Special Issue: The 2nd Bengkulu International Conference on Health (B-ICON 2022) 2023.18(1SP): 38–45
https://doi.org/10.20473/mgi.v18i1SP. 38–45

THE INFLUENCE OF CALCIUM AND IRON SUPPLEMENTATION IN PREGNANT WOMEN TO AFFECT NEWBORN BODY LENGTH IN BENGKULU

Agung Riyadi[1]*, Lisma Ningsih[2], Jumiyati[3], Antun Rahmadi[4]
[1]Department of Nursing, Bengkulu Health Polytechnic, Ministry of Health, Republic of Indonesia.
[2]Department of Health Promotion, Bengkulu Health Polytechnic, Ministry of Health, Republic of Indonesia.
[3]Department of Nutrition, Bengkulu Health Polytechnic, Ministry of Health, Republic of Indonesia.
[4]Department of Nutrition, Tanjung Karang Health Polytechnic, Ministry of Health, Republic of Indonesia.
*E-mail: agungr881@gmail.com

ABSTRACT

In 2021, the rate of stunting in Indonesia was 24.4%, and 21.1% happened in Bengkulu province. In 2020, the proportion of pregnant women who receive iron tablets in Bengkulu Province was 97%. Some regencies have a lower proportion, such as North Bengkulu at 87%. Pregnant women who suffer from the lack of iron and folic acid intake may experience anemia and impaired fetal growth. The aim of this study is to investigate the effect of calcium and iron supplementation in pregnant women on newborn body length in Bengkulu Province. This study used an experimental design with a post-test-only control group. The population was third semester pregnant women in Bengkulu Province. Subjects were taken using purposive sampling technique. The number of subjects involved was 29 in intervention group and control group. Instruments used in this study were food frequency questionnaire (FFQ), mid upper arm circumference tape, and a respondent characteristics questionnaire. Data analysis methods include independent t-test, correlation, and double linear regression. The consumption of iron tablets and calcium tablets (p=0.0001), as well as the nutritional status of pregnant women (p=0.0001), have significant effect on newborns body length. Calcium and iron tablets supplementation improve the nutritional status of pregnant women and increase newborn body length. However, it should be measured by using same controlling variables such as education, age, parity, protein intake, vitamin C intake, knowledge and gestational age of childbirth.

Keywords: *supplement, pregnant, stunting, experimental*

INTRODUCTION

Stunting is a public health issue in Indonesia that must be addressed. Malnutrition can cause stunting, particularly during the first 1000 days of life. Stunting affects children intelligence and health status as adults (Kementrian Kesehatan RI, 2018). Children nutritional intake must be fulfilled optimally, especially 1000 HPK, to grow up healthy and smart (Husnah, 2017).

Stunted children tended to have a non-optimal metabolism and were prone to non-communicable diseases. Stunting inhibits physical growth, increases the risk of developing diseases and can inhibit cognitive development. It also affects productivity in adulthood (Kementrian Kesehatan RI, 2018).

The stunting rate in Indonesia was 24.4% in 2021, and 21.1% in Bengkulu province (Kementrian Kesehatan RI, 2021). Pregnant women anemia and chronic lack of energy leads to high stunting rates. In 2018, 48.9% of pregnant women had anemia, and 17.3% had a chronic shortage of energy (Kemenkes, 2019).

Efforts to overcome stunting need to be carried out as early as possible, starting when the mother is declared pregnant until the child reaches the age of two. Government has carried out a program of providing supplementary food for children and pregnant women, as well as the provision of iron tablets. In 2020, the proportion of pregnant women who received iron tablets in Bengkulu Province was 97%. Almost all districts and cities have achieved quite well, but there are districts with lower coverage than the coverage of Bengkulu Province, one of which is North Bengkulu Regency, by 87% (Badan Pusat Statistik Provinsi Bengkulu, 2021).

 Received 26-12-2022, Accepted 31-05-2023, Published online 29-06-2023.

Many pregnant women have anemia. The prevalence of pregnant women suffering from anemia in Indonesia was 48.9% (Kemenkes, 2019). Lack of iron intake can cause anemia. Anemia in pregnant women can harm the health of both the mother and the baby. Anemia can affect fetal growth, causing bleeding and death (Wardani et al., 2021).

Pregnant women who consume iron during pregnancy prevent the occurrence of anemia and affect newborn body length. Pregnant women who take iron tablets have a lower risk of having stunted children than mothers who do not obediently consume iron tablets (Bingan, 2020). Babies with short body lengths are four times more likely to be stunted than newborns with a standard body length (Swathma et al., 2016).

Pregnant women need calcium more than when they were not pregnant. Pregnant women who lack calcium can experience bone fragility. The fetus needs calcium for the development of strong bones. Calcium is essential to maintain the stability of the heart rate and the functioning of the nerves and muscles of pregnant women (Cormick & Belizán, 2019).

Pregnant women in Asian countries experience low calcium intake. In low and middle income pregnant women, the average calcium intake was 648 mg/day (Cormick & Belizán, 2019). The average calcium intake in pregnant women in Southeast Asia was 602.4 mg/day (Panburana et al., 2021). In Indonesia, the recommended calcium intake for pregnant women is 1400 mg/day (Kementrian Kesehatan RI, 2019).

The blood carries calcium actively through the placenta during pregnancy. The need for calcium is increasing, especially in the third semester. The absorption and utilization of calcium become more efficient. Administration of calcium supplements to meet increased calcium needs. Supplementation is expected to maintain the balance of maternal calcium and bone density and support fetal development (Mousa et al., 2019).

METHODS

This study uses an experimental design with a posttest-only control group. The study population was all pregnant women in the third trimester in Bengkulu Province. Sampling used purposive sampling techniques, with a total sample of 29 individuals in the treatment group and 29 individuals in the control group. Data collection was carried out by making a list of all pregnant women in the third trimester in the Hulu Palik Public Health Center, the Lubuk Durian Public Health Center, and the Tanjung Agung Health Center in the Northern Bengkulu Regency as well as in the Curup Public Health Center in the east of the Rejang Lebong Regency. Data on pregnant women were collected through the practice of village midwives or private midwives in the public health center work area. The researchers determined which pregnant women were in the treatment group or control group on based sample criteria. All subjects received iron tablets (60 mg), a total of 90 tablets during pregnancy, and the treatment group received an additional calcium tablet (500 mg) a daily, at least 90 tablets.

This study used a variety of measuring instruments. Food Frequency Questionnaire instrument to collect nutritional intake data; upper middle arm circumference band to measure nutritional status and questionnaires to assess knowledge. Enumerators carried out data collection, totaling six people, who had been trained in advance so that enumerator knowledge was in a homogeneous state so that data collection could be carried out smoothly and the resulting data be valid.

The univariate analysis perfomed provided an overview of the newborn body length and its determinants. Bivariate analysis used independent t-test, linear correlation, and the double linear regression test to determine the most dominant factor affecting the newborn body length in Bengkulu Province. This research has been received as ethically worthy by the ethics committee of the health research poltekkes of the Ministry of Health Bengkulu no. KEPK. M/179/10/2021.

RESULTS

The intervention group consisted of pregnant women aged 20–39 years, with an average age of 26.76 years. The control group was between 20 and 41 years old, with a mean age of 29.45 years.

The average protein intake in the intervention group was 96.83 grams, while in the control group, it was 132.71 grams. The average vitamin C intake in the intervention group was 30.44 mg, while that in the control group was 62.20 mg. Gestational age at delivery was 39.17 weeks in the intervention group and 38.41 weeks in the control group.

Table 2 shows that the intervention group of pregnant women with secondary education was 48.3% and 69% in the control group. Most (72.4%) pregnant women in the intervention group were primiparous, while almost all women in the control group (82.8%) were multiparous.

The average birth body length of infants differed between the intervention groups (50.07 cm) and controls (48.10 cm).

Table 4 shows that babies average birth body length differs between pregnant women who fully consume iron and calcium tablets (50.07 cm) and pregnant women who consume iron tablets (48.10 cm). The results of further statistical tests

Table 2. Pregnant Women Characteristics Based on Education Level and Parity in the Bengkulu Province

Variable	Group			
	Intervention (n=29)		Control (n=29)	
	n	%	n	%
Maternal Education				
Basic	4	13.8	7	24.1
Senior high school	14	48.3	20	69.0
Higher education	11	37.9	2	6.9
Parity				
Primipara	21	72.4	5	17.2
Multipara	8	27.6	24	82.8

Table 3. The Distribution of Average Birth Length of Babies in Bengkulu Province

Variable	Group			
	Intervention (n=29)		Control (n=29)	
	Mean±SD	Min-Max	Mean±SD	Min-Max
Baby Birth Body Length	50.07±0.92	49-52	48.10 ±1.15	46-51

Table 4. Effect of Iron and Calcium Tablets Consumption, Education, and Parity of Pregnant Women on the Body Length of the Infant at Birth in Bengkulu Province

Variable	Baby Birth Body Length		P value
	Mean±SD	Min-Max	
Consumption of iron Tablets and Calcium			
Complete (Intervention)	50.07±0.92	49-52	0.001
Incomplete (Control)	48.10±1.15	46-51	
Education			
Basic	48.27±1.85	46-52	
Senior high school	49.09±1.31	46-52	0.035
Higher education	49.77±1.01	48-52	
Parity			
Primipara	49.65±1.38	48.27-51.03	0.005
Multipara	48.62±1.31	47.31-49.93	

Table 5. Analysis of Correlation and Regression of Age, Height, Nutritional Status, Nutritional Intake, and Knowledge of Pregnant Women with the Body Length of the Infant at Birth in Bengkulu Province

Variable	r	R2	Line Equation	*p value*
Age	-0.169	0.029	**PB**=50.560+(-0.052) ***Age**	0.205
Height	0.055	0.003	**PB**=46.671+(0.016) ***TB**	0.680
Nutritional Status	0.342	0.117	**PB**=45.158+(0.146) ***SG**	0.009
Protein Intake	-0.227	0.051	**PB**=49.802+(-0.006) ***AP**	0.087
Iron Intake	0.064	0.004	**PB**=48.949+(0.006) ***AZ**	0.635
Vitamin C Intake	-0.401	0.161	**PB**=50.048+(-0.021) ***VC**	0.002
Calcium Intake	0.059	0.003	**PB**=48.932+(0.000) ***AK**	0.660
Knowledge of Pregnant Women	0.187	0.035	**PB**=47.681+(0.022) ***Know**	0.160
Gestational Age at Childbirth	0.288	0.083	**PB=**35.199+0.358***MM**	0.028

showed an influence of the consumption of iron and calcium tablets on the length of the baby birth body (p = 0.0001). The average body length of babies born to basic-educated mothers was 48.27 cm. The average body length of babies born to middle-educated mothers was 49.09 cm, which is not much different from that of highly educated mothers, which is 49.77 cm. The statistical test results found a difference (p = 0.035) in the birth body length of the baby between the three levels of education of pregnant women. The average body length of babies born from primipara mothers was 49.65 cm and from multipara, mothers were 48.62 cm. The results of statistical tests found a difference (p = 0.005) in the birth body length of babies between primiparous and multiparous pregnant women.

Table 5 shows that the age of pregnant women has a weak relationship with baby birth length (r=-0.169) in a negative direction. The length of the newborn body length decreases with age. The regression line equation can only explain 2.9% of the variation in baby birth length.

The height of pregnant women has a weak relationship (r=0.055) with the birth length, and the direction was positive. The line equation obtained needs to be better to explain the variable body length of newborns with a coefficient of determination of 0.03. The nutritional status of pregnant women and baby birth length showed a moderate relationship (r=0.342), and the direction was positive.

There wasa significant relationship between the nutritional status of pregnant women and the baby birth length (p=0.009). The nutritional intake of pregnant women in this study consisted of protein, iron (Fe), vitamin C, and calcium. The correlation of protein intake with the baby birth length shows a weak relationship (r =-0.227). The direction was negative, meaning a higher protein intake does not necessarily increase the baby birth length. The correlation between iron intake and the baby birth length shows a weak relationship (r=0.064). The direction was positive, meaning that the better the iron intake, the greater the baby birth length. The correlation of vitamin C intake with a baby birth length shows a moderate relationship (r=-0.401), and the direction was negative. There is a significant relationship between vitamin C intake and birth length (p=0.002). While the correlation between calcium intake and baby birth length showed a weak relationship (r=0.059), the direction was positive, meaning that the better the calcium intake, the better the baby birth length. Knowledge has a weak correlation (r=0.187) with baby birth length, and the direction was positive. The coefficient of determination is 0.035, meaning that the regression line equation can only explain 3.5% of the variation in baby birth length.

The gestational age during childbirth with the infant body length at birth showed a moderate relationship (r=0.288) and a positive direction. The more advanced the gestational age during childbirth, the greater the size of baby birth body length. The value of the coefficient of determination is 0.083, so it can be concluded that the regression line equation can only explain 8.3% of the variation in the length of the baby birth body. Statistical studies also revealed a strong link between the baby birth body length and gestational age during birthing (p=0.028).

Multivariate Analysis

Variables included as candidates for multivariate analysis were variables with have a *p* value of less than 0.25 in bivariate analysis. In this study, nine variables met the requirements as multivariate candidates, namely consumption of iron and calcium tablets (p=0.0001), education (p=0.035), parity (p=0.005), age (p=0.205), nutritional status (p=0.009), protein intake (p=0.087), vitamin C intake (p=0.002), knowledge (p=0.160), and gestational age at delivery (p=0.028).

Several assumptions must be met for the line aquation used to predict to produce valid numbers:

Table 6. Final Multivariate Modeling

No	Variable	Coofisient B	*p* value	R square	*p* value
1	Consumption of iron Tablets and Calcium	-1.868	**0.0001**	0.687	0.0001
5	Nutritional Status	0.185	**0.0001**		

Special Issue: The 2nd Bengkulu International Conference on Health (B-ICON 2022) 2023.18(1SP): 38–45
https://doi.org/10.20473/mgi.v18i1SP. 38–45

existence, independence, linearity, homoscedascity, normality, and collinearity. The assumption and collinearity test results were fulfilled, so that the model could be used to predict baby birth length. The next step was the interaction test, which was substantially between variables seen as not interacting.

Model Interpretation

The results of the multivariate analysis found that two variables were significantly related to the length of baby birth body, namely the variables of consumption of iron tablets and calcium and the nutritional status of pregnant women. While the variables of education, parity, age, protein intake, vitamin C intake, knowledge, and gestational age during childbirth were confounding variables.

In the final multivariate modeling, an r square result of 0.687 was obtained, meaning that the nine independent variables could explain the variable of baby birth body length by 68.7%, while other variables explained the rest. The results of statistical tests, a p value of 0.0001, were obtained, meaning that the overall regression line equation was significant for predicting the variable body length of the infant at birth. The regression line equation is **Baby Birth Body Length** = 4 2.532 – 1.868 **Consumption of iron Tablets and Calcium** + 0.185 **Nutritional Status** + 0.266 **Education** + 0.397 **Parity** – 0.040 **Age -**0.002 **Protein Intake –** 0.003 **Vitamin C Intake +** 0.005 **Knowledge of Pregnant Women +** 0.112 **Gestational Age at Childbirth.**

Pregnant women who consumed iron and calcium tablets had babies with body length at birth higher by 1.868 after educational vaiarbles, parity, age, protein intake, vitamin C intake, knowledge of pregnant women and gestational age during childbirth were in control. Pregnant women with good nutritional status will increase baby body length at birth by 0.185 after the education variables, parity, age, protein intake, vitamin C intake, knowledge of pregnant women, and gestational age during childbirth were in control.

DISCUSSION

Characteristics of Pregnant Women

The characteristics of pregnant women studied in this study include age, height, nutritional status, nutritional intake (protein, Fe, vitamin C, and calcium), knowledge of pregnant women, gestational age during childbirth, education, and parity. Upper arm circumference was used to assess the nutritional status of pregnant women. The nutritional status showed no difference between the intervention and control groups. The average upper arm circumference of pregnant women in the intervention group was 26.5 cm, while in the control group, it was 27.3 cm. Another indicator for measuring nutritional status is the measurement of body mass index (BMI). Pre-pregnancy BMI affects the body length of newborns with a value of $r^2 = 0.767$, meaning that the BMI variable can explain the variable body length of newborns by 76.7% while the rest is influenced by other variables (Ningrum & Cahyaningrum, 2018).

This study showed that the average protein intake in the intervention group was 96.83, while in the control group it was 132.71. This intake is sufficient for pregnant women and, according to the protein adequacy figure recommended for the third-trismester pregnant woman in Indonesia, which is 90 grams daily (Kementrian Kesehatan RI, 2019).

The average vitamin C intake in the intervention group was 30.44 while in the control group, it was 62.20. This intake still needed to be improved compared to the nutritional adequacy rate. The nutritional adequacy rate for vitamin C in pregnant women is 85 mg/day (Adrian, 2020). Vitamin C plays a role in collagen formation in the skin, bones, and blood vessels; it repairs body tissues and can accelerate wound healing. Pregnant women need vitamin C to help the absorption of iron in the body. Pregnant women require additional iron to aid in the production of red blood cells and to prevent anemia.

Knowledge of pregnant women was similar between control and treatment groups; there was no difference. Knowledge can be obtained through education and information media such as newspapers, television, radio, and other mass media. Information media can already be accessed by all pregnant women in Bengkulu Province can already acces information media, so the knowledge of pregnant women tends to be the same. Pregnant

Special Issue: The 2nd Bengkulu International Conference on Health (B-ICON 2022) 2023.18(1SP): 38–45
https://doi.org/10.20473/mgi.v18i1SP. 38–45

women with good knowledge will have good attitudes and behaviors to meet their nutritional needs (Kusuma et al., 2020).

The results showed differences in education levels between the intervention and control groups. The last education that pregnant women have taken is mostly secondary education (SMA), which consists of an intervention group of 48.3% and a control group of 69%. Education plays a role in influencing the ability to obtain information and gain broader knowledge. Pregnant women education was linked to the incidence of stunting in children aged 24-59 months (Setiawan et al., 2018).

Characteristics of Baby Birth Length in Bengkulu Province

The study found that babies average birth body length differed between intervention and control groups. The average baby birth length in the intervention group was 50 cm, while in the control group, it was 48.1 cm. This study proves that the body length of babies from mothers who consume iron tablets and calcium completely is higher than mothers who only consume iron tablets. Body length measures bone mass growth due to nutritional intake, which is used as an anthropometric parameter to describe linear growth (Candra, 2020).

At the Kendall Health Center in Kendari City, the baby birth length was a risk factor for toddler stunting (Swathma et al., 2016). Toddlers having a history of being born with a short body length are 4.078 times more likely to be stunted than toddlers with a history of average birth length. Similarly, a study (Rahmadi, 2016) discovered a link between infant body length at birth and stunting in children aged 12-59 months in Lampung Province. Babies with low birth length are at 1.56 times the risk of stunting compared to babies with average body length. A child aged 6–23 months whose birth length is short has a three times greater chance of experiencing stunting and developmental delays after being controlled by variables of the child age, child sex, and father education (Amaliah et al., 2016).

The Effect of Iron Tablets and Calcium Consumption on Baby Birth Length in Bengkulu Province

The consumption of iron and calcium tablets significantly affects infant body length at birth. The total calcium intake depends on the food consumption pattern of pregnant women. Dietary calcium supplements are essential for people who consume fewer calcium-containing foods. Not all pregnant women consume calcium supplement tablets regularly, so monitoring is needed to ensure that pregnant women consume the calcium given. From 20 weeks of gestation, WHO recommends that all pregnant women from low-calcium-intake areas receive calcium supplementation of 1500–2000 mg/day (Cormick & Belizán, 2019).

Insufficient calcium intake can lead to maternal bone loss during pregnancy. Calcium absorption in pregnant women increases significantly during the second and third trimesters (Cormick & Belizán, 2019). The fetus needs calcium to grow bones and teeth, and it affects body length. The fetal spine begins to form at week four, and its growth occurs rapidly after the 24th to the third trismesterof the week. Lack of calcium intake at this time can result in impaired fetal development, especially if bone growth is not optimal.

The recommended calcium nutritional adequacy level for Indonesian mother was 1200 mg, and if pregnant, 200 mg was added, so that pregnant women need 1400 mg of calcium daily (Kementrian Kesehatan RI, 2019). The study found that the average calcium intake was 620.23 mg in the treatment group and 682.79 mg in the control group. This intake is deficient compared to pregnant women calcium nutritional adequacy rate. Additional calcium tablets of 500 mg daily have been shown to be able to meet the calcium needs of pregnant women and affect the length of the baby body at birth.

Pregnant women require 200-300% larger iron to form red blood cells and the placenta. Iron tablets can help create red blood cells that function as oxygen carriers and dietary nutrients for the mother and fetus. Iron deficiency anemia, poor birth weight, and preeclampsia can result from iron deficiency (Grzeszczak et al., 2020).

The need for iron by pregnant women increases by 25%. This iron is needed by pregnant

women for fetal and placental growth and to prevent bleeding during childbirth (Kementerian Kesehatan Republik Indonesia, 2020). The need for iron was not enough only from the daily diet because the daily diet contains little iron. It was seen that the iron intake of pregnant women in the third semester averaged 23.37 mg. This intake was still less than the adequacy of iron consumption of pregnant women in the third semester of 27 mg. Almost all (48.8%) pregnant women consume less iron than the nutritional adequacy rate, so their need iron tablets (Wardani et al., 2021). Iron deficiency will result in anemia and low hemoglobin levels in pregnant women. Hemoglobin carries oxygen to the tissues that the fetus needs to grow. This condition will affect the infant body length at birth. This study was in line with research by Bingan (2020), which found a relationship between the consumption of iron tablets in pregnant women (p=0.002) and the body length of children aged 12–24 months.

The administration of calcium in conjunction with iron affects the growth of the fetus. This condition follows the opinion (Cormick & Belizán, 2019) that administering calcium supplementation along with iron for a long time does not affect iron absorption or calcium. The administration of iron-tablet with a content of 200 mg of Ferrous Sulphate (equivalent to 60 mg of iron elements) and 0.25 mg of folic acid, along with the administration of calcium 500 mg, can meet the needs of the mother and fetus.

CONCLUSION

The consumption of iron and calcium tablets and their nutritional status significantly affect the body length of newborns after being controlled by variables of education, parity, age, protein intake, vitamin C intake, knowledge, and gestational age during childbirth. Calcium and iron supplement in pregnant women affect the length of baby birth length, on average 1,97 cm more than pregnant women without calcium and iron supplements.

The provision of calcium tablets for pregnant women is recommended to be a program that is given free of charge by the Community Health Center both through midwife practices and in Maternal and Child Health (MCH) services. In addition, monitoring by health workers is needed to ensure that pregnant women consume the iron and calcium tablets given regularly.

REFERENCES

Adrian, K. (2020). *Manfaat dan Dosis Aman Vitamin C untuk Ibu Hamil*. https://www.alodokter.com/vitamin-c-untuk-ibu-hamil-manfaatnya-dan-dosis-aman-yang-dianjurkan

Amaliah, N., Sari, K., & Suryaputri, I. Y. (2016). Panjang Badan Lahir Pendek Sebagai Salah Satu Faktor Determinan Keterlambatan Tumbuh Kembang Anak Usia 6-23 Bulan Di Kelurahan Jaticempaka, Kecamatan Pondok Gede, Kota Bekasi. *Jurnal Ekologi Kesehatan*, *15*(1), 3–9. https://doi.org/10.22435/jek.v15i1.4959.43-55

Arpianti Eka Wardani, N., Studi, P. S., & Husada Borneo, Stik. (2021). Kepatuhan Konsumsi Tablet FE, Tingkat Kecukupan Konsumsi FE dan Vitamin B12 Berkaitan dengan Anemia pada Ibu Hamil Compliance in consuming Fe tablets, adequacy level of Fe and Vitamin B12 consumption associated with anemia in pregnant women. *Arsip Gizi Dan Pangan*, *6*(1), 1–9. https://doi.org/10.22236/argipa.v6i1.5917

Badan Pusat Statistik Provinsi Bengkulu. (2021). *Profil Kesehatan ibu dan Anak Provinsi Bengkulu 2020*.

Candra, A. (2020). *Pemeriksaan Status Gizi*. http://eprints.undip.ac.id/80671/1/BUKU_PEMERIKSAAN_STATUS_GIZI_KOMPLIT.pdf

Cormick, G., & Belizán, J. M. (2019). Calcium intake and health. *Nutrients*, *11*(7), 1–16. https://doi.org/10.3390/nu11071606

Grzeszczak, K., Kwiatkowski, S., & Kosik-Bogacka, D. (2020). The role of fe, zn, and cu in pregnancy. *Biomolecules*, *10*(8), 1–33. https://doi.org/10.3390/biom10081176

Husnah, H. (2017). Nutrisi Pada 1000 Hari Pertama Kehidupan. *Jurnal Kedokteran Syiah Kuala*, *17*(3), 179–183. https://doi.org/10.24815/jks.v17i3.9065

Kemenkes, R. (2019). Riskesdas 2018.pdf. In *Riset Kesehatan Dasar*.

Kementerian Kesehatan Republik Indonesia. (2020). *Pedoman Pemberian Tablet Tambah Darah (TTD) Bagi Ibu Hamil*. 24.

Kementrian Kesehatan RI. (2018). Cegah Stunting, itu Penting. *Pusat Data Dan Informasi, Kementerian Kesehatan RI*, 1–27. https://www.kemkes.go.id/download.php?file=download/

pusdatin/buletin/Buletin-Stunting-2018.pdf

Kementrian Kesehatan RI. (2019). *Peraturan Menteri Kesehatan Republik Indonesia Nomor 28 tahun 2019 tentang Angka Kecukupan Gizi yang Dianjurkan untuk masyarakat Indonesia* (Vol. 45, Issue 45, pp. 95–98).

Kementrian Kesehatan RI. (2021). buku saku hasil studi status gizi indonesia (SSGI) tingkat nasional, provinsi, dan kabupaten/kota tahun 2021. *Angewandte Chemie International Edition, 6(11), 951–952.*, 2013–2015.

Kusuma, D. R., Aryawangsa, P. D., Satyarsa, A. B. S., & Aryani, P. (2020). Pengetahuan, Sikap Dan Perilaku Ibu Hamil Terhadap Nutrisi Selama Kehamilan Di Wilayah Kerja Upt Puskesmas Mengwi I, Badung, Bali. *Gema Kesehatan*, *12*(1), 20–29. https://doi.org/10.47539/gk.v12i1.127

Mousa, A., Naqash, A., & Lim, S. (2019). Macronutrient and micronutrient intake during pregnancy: An overview of recent evidence. *Nutrients*, *11*(2), 1–20. https://doi.org/10.3390/nu11020443

Ningrum, E. W., & Cahyaningrum, E. D. (2018). Status gizi pra hamil berpengaruh terhadap berat dan panjang badan bayi lahir. *Medisains*, *16*(2), 89. https://doi.org/10.30595/medisains.v16i2.3007

Panburana, P., Komwilaisak, R., Tongprasert, F., Phadungkiatwattana, P., Kor-Anantakul, O., & Lumbiganon, P. (2021). Calcium consumption during pregnancy: A multicenter study in a middle-income country in southeast Asia. In *International Journal of Women's Health* (Vol. 13, pp. 31–38). https://doi.org/10.2147/IJWH.S285516

Rahmadi, A. (2016). Hubungan Berat Badan Dan Panjang Badan Lahir Dengan Kejadian Stunting Anak 12-59 Bulan Di Provinsi Lampung. *Jurnal Keperawatan*, *XII*(2), 209–218.

Sabatina Bingan, E. C. (2020). Hubungan Konsumsi Fe Dengan Panjang Badan Pada Anak Usia 12-24 Bulan. *Media Informasi*, *15*(2), 115–120. https://doi.org/10.37160/bmi.v15i2.415

Setiawan, E., Machmud, R., & Masrul, M. (2018). Faktor-Faktor yang Berhubungan dengan Kejadian Stunting pada Anak Usia 24-59 Bulan di Wilayah Kerja Puskesmas Andalas Kecamatan Padang Timur Kota Padang Tahun 2018. *Jurnal Kesehatan Andalas*, *7*(2), 275. https://doi.org/10.25077/jka.v7.i2.p275-284.2018

Swathma, D., Lestari, H., & Ardiansyah, R. (2016). Risk Factors Analysis of Low Birth Weight, Body Length at Birth and Basic Immunization History Toward Stunting of Children Aged 12-36 Months in Working Area of Local Government Clinic of Kandai Kendari Municipality in 2016. *Jurnal Ilmiah Mahasiswa Kesehatan Masyarakat Unsyiah*, *1*(3), 186294. http://ojs.uho.ac.id/index.php/JIMKESMAS/article/view/1088/746