal delivery versus cesarean section. *International Journal of Academic Medicine and Pharmacy*, *6*(6), 170–175. https://doi.org/10.47009/jamp.2024.6.6.34

Huang, Y., Zhu, H., Li, Y., Wang, J., & Ni, L. (2025). Association between cortisol in umbilical cord blood and discordant growth in dichorionic twins. *PeerJ*, *13*(19479), 1–12. https://doi.org/10.7717/peerj.19479

Islam, S., Kabir, B., & Parveen, S. (2024). Association between birth weight of the babies and mode of delivery: A cross-sectional study. *Bangladesh Armed Forces Med J*, *57*(1), 8–13. https://doi.org/10.3329/bafmj.v57i1.76428

Kemenkes RI. (2022). *Standar Pelayanan Kebidanan*. Kementerian Kesehatan Republik Indonesia.

Kemenkes RI. (2023). *Pedoman Pelayanan Kesehatan Ibu dan Anak di Fasilitas Kesehatan Dasar dan Rujukan*. Direktorat Jenderal Kesehatan Masyarakat.

Kemenkes RI. (2024). *Hasil Survei Kesehatan Indonesia (SKI)*. Kementerian Kesehatan RI.

Mansor, E., Ahmad, N., & Lim, P. Y. (2024). Incidence and determinants of low birth weight in Peninsular Malaysia. *PLOS ONE*, *19*(7), 1–14. https://doi.org/10.1371/journal.pone.0306387

Mekonnen, E. G., & Coenen, S. (2026). A prognostic model to predict the risk of cesarean delivery after induction of labour: development, validation, and clinical utility. *Scientific Reports*, *16*(2026), 1–13. https://doi.org/10.1038/s41598-026-72797-0

Modzelewski, J., Pokropek, A., Jakubiak-Proć, M., Muzyka-Placzyńska, K., Filipecka-Tyczka, D., & Kajdy, A. (2022). Large-for-gestational-age or macrosomia as a classifier for risk of adverse perinatal outcome: a retrospective cross-sectional study. *The Journal of Maternal-Fetal & Neonatal Medicine*, *35*(25), 5564–5571. https://doi.org/10.1080/14767058.2021.1887127

Noer, T. E. P., Katili, D. N. O., Melani, N. A. D., & Katili, T. E. P. (2025). Hubungan Kualitas Pelayanan Persalinan Dengan Kepuasan Ibu Bersalin Di RS Islam Gorontalo. *Bunda Edu-Midwifery Journal (BEMJ)*, *9*(1), 1–10. https://repository.umgo.ac.id/4469/

Prawirohardjo, S. (2022). *Ilmu Kebidanan Edisi Revisi*. Yayasan Bina Pustaka Sarwono Prawirohardjo.

Rahmadani, U., & Rupilu, V. (2025). Hubungan paritas dengan kejadian persalinan sectio caesarea di RS Tk.II Marthen Indey Jayapura. *Inovasi Pembangunan : Jurnal Kelitbangan*, *13*(3), 1–6. https://doi.org/10.35450/jip.v13i03.1402

RS Sitti Khadijah Gorontalo. (2026). *Profil Rumah Sakit Sitti Khadijah Gorontalo*. https://rssittikhadidjahgorontalo.com/profil/

Sgayer, I., Nskovica, K., Murkhovskyi, I., Shqara, R. A., Bilyk, A., Lowenstein, L., & Wolf, M. F. (2024). The Impact on Birth Outcomes of Sonographic Fetal Weight Estimation in Neonatal Macrosomia. *American Journal of Perinatology*, *41*(16), 2271–2277. https://doi.org/10.1055/s-0044-1786743

Szücs, A., van der Lubbe, S. C. C., & de la Torre, J. A. (2025). The epidemiology and burden of maternal health outcomes in ASEAN countries. *The Lancet Public Health*, *10*(6), 480–491. https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(25)00098-2/fulltext

Vries, B. S. de, Morton, R., Burton, A. E., Kumar, P., Hyett, J. A., Phipps, H., & McGeechan, K. (2022). Attributable factors for the rising cesarean delivery rate over 3 decades: an observational cohort study. *American Journal of Obstetrics & Gynecology*, *4*(2), 1–14. https://doi.org/10.1016/j.ajogmf.2021.100555

WHO. (2021). *WHO recommendations on antenatal care for a positive pregnancy experience*. World Health Organization.

WHO. (2022). *WHO recommendations on maternal and newborn care for a positive postnatal experience*. World Health Organization. https://www.who.int/publications/i/item/9789240045989

WHO. (2023). *Low birth weight: Policy brief and monitoring framework update*. World Health Organization.

WHO. (2023). *Trends in Cesarean Section Rates 2000–2022*. World Health Organization.

Wijesiriwardhana, P., Habtewold, T. D., & Wang, G. (2025). Maternal parity modifies the association of birthweight polygenic score with fetal growth. *Scientific Reports*, *15*(27915), 1–9. https://doi.org/10.1038/s41598-025-10415-1

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