

# The Association Between Gestational Weight Gain with Birth Weight at Tanjung Public Health Center

Dewa Ayu Viennita Verdyanti Suria<sup>1</sup>, I Gusti Lanang Sidiartha<sup>2</sup>, Putu Tarita Susanti<sup>1</sup>

<sup>1</sup>Department Pediatric, North Lombok General Hospital, Tanjung, Indonesia

<sup>2</sup>Department Pediatric, Prof I.G.N.G Ngoerah Hospital, Denpasar, Indonesia

## Email address:

viennita@yahoo.com (Dewa Ayu Viennita Verdyanti Suria), lanangsidiartha@yahoo.com (I Gusti Lanang Sidiartha),

pututarita07@gmail.com (Putu Tarita Susanti)

\*Corresponding author

## To cite this article:

Dewa Ayu Viennita Verdyanti Suria, I Gusti Lanang Sidiartha, Putu Tarita Susanti. The Association Between Gestational Weight Gain with Birth Weight at Tanjung Public Health Center. *American Journal of Pediatrics*. Vol. 8, No. 4, 2022, pp. 263-266.

doi: 10.11648/j.ajp.20220804.22

**Received:** October 31, 2022; **Accepted:** November 16, 2022; **Published:** November 29, 2022

**Abstract:** *Background:* West Nusa Tenggara have 3.7% cases of neonates with low birthweight from 98,165 live birth and 7.3% was at Tanjung City. Gestational weight gain and birth weight may relate and there are many factors that influence them indirectly. Many low birthweights delivered by maternal with low nutrition status that undetected and untreated in pregnancy. *Objective:* To Assess the association of gestational weight gain with birth weight. *Methods:* This is a *retrospective crosssectional*. This research include 202 samples from Tanjung Public health care. This research was conducted since August-October the data from cohort book at Tanjung Public health care. This research uses 202 samples without placenta previa and preeclampsia. The bivariate analysis use *chi-square* to find the association. *Result:* There is a significant association between maternal weight gain and birth weight with Confident interval (CI) 95%, significant if  $P < 0.05$ . The means of weight gain of maternal is 11.2 kg. The means of neonatal birth weight is 2727 gram. From 202 samples, there are 72% maternal have suitable weight gain and the baby have normal weight birth. The prevalence of neonate with low birth weight is 43.06%. There are 75% low birth weight neonates came from maternal with inappropriate birth gain. *Conclusion:* Maternal weight gain that suitable to the target, have neonates with normal birth weight. Many factors predict might impact maternal weight gain that may need further research.

**Keywords:** Maternal, Weight Gain, Birth Weight, Low Birth Weight

## 1. Introduction

Maternal and child health is one of the indicators that determine the progress of a country. Now the world has set a goal to reduce maternal mortality to below 70 per 100,000 live births and decrease neonatal mortality to below 12 per 1,000 live births. Cases of Low Birth Weight (LBW) in Indonesia in 2020 reached 3.1% of 4,747,077 live births. The number of LBW in NTB in 2021 is 3.7% of the 98,165 live births, and 7.3% of the total are from North Lombok Regency. LBW is the highest cause of death in neonates, which is 35.2% in 2020. Deaths in LBW babies are caused by neonates being more prone to hypoglycemia and hypothermia. In addition to death, infants with LBW will be at risk for stunting. [1, 2]

Birth weight cannot be separated from the role of the

mother during pregnancy, one of which is the fulfillment of nutrition. Macronutrients such as carbohydrates, proteins, and fats are needed for fetal growth. Every trimester, the nutritional needs of the mother will increase because the fetus forms more organs, especially the brain. Lack of nutrition compliance in the brain formation phase will cause a decrease in intelligence so that it will cause difficulties during school and is irreversible. [3]

During the antenatal care (ANC) visit, the nutritional status of the mother was assessed by measuring weight and arm circumference. Weight gain at the visit becomes a benchmark for assessing nutritional adequacy during pregnancy. Adequate maternal nutrition will provide adequate intake for the growth of infants and babies born with sufficient weight. The process of gaining weight indirectly has an influence on the baby's birth weight. [4]

The government has pursued the First 1000 Days of Life program to prevent LBW births. The 1000 days of life program keeps the child from conception to 2 years of age. The government socializes the importance of ensuring nutrition in this phase. In addition, the government also seeks to monitor the nutritional status of maternal by weighing and measuring arm circumference every trimester, and by increasing the first visit of neonates to health facilities to monitor the baby's weight gain. This program is carried out to prevent the occurrence of LBW. In addition, it becomes a screening material for indications of supplementary feeding in maternal with chronic energy deficiency. This results in an increase in maternal weight during pregnancy. This program aims to prevent stunting in the future. [5]

Based on these problems, the researcher wants to conduct a study to assess the relationship between maternal weight gain during pregnancy and birth weight, which will be carried out in the North Lombok regency, especially at Tanjung Public Health Care (PHC).

## 2. Methods

This study uses an observational study with an analytic method with a cross-sectional approach. This study is a retrospective study that will take data from the 2021 cohort book at the Tanjung PHC. The data are maternal weight in first and last trimester, Body Mass Index (BMI) before pregnancy and birth weight of neonates. The study was conducted at the Tanjung PHC and data was collected in August and September 2022. The population were pregnant women who had K1 visits for pregnancies of less than 12 weeks in the Tanjung PHC working area in January–December 2021, totaling 440 people. The sample calculation used the Slovin method, and 202 samples were obtained. The data taken is secondary data recorded at the Tanjung PHC. The inclusion criteria are Pregnant women who visit Tanjung PHC for K1 visits, routine ANC visits and Identifying the Last Menstrual Period (LMP).

The exclusion criteria are suffering from Preeclampsia and Placenta Previa, IUFD or abortion baby, the data in the K1 visit log book is incomplete. Variable independent is total maternal weight gain during pregnancy will be categorized to unsuitable and suitable based on Institute of Medicine (IOM) 2009 category. Variable dependent is birth weight and will be divided into two categories, LBW and normal. The association between the two variables will be done using the chi-square method with confident interval 95%, significant if of 0.05.

## 3. Result

*Table 1. Sample Characteristic.*

Variable	Highest	(n) (f%)
Employment	Farmer	66 (37.2)
Education	High School	81 (40.1)
Parity	Grande Multipara	57 (28.2)
Nutrition	Good Nutrition	166 (82.2)
Give birth	Normal	155 (76.7)
Gestational age	Aterm	174 (86.1)
Birth weight	Normal	115 (59.6)
Maternal Weigh gain	Suitable	105 (52)

n= number; f=frequency

Maternal in Tanjung City mostly work as farmers, with a total of 66 people (32.7%). The educational characteristics of Maternal in Tanjung City variation from elementary to undergraduate. As many as 81 people (40.1%) received education up to high school. A total of 57 people (28.2%) had more than four children. Most maternal in Tanjung City have good nutrition for about 166 people (82.2%). Most of the mothers gave birth normally, with a total of 155 people (76.7%). The gestational age was mostly *aterm* with a total of 174 people (86.1%). Most neonates were born at normal birth weight, totaling 115 neonates (56.9%). There are 105 maternal (52%), experienced suitable weight gain.

*Table 2. Descriptive Analysis.*

Variable	Minimum	Maximum	Mean	Standard Deviation
Age	17	43	30.38	7.398
Pregnancies gap	0	6	2.83	1.909
BMI	17.02	34.98	25.5271	5.00275
Arm circumference	19	31	25.48	3.917
Birth weight	1115	4509	2637.59	777.025
Total weight gain	4.95	16.44	11.2434	2.83319

In this study there are several variables analyzed. The average age of maternal is 30.38 years, with the lowest age being 17 years and the highest age being 43 years. The mean distance between the mother's pregnancies is 2.83 years. The

mean BMI of maternal is 25.22. The average arm circumference of maternal is 25.48 cm. For the neonates's weight at birth, the average value was 2637.59 kg. The mean maternal weight gain was 11.24 kg.

*Table 3. Crosstabulation of Maternal Weight Gain with Birth Weight.*

Variable	Birth Weight		95% CI	P Value
	LBW (n=87) (f%)	Normal (n=115) (f%)		
Maternal Weight Gain	Unsuitable	65 (74.7)	0.36-0.50	0.01
	Suitable	22 (25.3)		
		83 (72.2)		

The Correlation test was conducted using Chi Square to

measure the association between maternal weight gain and birth

weight. There is a significant association if the  $p$  value  $< 0.05$ . From the results in the correlation table above, it was found that there were 65 (74.7%) maternal with unsuitable weight gain, gave birth to children with LBW and only 32 (27.8%) mothers who had less weight gave birth to children with normal weight. Meanwhile, there were 22 (25.3%) maternal who had suitable weight gain to giving birth to neonates with LBW. The remaining 83 (72.2%) people gave birth to neonates with normal weight. Maternal weight gain has association with birth weight (95% CI=0.36-0.50,  $p=0.01$ ).

## 4. Discussion

Maternal weight gain becomes an indicator of fetal well-being, associated with proper transfer of nutrition from mother to fetus. Nutritional imbalance during pregnancy will cause fetal growth and development restriction with a long-term consequence will affect not only the fetal phase but also the infant phase. During the fetal development process, nutrition is used to create cells and tissue in organogenesis; good nutrition will support a good formation of an organ anatomically and functionally [4, 6, 7].

This research aims to enlighten the correlation of Maternal Weight Gain with Birth Weight. The standard we used to describe suitable and unsuitable maternal weight gain adapted from Guideline from the Institute of Medicine (IOM) 2009. It defined in singleton pregnancy suitable maternal weight gain is categorized based on mother's BMI before pregnancy. maternal weight gain in BMI underweight, normal, overweight, dan obese are 12.5–18 kg, 11.5–16 kg, 7–11.5 kg, and 5–9 kg, respectively [8–10]. Our study shows 97 (48%) sample is included in unsuitable maternal weight gain, and 105 (52%) is in suitable maternal weight gain [11].

The unsuitable maternal weight gain can be associated with potential confounders, including social-economic factors like education, vitamin consumption, dietary habits, alcohol use, and smoking. Our analytic sample contains 202 pregnancies and was socioeconomically diverse, with the largest sample was graduated from senior high school. However, this study does not estimate the relationship between educational status and birth weight. Some studies confirmed that education status has a linear relation with lower odds of unsuitable WGM associated with being more likely to comply with health recommendations. However, the result is still subtle and cannot represent all of the race groups of women [11–13].

Our findings from comparing The Maternal Weight Gain with Birth Weight are 65 (74.7%) of unsuitable maternal weight gain give birth to LBW neonates. Only 22 (25.3%) of suitable maternal weight gain give birth to low birth weight (LBW) neonates, with crosstabulation statistical analysis confirm a significant association ( $p$ -value  $< 0.05$ ) between maternal weight gain and birth weight. our finding is consistent with evidence that every 1 kg maternal weight gain will contribute to an increase of 97 g birth weight [12]. One study in Taiwan explains maternal weight gain has a significant contribution to birth weight, the mean maternal weight gain of mothers who gave birth to neonates weighing  $< 2,500$  g is less than women who gave birth

to children  $> 2,500$  g [5, 6, 14].

The association of maternal weight gain is not solely affected LBW; excessive maternal weight gain increases the incidence of high birth weight [15, 16]. Guideline from IOM is based on total weight gain during pregnancy [10], used as an indicator of fetal growth; however, it cannot be applied in pregnancy with a higher risk of fetal growth restriction, preeclampsia, and small gestational age, specifically in twin pregnancy [17]. This aligns with the finding from Korea, in which twin pregnancy babies are born with a higher weight if the increase in maternal weight gain occurs more in the second trimester. maternal weight gain in the first trimester was not significant when used as a predictor of fetal growth and was most significant when measured at 24–28 and 15–18 weeks [18].

## 5. Conclusion

In the research we find maternal weight gains that suitable to the target, have neonates with normal birth weight. Although there are many factors predict might give an impact to maternal weight gain, such as education, job, and daily intake. These factors may need further research.

## References

- [1] Kementrian Kesehatan, *Profil Data Kesehatan Indonesia Tahun 2011*. 2014. doi: 351.770.212 Ind P.
- [2] Dinas Kesehatan Provinsi NTB, “Bayi Berat Badan Lahir Rendah (BBLR) di Provinsi NTB,” *Ntb Satu Data*. 2018. [Online]. Available: <https://data.ntbprov.go.id/dataset/bayi-berat-badan-lahir-renda-h-bblr-di-provinsi-ntb>
- [3] R. Sadarang, “Kajian Kejadian Berat Badan Lahir Rendah di Indonesia: Analisis Data Survei Demografi dan Kesehatan Indonesia tahun 2017,” *J. Kesmas Jambi*, vol. 5, no. 2, pp. 28–35, 2021, doi: 10.22437/jkmj.v5i2.14352.
- [4] A. Mousa, A. Naqash, and S. Lim, “Macronutrient and micronutrient intake during pregnancy: An overview of recent evidence,” *Nutrients*, vol. 11, no. 2, MDPI AG, Feb. 01, 2019, doi: 10.3390/nu11020443.
- [5] H. J. J. Mohamed *et al.*, “Maternal diet, nutritional status and infant birth weight in Malaysia: a scoping review,” *BMC Pregnancy Childbirth*, vol. 22, no. 1, Dec. 2022, doi: 10.1186/s12884-022-04616-z.
- [6] M. S. Tyagi, G. Singh Toteja, and N. Bhatia, “Maternal Nutritional Status and Its Relation with Birth Weight,” *Int. J. Heal. Sci. Res.*, vol. 7, no. 8, p. 422, 2017, [Online]. Available: [www.ijhsr.org](http://www.ijhsr.org)
- [7] R. Retnakaran *et al.*, “Association of timing of weight gain in pregnancy with infant birth weight,” *JAMA Pediatr.*, vol. 172, no. 2, pp. 136–142, Feb. 2018, doi: 10.1001/jamapediatrics.2017.4016.
- [8] T. H. Hung and T. T. an. Hsieh, “Pregestational body mass index, gestational weight gain, and risks for adverse pregnancy outcomes among Taiwanese women: A retrospective cohort study,” *Taiwan. J. Obstet. Gynecol.*, vol. 55, no. 4, pp. 575–581, Aug. 2016, doi: 10.1016/j.tjog.2016.06.016.

- [9] F. Y. Fouelifack, J. H. Fouedjio, J. T. Fouogue, Z. Sando, L. D. Fouelifa, and R. E. Mbu, "Associations of body mass index and gestational weight gain with term pregnancy outcomes in urban Cameroon: a retrospective cohort study in a tertiary hospital," *BMC Res. Notes*, vol. 8, no. 1, Dec. 2015, doi: 10.1186/s13104-015-1765-9.
- [10] F. G. Tela, A. M. Bezabih, and A. K. Adhanu, "Effect of pregnancy weight gain on infant birth weight among mothers attending antenatal care from private clinics in Mekelle City, Northern Ethiopia: A facility based follow-up study," *PLoS One*, vol. 14, no. 3, pp. 1–10, 2019, doi: 10.1371/journal.pone.0212424.
- [11] B. Firsti Winasandis and S. Anantanyu, "Associations between Maternal Nutritional Status, Carbohydrate, Fat, and Protein Intakes, and Low Birth Weight in Jember, East Java," *J. Matern. Child Heal.*, vol. 5, no. 1, pp. 1–11, 2020, doi: 10.26911/thejmch.2020.05.01.01.
- [12] T. Tejayanti, "Determinants Of Chronic Energy Deficiency And Low Body Mass Index Of Pregnant Women In Indonesia Determinan Kurang Energi Kronik dan Indeks Massa Tubuh Rendah pada Ibu Hamil di Indonesia," *J. Kesehat. Reproduksi*, vol. 10, no. 2, pp. 173–180, doi: 10.22435/kespro.v10i2.2403.173-180.
- [13] S. Wiyono *et al.*, "Study causes of chronic energy deficiency of pregnant in the rural areas," *Int. J. Community Med. Public Heal.*, vol. 7, no. 2, p. 443, Jan. 2020, doi: 10.18203/2394-6040.ijcmph20200412.
- [14] G. G. Woldeamanuel, T. G. Geta, T. P. Mohammed, M. B. Shuba, and T. A. Bafa, "Effect of nutritional status of pregnant women on birth weight of newborns at Butajira Referral Hospital, Butajira, Ethiopia," *SAGE Open Med.*, vol. 7, p. 205031211982709, Jan. 2019, doi: 10.1177/2050312119827096.
- [15] D. H. Afian, M. S. Anam, A. B. Himawan, and A. N. R. Suswihardhyono, "Faktor yang Berhubungan dengan Kenaikan Berat Badan Bayi Berat Lahir Rendah," *Sari Pediatr.*, vol. 23, no. 2, p. 75, 2021, doi: 10.14238/sp23.2.2021.75-81.
- [16] K. S. D. Trombe *et al.*, "Is birth weight associated with pregestational maternal bmi? Brisa cohort, Ribeirão Preto, Brazil," *Brazilian J. Med. Biol. Res.*, vol. 54, no. 1, pp. 1–7, 2020, doi: 10.1590/1414-431x202010037.
- [17] R. Sámano *et al.*, "Association of pregestational bmi and gestational weight gain with maternal and neonatal outcomes in adolescents and adults from mexico city," *Int. J. Environ. Res. Public Health*, vol. 19, no. 1, Jan. 2022, doi: 10.3390/ijerph19010280.
- [18] M. J. Kim, H. M. Kim, H.-H. Cha, and W. J. Seong, "Correlation between Maternal Weight Gain in Each Trimester and Fetal Growth According to Pre-Pregnancy Maternal Body Mass Index in Twin Pregnancies," *Medicina (B. Aires).*, vol. 58, no. 9, 2022, doi: 10.3390/medicina58091209.