International Journal of Contemporary Sciences (IJCS)
Vol. 4, No. 4, 2026: 1309-1320

The Influence of Maternal Height on the Incidence of Cephalopelvic Disproportion (CPD) in Mothers Giving Birth at RSUD Bahteramas, Southeast Sulawesi Province

Juli Purnama Hamudi[1*], Lisnawati[2], Astri Yunita[3]
[1]Program Studi DIII Kebidanan
[2]Program Studi S1 Kebidanan, Sekolah Tinggi Ilmu Kesehatan Pelita Ibu, Kendari, Sulawesi Tenggara, Indonesia
[3]Program Studi Psikologi UHO
Corresponding Author: Juli Purnama Hamudijulipurnamahd@gmail.com

A R T I C L E I N F O
Keywords: Maternal Height, Cephalopelvic Disproportion, CPD, Obstetric Complication, Logistic Regression

Received : 10 February
Revised : 15 March
Accepted: 30 April

A B S T R A C T
This study aims to determine the effect of maternal height on the incidence of Cephalopelvic Disproportion (CPD) in mothers giving birth in the Tumbudadai Room of Bahteramas Regional General Hospital (RSUD), Southeast Sulawesi Province. CPD is a complication characterized by incompatibility between the fetal head and the maternal pelvis, potentially leading to obstructed labor and serious maternal-fetal morbidity. This quantitative study used a logistic regression design with secondary data from medical records for the period 2020–2024. A total sampling technique was applied, yielding 114 respondents who had been diagnosed with CPD. Results of the logistic regression analysis showed a p-value of 0.346, which exceeds the significance threshold of 0.05. Therefore, the null hypothesis (H0) is accepted, indicating that there is no statistically significant effect of maternal height on CPD incidence in this population. The Nagelkerke R Square value of 0.011 suggests that maternal height explains only 1.1% of variation in CPD outcomes. These findings suggest that CPD is a multifactorial condition not solely determined by maternal stature, but also influenced by fetal size, pelvic architecture, nutritional history, and obstetric factors. Comprehensive risk assessment—beyond anthropometric indicators alone—is recommended for obstetric care practice

DOI: https://doi.org/10.55927/xjpw8488
E-ISSN: 3047-4078
https://journalijcs.my.id/index.php/ijcs

INTRODUCTION

Cephalopelvic Disproportion (CPD) is one of the most significant obstetric complications encountered in clinical midwifery practice, particularly in first pregnancies. The condition is characterized by a mismatch between the size of the fetal head and the maternal pelvic cavity, rendering spontaneous vaginal delivery mechanically difficult or impossible (Cunningham, 2018). This disproportion may arise from a narrow maternal pelvis, an oversized fetus, or a combination of both factors.

According to the American College of Nurse Midwives (ACNM), CPD occurs in approximately one out of every 250 pregnancies. The incidence is notably higher among Asian populations, attributed to the generally shorter stature of Asian women compared to their Western counterparts—a physiological characteristic that correlates with a higher probability of pelvic narrowing and obstructed labor (Utami et al., 2023). When unmanaged, CPD almost invariably leads to operative delivery via caesarean section.

The global burden of CPD is substantial. Data from the World Health Organization (WHO, 2023) indicate that CPD contributes to approximately 8% of all maternal deaths worldwide—equivalent to roughly 23,000 maternal fatalities annually. In Indonesia, the 2023 Indonesia Health Survey (SKI) reported a national CPD prevalence of 4.9%, with West Java recording the highest regional rate at 5.0% (Kemenkes, 2023).

Locally, data from Bahteramas Regional General Hospital (RSUD Bahteramas), Southeast Sulawesi Province, reveal the following CPD trends across a five-year period: 26 cases (4.31%) in 2020, 29 cases (3.78%) in 2021, 38 cases (5.65%) in 2022, 14 cases (2.16%) in 2023, and 7 cases (1.04%) in 2024—totaling 114 cases over the study period. Despite the declining trend, the peak incidence in 2022 underscores the need for continued risk factor surveillance.

Maternal stature has long been considered an anthropometric surrogate for pelvic adequacy. Women with height below 145 cm are typically classified as high-risk for CPD, given the established anatomical correlation between short stature and reduced pelvic dimensions (Wahyuningsi et al., 2022). However, existing evidence presents a mixed picture. Research by Irhamni Istiqomah (2018) found no statistically significant association between maternal height and CPD ($p = 0.347$), though women under 145 cm showed 1.6 times higher CPD risk. Similarly, Mendez-Dominguez et al. (2020) demonstrated that the maternal-neonatal body size index—rather than maternal height alone—was a stronger predictor of caesarean delivery due to CPD.

Given these inconsistencies, this study was conducted to specifically investigate the influence of maternal height on CPD incidence at RSUD Bahteramas, providing locally-contextualized evidence to guide clinical screening practices. The central research question is: Does maternal height significantly influence the incidence of CPD among mothers delivering at Tumbudadai Ward, RSUD Bahteramas, Southeast Sulawesi Province?

LITERATURE REVIEW

Cephalopelvic Disproportion (CPD)

CPD is defined as a condition arising from an incompatibility between the capacity of the maternal bony pelvis and the size of the fetal head, such that normal vaginal delivery is not feasible (Manuaba, 2015; Mochtar, 2017; Prawirohardjo, 2010). It encompasses two clinical subtypes: (1) Absolute CPD, in which the pelvic dimensions are anatomically insufficient regardless of fetal size, necessitating mandatory caesarean section; and (2) Relative CPD, in which complications arise from suboptimal fetal positioning, presentation abnormalities, or incomplete head flexion rather than purely inadequate pelvic size (Cunningham et al., 2022).

The etiology of CPD is multifactorial. Beyond maternal stature, contributing causes include prior pelvic fractures, scoliosis or kyphosis, gestational diabetes (leading to fetal macrosomia), polyhydramnios, post-term pregnancy, childhood rickets or calcium deficiency affecting pelvic bone development, and maternal obesity (Demang et al., 2023). Fetal factors such as macrosomia, malpresentation, and abnormal head attitude further compound the risk.

CPD carries serious consequences for both mother and neonate. Maternal complications include prolonged labor (dystocia), dehydration, metabolic acidosis, postpartum infection, uterine rupture, and obstetric fistula. Neonatal consequences include perinatal death and cranial fractures—particularly of the parietal bone—secondary to excessive mechanical compression (Pahlevi et al., 2017; Varney, 2010).

Maternal Height and Pelvic Dimensions

Maternal height is an anthropometric indicator of musculoskeletal development, including the bony pelvis. The anatomical basis for using height as a CPD proxy lies in the established positive correlation between overall stature and pelvic dimensions: taller women tend to have wider and larger pelvic outlet structures, while shorter women are more likely to have contracted pelves (Indryani et al., 2021; Mappaware et al., 2020). In the Indonesian obstetric context, a height threshold of <145 cm is adopted as a classification criterion for high-risk pelvic narrowing.

Standard clinical pelvic measurements used in CPD assessment include: distantia spinarum (23–26 cm), distantia cristarum (28–30 cm), conjugata externa (18 cm), and distantia tuberum (10.5 cm). A height below 145 cm often correlates with reduced values in these parameters, though individual variation and ethnic differences mean this correlation is not absolute (Humaera et al., 2018).

Nutritional status during adolescence plays a crucial role in pelvic development. Deficiency in protein, calcium, vitamin D, and phosphorus during puberty can impair bone mineralization and pelvic widening—processes that are integral to birth canal adequacy in adulthood (Herwinda, 2023). This explains why nutritional factors during growth may be stronger determinants of pelvic adequacy than adult height per se.

Hypothesis

H1: Maternal height has a statistically significant effect on the incidence of CPD in mothers delivering at Tumbudadai Ward, RSUD Bahteramas.
H0: Maternal height does not have a statistically significant effect on the incidence of CPD.

METHODOLOGY

This study employs a quantitative research design using binary logistic regression analysis, which is appropriate for examining the influence of a categorical independent variable (maternal height) on a categorical dependent variable (type of CPD: absolute vs. relative). Logistic regression estimates the log-odds of an outcome given predictor variables and is expressed as:

$$\ln(\hat{p}/1-\hat{p}) = B_0 + B_1X \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where $\hat{p}$ represents the probability of CPD occurrence, B_0 is the constant, B_1 is the regression coefficient, and X is the independent variable (maternal height category).

Research Setting and Population

The study was conducted at Bahteramas Regional General Hospital (RSUD Bahteramas), located at Jalan Kapten Pierre Tendean No. 40, Baruga, Kendari City, Southeast Sulawesi Province, Indonesia. The hospital serves as the provincial referral center and provides comprehensive obstetric services including specialist maternal-fetal medicine. Data collection took place in June 2025, covering medical records from 2020 to 2024.

The study population comprised all mothers who delivered and were diagnosed with CPD at Tumbudadai Ward during the five-year period (N = 114). A total sampling technique was applied, meaning all 114 cases were included in the analysis without exclusion, as no missing data were identified in the medical records.

Variables and Operational Definitions

Table 1. Operational Definitions and Objective Criteria

Variable	Definition	Criteria	Scale
Cephalopelvic Disproportion (Dependent)	Condition arising from mismatch between fetal head size and maternal pelvic capacity	1 = CPD Absolute 2 = CPD Relative	Nominal
Maternal Height (Independent)	Anthropometric measurement of standing height as a proxy for pelvic dimensions and CPD risk	0 = TB <145 cm 1 = TB ≥145 cm	Nominal

Data Collection and Analysis

Secondary data were extracted from the patient register book at Tumbudadai Ward, RSUD Bahteramas. The data collection instrument was a standardized observation form designed to capture maternal characteristics (age, parity, education, occupation, height) and CPD classification. Data processing followed the sequence of: editing → coding → entry → tabulation → processing → cleaning, as per Masturoh & Anggita (2018).

Statistical analysis was performed in two stages. Univariate analysis generated frequency distribution tables for all variables. Bivariate analysis applied binary logistic regression using SPSS software, with statistical significance set at $p < 0.05$. Model fit was assessed using the Hosmer-Lemeshow test, and the Nagelkerke R Square was reported as an effect size indicator.

RESEARCH RESULT

Respondent Characteristics

Table 2. Distribution of Respondents by Age (n = 114)

Age Category	Frequency (n)	Percentage (%)
< 20 years	7	6.14
20–35 years	96	84.21
> 35 years	11	9.65
Total	114	100.00

The majority of respondents (84.21%) were in the reproductive age range of 20–35 years, reflecting optimal childbearing age. Women under 20 years accounted for 6.14%, and those over 35 years comprised 9.65%.

Table 3. Distribution of Respondents by Parity (n = 114)

Parity	Frequency (n)	Percentage (%)
Parity I (Primipara)	65	57.01
Parity II	41	35.96
Parity III	5	4.39
Parity IV	3	2.63

Total	114	100.00

More than half of the respondents (57.01%) were primiparous. This aligns with the clinical understanding that CPD is most prevalent in first pregnancies, where the pelvic soft tissues have not undergone prior parturition-related remodeling.

Table 4. Distribution of Respondents by Education and Occupation (n = 114)

Category	Sub-category	Frequency (n)	Percentage (%)
Education	Elementary School (SD)	11	9.64
	Junior High (SMP)	7	6.14
	Senior High (SMA)	55	48.25
	Diploma/University	41	35.96
Occupation	Housewife (IRT)	88	77.19
	Civil Servant/Private	21	18.42
	Self-Employed	5	4.39

Senior high school education was the most common educational attainment (48.25%), while the majority of respondents (77.19%) were housewives. This demographic profile is typical of the Southeast Sulawesi maternal population and may reflect socioeconomic determinants influencing nutritional status and antenatal care access.

Univariate Analysis

Table 5. Distribution of Maternal Height Categories (n = 114)

Height Category	Frequency (n)	Percentage (%)
Short stature (<145 cm)	32	28.07
Normal/Tall stature (≥145 cm)	82	71.93
Total	114	100.00

Approximately 28.07% of respondents fell into the short stature category (<145 cm), which is the established clinical threshold associated with elevated CPD risk. The remaining 71.93% had height at or above the 145 cm threshold.

Table 6. Distribution of CPD Classification (n = 114)

CPD Type	Frequency (n)	Percentage (%)
Absolute CPD	65	57.01
Relative CPD	49	42.99
Total	114	100.00

Absolute CPD was more prevalent (57.01%) compared to Relative CPD (42.99%). This distribution indicates that over half of the cases involved an anatomically absolute pelvic-head incompatibility, which typically mandates elective or emergency caesarean section.

Bivariate Analysis: Logistic Regression

Table 7. Case Processing Summary

Category	N	Percentage (%)
Included in Analysis	114	100.0
Missing Cases	0	0.0
Total	114	100.0

All 114 cases were successfully included in the logistic regression analysis with no missing data, ensuring a complete and valid dataset.

Table 8. Omnibus Tests of Model Coefficients

Model Component	Chi-Square	df	Sig.
Step	0.889	1	0.346
Block	0.889	1	0.346
Model	0.889	1	0.346

The omnibus test of model coefficients yielded a chi-square value of 0.889 with a p-value of 0.346 (df = 1). Since p > 0.05, the independent variable (maternal height) does not significantly improve the prediction of CPD type when included in the logistic model.

Table 9. Model Summary

-2 Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
134.455	0.008	0.011

The Nagelkerke R Square value of 0.011 indicates that maternal height accounts for only approximately 1.1% of the variance in CPD classification. This very low explanatory power further supports the conclusion that maternal height alone is an insufficient predictor of CPD type.

Table 10. Hosmer and Lemeshow Goodness-of-Fit Test

Step	Chi-Square	df	Sig.
1	0.894	1	0.344

The Hosmer-Lemeshow test produced a chi-square value of 0.894 and p = 0.344. Since this p-value exceeds 0.05, the model demonstrates adequate fit—there is no statistically significant difference between observed and expected values, confirming the model's goodness of fit.

Table 11. Variables in the Equation (Hypothesis Testing)

Variable	B	S.E.	Wald	df	Sig.	Exp(B)/OR
CPD Type (Kejadian_CPD)	-0.395	0.419	0.889	1	0.346	0.673
Constant	1.515	0.651	5.404	1	0.020	4.547

The logistic regression coefficient for maternal height (B = −0.395) yielded a Wald statistic of 0.889 (df = 1, p = 0.346). The odds ratio (Exp(B)) of 0.673 indicates that taller mothers (≥145 cm) have approximately 32.7% lower odds of absolute CPD compared to shorter mothers, but this difference did not reach statistical significance. The null hypothesis is therefore accepted: there is no significant effect of maternal height on CPD incidence.

DISCUSSION

The principal finding of this study—that maternal height does not significantly influence CPD type ($p = 0.346$)—is consistent with the earlier work of Irhamni Istiqomah (2018), who similarly found no statistically significant relationship between maternal height and CPD ($p = 0.347$; PR = 1.60; 95% CI: 0.59–4.33). In both studies, although short-statured women demonstrated marginally elevated CPD risk, the association failed to achieve conventional statistical significance thresholds.

This finding, however, should not lead to the dismissal of maternal height as a risk factor. Rather, the result suggests that CPD is a complex, multidimensional condition in which anthropometric stature is one of several interacting determinants. Research by Mendez-Dominguez et al. (2020), conducted at a general hospital in Merida, Mexico, demonstrated that the maternal-neonatal body index—reflecting the proportional relationship between maternal and fetal body size—was a stronger predictor of caesarean delivery for CPD than maternal height or birthweight independently. This perspective aligns with Asmara et al. (2023), who found a significant correlation between maternal height and CPD ($r = -0.737$, $p = 0.000$) in a different Indonesian hospital setting, indicating population-specific variability.

One plausible explanation for the non-significant finding in the current study relates to the nutritional status of the sample population. In communities with improving nutritional profiles over recent decades, short-statured women may nonetheless have developed adequate pelvic dimensions through optimal calcium, phosphorus, and vitamin D intake during adolescent growth spurts (Herwinda, 2023). This metabolic-physiological pathway suggests that pelvic width may not be fully determined by final adult height, but rather by the quality of nutrition during bone mineralization periods.

Furthermore, genetic and ethnic variation in pelvic morphology may modulate the stature-pelvis relationship across different Southeast Sulawesi subpopulations. The Bugis-Makassar and Tolaki ethnic groups, prominent in this hospital's catchment area, may exhibit distinct anthropometric relationships between height and pelvic dimensions compared to populations studied in other Indonesian or international research contexts.

The Nagelkerke R^2 of 0.011 and the odds ratio of 0.673 further illustrate that while the direction of the association is biologically plausible (taller women having lower CPD risk), the effect size is negligible. This suggests that clinical CPD risk stratification relying primarily on height thresholds may lead to both false-positive and false-negative screenings. A comprehensive diagnostic approach incorporating pelvimetry—including distantia spinarum, conjugata externa, and distantia tuberum—ultrasonographic estimation of fetal weight, obstetric history, and labor progress monitoring remains the gold standard for CPD diagnosis (Saifuddin, 2020; Asmara et al., 2023).

From a public health perspective, these findings advocate for nutritional intervention programs targeting adolescent girls to optimize skeletal development and pelvic growth. Ensuring adequate intake of calcium, vitamin D, protein, and iron during the formative pubertal years may contribute to

reduced CPD incidence in future reproductive cohorts—potentially more effectively than relying on adult height as a standalone screening criterion.

This study has several limitations that must be acknowledged. First, as a retrospective secondary data study, the quality of analysis depends on the completeness and accuracy of hospital medical records. Second, the study examined only one variable (maternal height), while CPD is influenced by multiple factors including fetal weight, pelvic shape, labor mechanism, and maternal parity—none of which were controlled for in the regression model. Third, the exclusive focus on CPD cases (rather than all deliveries) limits the generalizability of findings to the broader obstetric population at RSUD Bahteramas.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the logistic regression analysis of 114 CPD cases at Tumbudadai Ward, RSUD Bahteramas, Southeast Sulawesi Province (2020–2024), this study concludes that maternal height does not exert a statistically significant effect on the type of Cephalopelvic Disproportion experienced ($p = 0.346 > 0.05$). The very low Nagelkerke R^2 value (0.011) indicates that height alone explains minimal variance in CPD outcomes.

These findings do not negate the biological plausibility of the stature-CPD relationship, but rather underscore the multifactorial nature of CPD and the limitation of using a single anthropometric parameter for risk assessment. Comprehensive obstetric risk evaluation—integrating clinical pelvimetry, fetal biometry, nutritional history, and labor progress—is recommended over reliance on height alone.

Recommendations

- Healthcare providers—particularly midwives and obstetricians—should use multi-factor risk assessment protocols for CPD that include pelvimetry, ultrasonography, and obstetric history, rather than height alone.
- Public health programs should prioritize adolescent nutritional interventions to support optimal pelvic skeletal development.
- Future research should adopt a case-control or cohort design with larger sample sizes and multiple predictor variables (fetal weight, pelvic dimensions, nutritional status, ethnicity) to provide a more comprehensive analysis of CPD etiology.

ADVANCED RESEARCH

Future studies are encouraged to expand the scope of analysis beyond single anthropometric indicators. A prospective cohort study incorporating direct pelvimetric measurements (clinical and radiological), fetal head circumference at delivery, gestational age, maternal body mass index, and nutritional biomarkers would provide richer insight into the causal pathways underlying CPD. Ethnic-stratified analyses would also contribute to understanding population-specific risk profiles across the diverse communities

of Southeast Sulawesi. Additionally, investigating whether improved nutritional programs for adolescent girls reduce future CPD rates would provide valuable evidence for preventive maternal health policy.

ACKNOWLEDGMENT

The authors express sincere gratitude to the Director and medical records staff of RSUD Bahteramas, Southeast Sulawesi Province, for granting access to the study data. Appreciation is also extended to the supervisors—Dr. Hj. Rosmawati Ibrahim, SST., MS., M.Kes and Ano Luthfa, SST., M.Kes—for their invaluable guidance throughout this research. Special thanks to the faculty and staff of the S1 Midwifery Study Program, STIKes Pelita Ibu, Kendari.

REFERENCES

Asmara, E. C., Mofrilindo, M., Ratu, N. A., & Hidayat, F. (2023). Correlation between the body height of pregnant mother with the case of cephalopelvic disproportion (CPD) at the general hospital in Mandau Subdistrict, Bengkalis Regency. Jurnal Riset Ilmu Kesehatan Umum dan Farmasi, 1(4), 117–127.

Archana, R., & Patra, S. (2021). Diagnostic accuracy of sacral rhomboid dimensions in prediction of cephalopelvic disproportion in primigravidae. Journal of Obstetrics and Gynaecology, 10(April), 1472–1477.

Cunningham, F. G., Leveno, K. J., Dashe, J. S., Hoffman, B. L., Spong, C. Y., & Casey, B. M. (2022). Williams obstetrics (26th ed.). McGraw-Hill Education.

Demang, F. Y., Muslimin, N., & Samsualam. (2023). Kesehatan ibu dan anak. Pustaka Lima Jari Indonesia.

Herwinda, K. R. (2023). Gizi dan kesehatan remaja. CV. ZT Corpora.

Humaera, A., Apri, M., & Handayani, D. (2018). Hubungan antropometri ibu dengan dimensi panggul pada ibu hamil. Jurnal Kesehatan Maternal, 15(1), 44–51.

Indryani, W., Sumarni, S., & Fitriani, H. (2021). Keterampilan dasar klinik kebidanan. Yayasan Kita Menulis.

Irhamni Istiqomah. (2018). Hubungan tinggi badan ibu bersalin dengan kejadian disproporsi kepala panggul. Jurnal Ilmu Kebidanan, 9(2), 85–92.

JNPK-KR. (2017). Asuhan persalinan normal. Departemen Kesehatan Republik Indonesia.

Kementerian Kesehatan RI. (2023). Survey Kesehatan Indonesia (SKI) 2023. Kemenkes RI.

Manuaba, I. B. G. F., Manuaba, I. A. C., & Manuaba, I. B. G. (2015). Ilmu kebidanan, penyakit kandungan dan KB (2nd ed.). Penerbit Buku Kedokteran EGC.

Mappaware, N. A., Muchlis, N., & Samsualam. (2020). Kesehatan ibu dan anak. Deepublish.

Masturoh, I., & Anggita, N. (2018). Metodologi penelitian kesehatan. Kementerian Kesehatan Republik Indonesia.

Mendez-Dominguez, N., Santos-Zaldívar, K., Gomez-Carro, S., Cortés-Telles, A., & Mézquita-Parra, M. (2020). Cephalopelvic disproportion as primary diagnosis for cesarean section: Role of neonatal birthweight in relation to maternal height at a hospital in Merida, Mexico. BMC Pregnancy and Childbirth, 20(1), 1–8. https://doi.org/10.1186/s12884-020-03016-3

Mochtar, R. (2017). Sinopsis obstetri. EGC.

Pahlevi, I. R., Widiastini, L. P., & Fitriani, D. R. (2017). Multigravida dengan riwayat seksio sesarea atas indikasi disproporsi kepala panggul. Jurnal Kesehatan Ibu dan Anak, 12(2), 30–36.

Prawirohardjo, S. (2010). Ilmu kebidanan Sarwono Prawirohardjo (4th ed.). PT Bina Pustaka Sarwono Prawirohardjo.

Saifuddin, A. B. (2020). Ilmu kebidanan Sarwono Prawirohardjo. PT Bina Pustaka Sarwono Prawirohardjo.

Sugiyono. (2019). Metode penelitian kuantitatif, kualitatif dan R&D. CV Alfabeta.

Utami, P., Marlina, M., Sari, S., & Adawiyah, R. (2023). Hubungan tinggi badan dengan kejadian cephalopelvic disproportion (CPD) pada ibu bersalin di Rumah Sakit Umum Dewi Sartika Kota Kendari. Jurnal Pelita Sains Kesehatan, 4(3), 23–31.

Varney, H., Kriebs, J. M., & Gegor, C. L. (2010). Buku ajar asuhan kebidanan (4th ed.). EGC.

Wahyuningsi, S., Nurhaeni, H., & Sulistyorini, E. (2022). Faktor risiko CPD pada ibu bersalin. Jurnal Kebidanan Indonesia, 13(1), 5–12.

World Health Organization. (2023). Cephalopelvic disproportion: Global burden and management. WHO Press. Retrieved from https://www.who.int/maternal_health