

## Dietary Intake and Emotional Eating Status in Relation to Gestational Weight Gain among Indonesian Pregnant Women in Bantul

Rani Risa Sativa<sup>1</sup>, Arif Sabta Aji<sup>1,2</sup>, Rahmawati Yulinda<sup>1</sup>, Sintha Dewi Purnamasari<sup>1</sup>, Yhona Paratmanitya<sup>1</sup>

<sup>1</sup>Nutrition Department, Faculty of Health Sciences, Universitas Alma Ata, Yogyakarta, Indonesia

<sup>2</sup>Public Health Department, Faculty of Health Sciences, Universitas Alma Ata, Yogyakarta, Indonesia



 Corresponding Author: [yhona.nitya@almaata.ac.id](mailto:yhona.nitya@almaata.ac.id)



### ARTICLE INFO

#### Article History:

Received: 2023-10-12

Accepted: 2023-12-29

Published: 2023-12-31

#### Keywords:

dietary intake;  
emotional eating;  
diversity intake;  
gestational weight gain;

### ABSTRACT

**Introduction:** Covid-19 pandemic impact the ability to reach nutritious food due to social restrictions and economic difficulties situation. **Objective:** This study determined the relationship between dietary diversity status (DDS) and emotional eating and its association with dietary intake and gestational weight gain (GWG) in Bantul, Indonesia. **Methods:** The cross-sectional study design conducted from December 2021 to February 2022 in three public health centers. Of 105 third trimester pregnant women were obtained and interviewed for DDS, semi quantitative food frequency questionnaire (SQ-FFQ), and emotional eating questionnaires. Bivariate analysis was used to measure association between variables with SPSS 25.0 version. **Results:** The majority of pregnant women had an adequate varied diet and an emotional eating with food (59.0% and 56.2%, respectively). The GWG status was mostly (61%) had normal GWG. There was no association of DDS with GWG ( $p = 0.131$ ). However, there was a significant association between emotional eating and dietary intake status on GWG status ( $p < 0.001$  for all comparisons). **Conclusion:** Dietary intake and emotional eating during pregnancy were linked to GWG status. Pregnant women need to maintain their psychological well-being and dietary intake in order to maintain a normal GWG and prevent adverse pregnancy outcomes.



©2023 by the authors. Submitted for possible open-access publication under the terms and conditions of the Creative Commons Attribution (CC BY SA) license (<https://creativecommons.org/licenses/by-sa/4.0/>)

## INTRODUCTION

Coronavirus Disease 2019 (COVID-19) is a new type of disease that can be transmitted from human to human and has spread widely in the world and has become a global pandemic (PPSDM, 2020; Rachmah et al., 2021). A pandemic causes a condition of fear and stress that can increase many risk factors that affect our health status. Individuals who experience stress can cause various kinds of problems including the economy, family, work (Devid Saputra, 2020). Stress will also affect emotional eating, which makes people eat more because it doesn't fulfill their appetite in order to improve emotional conditions or as a reward (Trimawati & Wakhid, 2018). Pregnant women are a vulnerable group and easily get stressed due to the pandemic and worries about their pregnancy and childbirth. Pandemic has made people spend more time at home and there may be an opportunity to change eating patterns to

become less diverse, increased consumption of processed foods, and lack of consumption of nutritious food (*FAO, IFAD, UNFPA, WFP, WHO, dan UNICEF tentang Ketahanan Pangan dan Gizi | UNICEF Indonesia, 2020*).

The pregnancy is a very important period for maintaining body weight because it determines the generation's health status that will be born (Robertson et al., 2019). Adequate weight gain is necessary to support the growth of the fetal so that it can be born normally and healthy (Zhang et al., 2020). Gestational weight gain (GWG) is influenced by many factors, including nutritional status, maternal age during pregnancy, diet during pregnancy, knowledge, social factors, and poverty (Aji et al., 2022; Mooduto et al., 2023). Adequate weight gain during pregnancy can reduce the risk of complications and inadequate weight gain during pregnancy will have negative consequences for both of them (Nurhayati, 2016). Therefore, it is necessary for pregnant women to maintain their adequate nutritional intake and weight gain in order to prevent risks such as low birth weight, risk of labor bleeding, gestational diabetes mellitus, and premature birth (Aji et al., 2022; Susanto et al., 2021).

One of the nutritional problems experienced during pregnancy is KEK (Chronic Energy Deficiency) (Istiany, 2013). The prevalence of KEK in Indonesia in 2018 is 17.3% (Kemenkes RI, 2018). Based on data from the Special Region of Yogyakarta (DIY) Health Service Department, the prevalence of pregnant women suffering from CED in 2019 was 12.68%. The prevalence of CED in pregnant women in Bantul Regency in 2016 was 9.92%, increased in 2018 to 9.96% and continued to increase in 2019 to 10.66% with the highest cases being in Banguntapan District, namely 197 cases.

There is a significant relationship between nutritional status and diet (a diet of staple foods and animal side dishes) on the weight gain of pregnant women (Harti et al., 2016). Consuming of balanced nutrition of carbohydrates, fats and proteins can help increase pregnant women's weight gain optimally (Lai et al., 2019). Apart from dietary patterns, diversity in food consumption also influences weight gain. The Dietary Diversity Score (DDS) is a simple method for measuring the diversity of food consumption at the household and individual level. Food consumption diversity refers to increasing consumption of various types of food that can meet nutritional needs optimally, because no one food contains all the nutrients needed by the body (Nurhayati et al., 2020). Pregnant women who consume a variety of foods with the lowest scores tend to had no adequate of weight gain and failed to meet the standards (Tebbani et al., 2021). Dietary diversity has a positive relationship with weight gain in pregnant women (Perkins et al., 2018). Hence, this study determined whether the dietary diversity status (DDS) and emotional eating and its association with dietary intake and GWG in Bantul, Indonesia.

## METHODS

This was cross-sectional study design as known as Bantul's Maternal Weight Gain (BMW) Study. This study conducted between December 2021-February 2022 at three public health centers (Banguntapan 1, Banguntapan 2, and Banguntapan 3) in Bantul District, Special Region of Yogyakarta Province, Indonesia. The study variables were socio-demography, dietary diversity score (DDS), dietary intake, emotional eating, and other factors associated with gestational weight gain (GWG). The aimed of this study was to determine whether DDS, dietary intake, and emotional eating status have associated with GWG during pregnancy during pandemic Covid-19.

The sample collection in this research was used the Purposive Sampling technique. The results of calculations using the Slovin formula obtained a sample of

95 subjects with 90% of power calculation. To anticipate if there is incomplete or unwilling data, the sample will be increased by 10%. So the total sample was 105 people. The sample in this study was pregnant women who met the criteria. The study participants were women with third trimester of pregnancy. The inclusion criteria of study participants were women who have maternal and child book (KIA), have pre-pregnancy body weight data, clearly to be able to communicate, healthy, and willing to be study participant. While, women who have given birth and chronic diseases were excluded. These data were acquired directly from the participants through questionnaires and included information from the women's medical histories as provided by certified nutritionists and midwives. Total of study participants was 105 third trimester pregnant women from three different public health centers. All participants were signing the informed consent form and following the study protocol. All individual information gathered before the data collection and recruitment in this study has remained confidential. This study was approved by Universitas Alma Ata's Ethic Committee review board (No: KE/AA/XI/10637/EC/2021).

Data characteristics were collected from the socio-demographic questionnaire such as age, education level, and parity status. The pregnancy history data was collected from maternal and child book (KIA). This book was used to monitor pregnancy health recorded during pregnancy until the newborn aged five years old, promoting maternal and neonatal health education (Osaki et al., 2018). Secondary data in this study is data from a cohort of pregnant women which was obtained from the records of midwives at Banguntapan Community Health Center 1, Banguntapan Community Health Center 2, and Banguntapan Community Health Center 3.

Emotional eating was the purpose of eating to not satiate the hunger, but to relieve stress and to enhance one's emotional state (Trimawati & Wakhid, 2018). Emotional eating status was to determine whether women during pregnancy have changing consumption behavior during pandemic covid-19. The Dutch Eating Behavior Questionnaire (DEBQ-C) in Bahasa Indonesia version was used to assess emotional eating status (Blau et al., 2018). Three domains are covered by the DEBQ-C: controlled eating, external eating, and emotional eating. Regarding the feelings of anxiety, aggravation, boredom, despair, loneliness, disappointment, rage, fear, etc., only the emotional eating domain, which consists of 13 items, was employed in the current survey. The frequency of occurrence of the aforementioned emotional eating during the COVID-19 pandemic was examined using a Likert scale. The frequency was categorized as "never", "rarely", "sometimes", "often", or "always" and was given a score between 1 and 5. Assessment of each aspect of eating behavior is carried out by obtaining an average score with dividing the total score from the aspect of eating behavior by the number of questions on each aspect. If the average score is  $< 2.35$ , then the emotional eating score is said to be low and vice versa if the average score is  $\geq 2.35$  then it is said to be high (Cebolla et al., 2014).

Anthropometric measurements were performed by a trained measurer in a private room with the help of a midwife. A portable adult beam scale with 150 kg capacity (Gmbh & co.kg, Germany) was calibrated every morning and used to measure weight of participants. Height measurements were performed twice on every participant and the mean of the readings was considered as the height using stadiometer (OneMed Medicom stature meter, YF.05.05.V.A.1022, Indonesia). The PPBMI was created as the standard formula weight in kg divided by the square of body height in meter (Pan & Yeh, 2008). Four categories classification from the Asian-Pacific population cut-off point were determined as the World Health Organization (WHO) recommendation (underweight,  $< 18.5$  kg/m<sup>2</sup>; normal, 18.5–22.99 kg/m<sup>2</sup>; overweight, 23.00–24.99

kg/m<sup>2</sup>; and obese  $\geq 25$  kg/m<sup>2</sup>) (WHO, 2004).

GWG status determined when the women divided into two group categories who gain adequate and inadequate based on pre-pregnancy BMI (PPBMI)(Kominiarek & Peaceman, 2017). The Institute of Medicine (IOM) weight gain recommendation was used as the GWG status indicator (Institute of Medicine, 2009). The IOM guidelines state the following categories for recommended GWG: 12.5–18 kg for underweight, 11.5–16 kg for normal weight, 7–11.5 kg for overweight, and 5–9 kg for obese (Table 1).

**Table 1.** Pre-pregnancy body mass index (PPBMI) and gestational weight gain (GWG) categories

PPBMI status	Asian-pacific BMI status	IOM-recommended GWG
Underweight	<18.50	12.50-18.00
Normal	18.50-22.99	11.50-16.00
Overweight	23.00-27.49	7.00-11.50
Obese	$\geq 27.50$	5.00-9.00

*IOM: International of Medicine; GWG: Gestational weight gain; BMI: Body mass index; PPMI: Pre-pregnancy body mass index.*

Dietary intake data were assessed using the semi-quantitative food frequency questionnaire (SQ-FFQ). The details about SQ-FFQ data explanation was available elsewhere (Aji et al., 2019, 2020, 2022; Putri et al., 2019). We calculated energy (kcal), carbohydrate (g), protein (g), and fat (g) to determine dietary intake of pregnant women during their third trimester of pregnancy. Dietary diversity is defined as the consumption of at least four food groups of a total of seven food groups: 1) grains, roots and tubers; 2) legumes and nuts; 3) dairy products; 4) animal protein foods; 5) eggs; 6) vitamin-A rich fruits and vegetables; and 7) other fruits and vegetables (Kant et al., 1995). Dietary diversity score (DDS) was calculated by counting the number of the food groups (group 1-7) which was consumed during last 24-h recall (Rathnayake et al., 2012). Summing up all the scores and dividing them by the number of respondents. Therefore, DDS was not considering a minimum intake for the food group and the participants divided into adequate (if they consumed  $\geq 5$  food groups) and inadequate (if they consumed  $< 5$  food groups).

Data analysis was performed using SPSS V.23.0. Basic information about the variables was provided by descriptive statistics, which used frequencies, means, and standard deviations (SD) to represent both numerical and categorical data. GWG and the rates of GWG during the third trimester of pregnancy were the outcome variables of interest. The suggestions made by the IOM were compared with these two outcome factors. Chi-square and Mann-Whitney bivariate analyses were used to compare variables. The cut-off for statistical significance was  $p=0.05$ .

## RESULTS

Table 2 shows that the frequency distribution based on age group shows that the group of pregnant women aged 20-35 years is 88 people (83.8%), the majority of pregnant women who are respondents in this study are aged 20-35 years. In the category of education level, the majority of mothers who were respondents in this study were high school graduates, namely 75 people (71.4%). Based on the level of employment, the majority of pregnant women who were respondents in this study worked as housewives (IRT) of 75 (71.4%). Based on the occupational level of the husband, the most respondents were self-employed/entrepreneur 74 (70.5%). Based on parity, the majority of pregnant women with multigravida parity were 57 (54.3%).

Based on the weight gain of 105 respondents, there were 64 respondents whose weight gain (61%) was in accordance with IOM standards, while 41 (39%) of respondents had weight gain not in accordance with IOM standards. 62 (59%) consumed an adequate varied diet, while 43 respondents (41%) consumed an inadequate varied diet. Then those who experienced emotional eating were as many as 59 (56.2%).

**Table 2.** Characteristic of Participants

<b>Variables</b>	<b>n</b>	<b>%</b>
<b>Maternal age</b>		
<20	4	3.8
20-35	88	83.8
>35	13	12.4
<b>Mother Educational Level</b>		
Junior high school	24	22.9
Senior high school	75	71.4
Diploma	6	5.7
<b>Mother Occupational Status</b>		
Housewife	75	71.4
Employee	16	15.2
Civil Servant	5	4.8
Entrepreneur	9	8.6
<b>Parity Status</b>		
Primiparous	48	45.7
Multiparous	57	54.3
<b>Dietary Diversity Score (DDS) Status</b>		
Adequate varied diet	62	59.0
Inadequate varied diet	43	41.0
<b>Emotional eating status</b>		
High	59	56.2
Low	46	43.8
<b>Gestational Weight Gain (GWG) Status</b>		
Adequate	64	61.0
Inadequate	41	39.0

**Table 3.** Dietary Intake Status

<b>Variables</b>	<b>Mean±SD</b>	<b>N</b>	<b>%</b>
<b>Energy, kcal</b>	2146.7±97.7		
<b>Adequacy status of energy intake (n=105)</b>			
Adequate		49	46.7
Inadequate		56	53.3
<b>Protein, g</b>	71.5±8.5		
<b>Adequacy status of protein intake (n=105)</b>			
Adequate		44	41.9
Inadequate		61	58.1
<b>Fat, g</b>	59.3±8.3		
<b>Adequacy status of fat intake (n=105)</b>			
Adequate		57	54.3
Inadequate		48	45.7
<b>Carbohydrate, g</b>	347.5±39.7		
<b>Adequacy status of carbohydrate intake (n=105)</b>			
Adequate		52	49.5
Inadequate		53	50.5

Table 3 shows that the nutrient with the highest percentage is a source of fat (54.3%) while the lowest is a source of protein (41.9%). The average total food intake for pregnant women in Banguntapan District is 2146.7 kcal, 71.9 grams of protein, 59.2 grams of fat and 347.5 grams of carbohydrates. The average consumption is still low when compared to the standard consumption based on the nutritional adequacy rate of third trimester pregnant women who should consume 2550 kcal of energy, 90 grams of protein, 65.3 grams of fat and 400 grams of carbohydrates (Ministry of Health Republic of Indonesia, 2019).

Table 4 shows that the percentage of pregnant women whose adequate gestational weight gain is in the group of mothers who consume <5 types of food groups with a percentage of 48.8% and the least in the group of mothers who consume >5 types of food groups (32.3%). It shows that there is no association between the dietary diversity score (diversity in food consumption) and the gestational weight gain of pregnant women ( $p > 0.131$ ). It shows that the percentage of pregnant women who have adequate weight gain is higher (58.7%) than women with low emotional eating status, while pregnant women who have inadequate weight gain (76.3%) with emotional eating status. It found that a significant association between emotional eating and gestational weight gain status in pregnant women ( $p < 0.001$ ).

**Table 4.** Association of DDS and Emotional Eating with GWG Status

	Gestational Weight Gain Status				OR	95%CI	P-Value
	Adequate		Inadequate				
	n	%	n	%			
<b>Dietary Diversity Score</b>							
Inadequate varied diet	21	48.8	22	51.2	2.0	0.9-4.5	0.131
Adequate varied diet	20	32.3	42	67.7			
<b>Emotional eating status</b>							
High	14	23.7	45	76.3	3.3	1.4-7.6	<0.001
Low	27	58.7	19	41.3			

Table 5. shows that the group of women with inadequate weight gain has a median energy intake higher than the group of pregnant women with adequate gestational weight gain. Likewise with protein, fat and carbohydrate intake, the median intake was higher in the group of mothers who had inadequate weight gain compared to those with adequate weight gain. There is a significant median difference between the amount of food consumption (energy, protein, fat, carbohydrates) in the group of mothers with an increase in normal and abnormal weight gain ( $p < 0.001$  for all comparison).

**Table 5.** Association of Dietary Intake with GWG Status

Dietary Intake Status	Gestational Weight Gain Status				P-Value
	Adequate		Inadequate		
	Median	IQR	Median	IQR	
Energy, kcal	1988.5	1945.2-2031.0	2310.0	2231.0-2366.0	<0.001
Protein, g	66.0	61.1-70.0	76.0	74.8-79.0	<0.001
Fat, g	53.3	50.0-57.8	65.2	60.7-68.5	<0.001
Carbohydrate, g	316.5	305.0-360.0	366.0	350.8-385.7	<0.001

## DISCUSSION

### DDS Status and Its Association with GWG Status

The diversity of food consumption measured on an individual scale in pregnant women in this study, on average, had a high score of five. However, the score of food diversity in pregnant women was not statistically related to GWG of pregnant women. This could have been due to conducting interviews with women who are consuming quite a variety of types of food so that the data obtained shows a variety of consumption. According to research by Mayimbo S (2020), the DDS cannot describe an individual's eating habits because data collection was carried out using the recall method 24 hours earlier (Mayimbo et al., 2020).

Dietary diversity is influenced by socioeconomic status because the income of a family greatly affects the fulfillment of primary needs, which will have an impact on the nutritional status and health of the family, especially for pregnant women who need a variety of intakes to meet the nutritional needs of the fetus they contain (Dhiu et al., 2022). This study is in line with Ismi Nurwaqiah Ibnu et al., (2020) which states that the food diversity score of pregnant women is not statistically significant for the nutritional status of pregnant women. This could be because it is not known whether the intake consumed is sufficient or not for the calorie needs of pregnant women due to the dietary questionnaire the diversity score only mentions the type of food consumed at least 10 grams with the 24-hour recall method so it cannot describe an individual's eating habits (Ibnu, 2020). However, this study is not in line with the research of Brazier et al (2020) which stated that the dietary diversity score (diversity in food consumption) is positively correlated with weight gain for pregnant women (Brazier et al., 2020). Another study from Tebbani et al., (2021) found that pregnant women with a variety of food consumption with low scores tended to gain weight that did not meet the standard (Tebani et al., 2021).

### Emotional Eating Status and Its Association with GWG Status

Excess GWG based on IOM standards can cause several consequences in pregnancy, such as labor and postpartum. Overweight pregnant women risk lifelong obesity in both mother and child. The desire to consume food and negative influences are often cited as triggers for excessive food consumption in pregnant women (Blau et al., 2018). According to Hadiyuni et al (2021) eating behavior is a condition that describes a person's attitude towards eating manners, eating patterns, eating preferences, and food choices. Unhealthy eating behavior will certainly have a negative impact and it is important for someone to maintain their eating behavior (Hadiyuni et al., 2021). Eating behavior is a risk factor for obesity, one of which is emotional eating. Emotional eating is a tendency to overeat in response to negative emotions that are inadequate and ineffective (Kustantri et al., 2021).

In this study, it is known that the results of the study show that pregnant women who experience emotional eating have adequate GWG with an OR= 3.3, which means that respondents who experience high emotional eating have three times the risk of experiencing weight gain during pregnancy. This happened because during the pandemic, pregnant women experienced increased consumption which caused GWG during pregnancy. This was supported by previous research which stated that people experienced changes in their behavior, such as eating behavior, which was described as emotional eating (Zhang et al., 2020).

Emotional eating that is carried out continuously, can affect improper eating

patterns, weight and health (Sukianto et al., 2020). Wijaksana et al., (2016) explained that, if the amount of energy input and energy expenditure is not balanced, body weight can become heavier than ideal body weight and become obese due to fat accumulation in the body (Wijaksana, 2016).

### **Dietary Intake Status and Its Association with GWG Status**

Pregnant women need far more nutrients than what is needed in a non-pregnant state, nutritional needs increase with increasing gestational age and there is an increase in the basal metabolic rate. contains energy, protein, fat, vitamins and minerals in a balanced portion and according to the recommended requirements (Usrina et al., 2021).

The results of bivariate analysis using the Mann Whitney statistical test showed that pregnant women who consumed higher protein experienced weight gain that was in accordance with IOM recommendations or included in the good category compared to mothers who consumed low protein. The results of this study are in line with Fitri et al., (2018) which stated that pregnant women with low protein intake are 12 times more likely to give birth to LBW babies compared to mothers with good protein intake (Fitri & Wiji, 2018). Haryani et al., (2012) stated that protein intake has a significant relationship with maternal weight gain during pregnancy (Haryani et al., 2012). The results of this study are in line with the theory that increased protein requirements during pregnancy will affect the development and growth of the fetus (Pratiwi & Hamidiyanti, 2020; Siregar et al., 2022). The average protein consumption of pregnant women in Banguntapan District is 71.9 grams of protein.

The results of bivariate analysis using the Mann Whitney statistical test found that pregnant women who consumed higher fat experienced GWG in accordance with IOM recommendations or were included in the adequacy category compared to mothers with low fat consumption. This study is in line with Setyarahma et al, (2016) which states that there is a relationship between the level of adequacy of fat and the GWG of pregnant women (Setyarahma et al., 2016). Fat intake in some pregnant women is low. Fat during pregnancy serves as a source of energy, a source of essential fatty acids, maintains body temperature and protects the placenta and prepares milk production (Ningsih et al., 2021). In this study, the fat intake of pregnant women was 59.2 gr.

The results of bivariate analysis using the Mann Whitney statistical test showed that pregnant women who consumed higher carbohydrates experienced weight gain in accordance with IOM recommendations or were included in the inadequate category compared to mothers who consumed low carbohydrates. This finding is in line with the research by Ningsih Setya N et al (2021) which stated that there is a significant relationship between the amount of carbohydrate consumption and the weight gain of pregnant women (Ningsih et al., 2021). According to research by Syari M et al, (2015) pregnant women who consume less carbohydrates have 12 times the risk of giving birth to LBW newborn (Syari et al., 2015). Carbohydrates are nutrients needed by the body in large quantities to produce energy, carbohydrates can fulfill nearly 60% of the calories needed by pregnant women if the energy needs produced by carbohydrates are sufficient, it will help the formation of the placenta, fetal growth, blood vessels, fat reserves, and changes in metabolism, but conversely if it is not sufficient there will be impaired growth of placental function which will have an impact on the weight and size of the placenta which is more so that it reduces the transfer of nutrients to the fetus (Fitri & Wiji, 2018). In this study, the average carbohydrate intake of pregnant women was 347.5 g of carbohydrates.

## Strength and Limitation of The Study

The strength of this research is that data collection is carried out directly so that it can determine the actual health condition of the community, such as eating habits, types of food consumed and foods that are avoided. In addition, this study also has weaknesses, including the age of the respondents who vary so that the standards for nutritional needs that are set also varied.

## CONCLUSION AND RECOMMENDATIONS

The diversity intake of pregnant women is not associated with GWG. However, there is an emotional eating effect of pregnant women on dietary intake status and GWG. Pregnant women need to pay attention to the type and amount of food consumed to maintain optimal weight for pregnant women and maintain their psychological well-being and dietary intake in order to maintain a normal GWG and prevent adverse pregnancy outcomes.

## ACKNOWLEDGEMENT

Thanks to all participants who participated during the study and all the staff in public health centers of Banguntapan 1, Banguntapan 2, and Banguntapan 3. All the research members and supervisor who helped us a lot in data collection guidance, analysis, and writing the manuscript.

## REFERENCES

- Aji, A. S., Lipoeto, N. I., Yusrawati, Y., Malik, S. G., Kusmayanti, N. A., Susanto, I., Majidah, N. M., Nurunnayah, S., Alfiana, R. D., Wahyuningsih, W., & Vimalleswaran, K. S. (2022). Association between pre-pregnancy body mass index and gestational weight gain on pregnancy outcomes: A cohort study in Indonesian pregnant women. *BMC Pregnancy and Childbirth*, *22*(1), 492. <https://doi.org/10.1186/s12884-022-04815-8>
- Aji, A. S., Yerizel, E., Desmawati, D., & Lipoeto, N. I. (2019). Low Maternal Vitamin D and Calcium Food Intake during Pregnancy Associated with Place of Residence: A Cross-Sectional Study in West Sumatran Women, Indonesia. *Open Access Macedonian Journal of Medical Sciences*, *7*(17), 2879–2885. <https://doi.org/10.3889/oamjms.2019.659>
- Aji, A. S., Yusrawati, Y., Malik, S. G., & Lipoeto, N. I. (2020). The Association of Maternal Vitamin D Status during Pregnancy and Neonatal Anthropometric Measurements: A Longitudinal Study in Minangkabau Pregnant Women, Indonesia. *Journal of Nutritional Science and Vitaminology*, *66*(Supplement), S63–S70. <https://doi.org/10.3177/jnsv.66.S63>
- Blau, L. E., Orloff, N. C., Flammer, A., Slatch, C., & Hormes, J. M. (2018). Food craving frequency mediates the relationship between emotional eating and excess weight gain in pregnancy. *Eating Behaviors*, *31*, 120–124. <https://doi.org/10.1016/j.eatbeh.2018.09.004>
- Brazier, A. K. M., Lowe, N. M., Zaman, M., Shahzad, B., Ohly, H., McArdle, H. J., Ullah, U., Broadley, M. R., Bailey, E. H., Young, S. D., Tishkovskaya, S., & Khan, M. J. (2020). Micronutrient Status and Dietary Diversity of Women of Reproductive Age in Rural Pakistan. *Nutrients*, *12*(11), Article 11. <https://doi.org/10.3390/nu12113407>
- Cebolla, A., Barrada, J. R., van Strien, T., Oliver, E., & Baños, R. (2014). Validation of the Dutch Eating Behavior Questionnaire (DEBQ) in a sample of Spanish women. *Appetite*, *73*, 58–64. <https://doi.org/10.1016/j.appet.2013.10.014>
- Devid Saputra. (2020). A Rumor (Hoax) about Covid-19. *Mau'idhoh Hasanah : Jurnal Dakwah Dan Ilmu Komunikasi*, *1*(2), 1–10. <https://doi.org/10.47902/mauidhoh.v1i2.69>

- Dhiu, E., Berek, N. C., Ruliati, L. P., Jutomo, L., & Ratu, J. M. (2022). Faktor yang Memengaruhi Kejadian Kurang Energi Kronik (KEK) pada Ibu Hamil. *Journal of Telenursing (JOTING)*, 4(2), Article 2. <https://doi.org/10.31539/joting.v4i2.3897>
- FAO, IFAD, UNFPA, WFP, WHO. (2020). *Pernyataan Bersama FAO, IFAD, UNFPA, WFP, WHO, dan UNICEF tentang Ketahanan Pangan dan Gizi | UNICEF Indonesia*. (2020, May 22). <https://www.unicef.org/indonesia/id/laporan/pernyataan-bersama-fao-ifad-unfpa-wfp-who-dan-unicef-tentang-ketahanan-pangan-dan-gizi>
- Fitri, I., & Wiji, R. N. (2018). Asupan zat gizi makro dan kenaikan berat badan selama hamil terhadap luaran kehamilan. *Jurnal Gizi Klinik Indonesia*, 15(2), Article 2. <https://doi.org/10.22146/ijcn.39163>
- Hadiyuni, M. K., Purwani, L. E., & Nugrohowati, N. (2021). Analisa Faktor-Faktor yang Berhubungan dengan Perilaku Makan Mahasiswa Tingkat Akhir Fakultas Kedokteran Universitas Pembangunan Nasional "Veteran" Jakarta Tahun 2020. *Jurnal Kesehatan Masyarakat Indonesia*, 16(1), 20. <https://doi.org/10.26714/jkmi.16.1.2021.20-25>
- Harti, L. B., Kusumastuty, I., & Hariadi, I. (2016). Hubungan Status Gizi dan Pola Makan terhadap Penambahan Berat Badan Ibu Hamil (Correlation between Nutritional Status and Dietary Pattern on Pregnant Mother's Weight Gain). *Indonesian Journal of Human Nutrition*, 3(1), Article 1. <https://doi.org/10.21776/ub.ijhn.2016.003.Suplemen.6>
- Haryani, F. D., Ss, D., & Rakhmawatie, M. D. (2012). Hubungan Karakteristik, Tingkat Konsumsi Energi, Tingkat Konsumsi Protein, dan Frekuensi Periksa Kehamilan dengan Pertambahan Berat Badan Ibu Hamil Trimester II (Studi di Wilayah Kerja Puskesmas Pandanaran Semarang). *Jurnal Kedokteran Muhammadiyah*, 1(3), Article 3. <https://jurnal.unimus.ac.id/index.php/kedokteran/article/view/1345>
- Ibnu, I. N. (2020). Hubungan Sosial Demografi, Keanekaragaman Pangan dengan Status Gizi Ibu Hamil di Sulawesi Selatan. *Ghidza: Jurnal Gizi Dan Kesehatan*, 4(1), Article 1. <https://doi.org/10.22487/ghidza.v4i1.45>
- Institute of Medicine. (2009). *Weight Gain During Pregnancy: Reexamining the Guidelines* (K. M. Rasmussen & A. L. Yaktine, Eds.). National Academies Press (US). <http://www.ncbi.nlm.nih.gov/books/NBK32813/>
- Istiany, A. (2013). *Gizi Terapan*. Remaja Rosdakarya. <https://ilms.jabarprov.go.id/inlislite31/opac/detail-opac?id=10325>
- Kant, A. K., Schatzkin, A., & Ziegler, R. G. (1995). Dietary diversity and subsequent cause-specific mortality in the NHANES I epidemiologic follow-up study. *Journal of the American College of Nutrition*, 14(3), 233–238. <https://doi.org/10.1080/07315724.1995.10718501>
- Kemendes RI. (2018). *Riset Kesehatan Dasar 2018*. Kementerian Kesehatan Republik Indonesia. [https://kesmas.kemkes.go.id/assets/upload/dir\\_519d41d8cd98f00/files/Hasil-risikesdas-2018\\_1274.pdf](https://kesmas.kemkes.go.id/assets/upload/dir_519d41d8cd98f00/files/Hasil-risikesdas-2018_1274.pdf)
- Kominiarek, M. A., & Peaceman, A. M. (2017). Gestational weight gain. *American Journal of Obstetrics and Gynecology*, 217(6), 642–651. <https://doi.org/10.1016/j.ajog.2017.05.040>
- Kustantri, A. W., Has, D. F. S., & Ernawati, E. (2021). Hubungan Emotional Eating, Pola Makan, Dan Aktivitas Fisik Dengan Kejadian Obesitas Pada Petugas Puskesmas Wilayah Kecamatan Manyar Kabupaten Gresik. *Ghidza Media Jurnal*, 1(2), Article 2. <https://doi.org/10.30587/ghidzamediajurnal.v1i2.2162>
- Lai, J. S., Soh, S. E., Loy, S. L., Colega, M., Kramer, M. S., Chan, J. K. Y., Tan, T. C., Shek, L. P. C., Yap, F. K. P., Tan, K. H., Godfrey, K. M., Chong, Y. S., & Chong, M. F. F. (2019). Macronutrient composition and food groups associated with gestational weight gain: The GUSTO study. *European Journal of Nutrition*, 58(3), 1081–1094. <https://doi.org/10.1007/s00394-018-1623-3>
- Mayimbo, S., Haruzivishe, C. M., Kwaleyela, C., Phoebe, B., Chirwa, E., Kaonga, P., & Ngoma, C. (2020). Assessing Malnutrition in Pregnant Women Using the Dietary Diversity Score and the Mid-Upper Arm Circumference: A Cross-Sectional Study, Zambia. *Food and Nutrition Sciences*, 11(7), Article 7. <https://doi.org/10.4236/fns.2020.117051>

- Ministry of Health Republic of Indonesia. (2019). *The Indonesian Dietary Recommendation (AKG -Angka Kecukupan Gizi)*. Ministry of Health Republic of Indonesia. <https://peraturan.bpk.go.id/Home/Details/138621/permenkes-no-28-tahun-2019>
- Mooduto, N., Harismayanti, H., & Retni, A. (2023). Kenaikan Berat Badan Ibu Selama Kehamilan Dengan Berat Badan Lahir Bayi Di Rsia Sitti Khadijah Kota Gorontalo. *Jurnal Rumpun Ilmu Kesehatan*, 3(1), <https://doi.org/10.55606/jrik.v3i1.1285>
- Ningsih, N. S., Simanjuntak, B. Y., & Haya, M. (2021). Asupan Energi, Zat Gizi Makro dan Pertambahan Berat Badan Ibu Hamil. *Jurnal Kesehatan*, 12(2), Article 2. <https://doi.org/10.26630/jk.v12i2.2177>
- Nurhayati, E. (2016). Indeks Massa Tubuh (IMT) Pra Hamil dan Kenaikan Berat Badan Ibu Selama Hamil Berhubungan dengan Berat Badan Bayi Lahir. *Jurnal Ners Dan Kebidanan Indonesia*, 4(1), 1. [https://doi.org/10.21927/jnki.2016.4\(1\).1-5](https://doi.org/10.21927/jnki.2016.4(1).1-5)
- Nurhayati, E., Paramashanti, B. A., Astiti, D., & Sabta Aji, A. (2020). Dietary diversity, vitamin D intake and childhood stunting: A case-control study in Bantul, Indonesia. *Malaysian Journal of Nutrition*, 26(2), 273–287. <https://doi.org/10.31246/mjn-2020-0021>
- Osaki, K., Hattori, T., Toda, A., Mulati, E., Hermawan, L., Pritasari, K., Bardosono, S., & Kosen, S. (2018). Maternal and Child Health Handbook use for maternal and child care: A cluster randomized controlled study in rural Java, Indonesia. *Journal of Public Health (Oxford, England)*, 41. <https://doi.org/10.1093/pubmed/idx175>
- Pan, W.-H., & Yeh, W.-T. (2008). How to define obesity? Evidence-based multiple action points for public awareness, screening, and treatment: an extension of Asian-Pacific recommendations. *Asia Pacific Journal of Clinical Nutrition*, 17(3), 370–374. <https://pubmed.ncbi.nlm.nih.gov/18818155/>
- Perkins, J. M., Jayatissa, R., & Subramanian, S. V. (2018). Dietary diversity and anthropometric status and failure among infants and young children in Sri Lanka. *Nutrition*, 55–56, 76–83. <https://doi.org/10.1016/j.nut.2018.03.049>
- PPSDM,; K. K. R. B. (2020). *E-Book: Pedoman Pencegahan dan Pengendalian Coronavirus Disease (Covid-19)*. Kemenkes RI. [https://lisa.poltekkesjakarta3.ac.id/perpustakaan/index.php?p=show\\_detail&id=12274](https://lisa.poltekkesjakarta3.ac.id/perpustakaan/index.php?p=show_detail&id=12274)
- Pratiwi, I. G., & Hamidiyanti, Y. F. (2020). Gizi dalam Kehamilan: Studi Literatur. *Jurnal Gizi Prima (Prime Nutrition Journal)*, 5(1), Article 1. <https://doi.org/10.32807/jgp.v5i1.171>
- Putri, N. I., Lipoeto, N. I., Rita, R. S., & Aji, A. S. (2019). Analysis of the association between maternal 25-hydroxyvitamin D levels and newborn birthweight in Tanah Datar and Solok Districts, West Sumatra, Indonesia. *Jurnal Ilmiah Universitas Batanghari Jambi*, 19(1), 61–64. <https://doi.org/10.33087/jiubj.v19i1.546>
- Rachmah, Q., Nindya, T. S., Aji, A. S., Patimah, S., Rachmah, N., Maulana, N. I., Agustin, A. M., & Astina, J. (2021). Increased Knowledge and Self-Efficacy of COVID-19 Prevention through Conventional Nutrition Education. *Media Gizi Indonesia*, 16(3), <https://doi.org/10.20473/mgi.v16i3.273-279>
- Rathnayake, K. M., Madushani, P., & Silva, K. (2012). Use of dietary diversity score as a proxy indicator of nutrient adequacy of rural elderly people in Sri Lanka. *BMC Research Notes*, 5, 469. <https://doi.org/10.1186/1756-0500-5-469>
- Robertson, R. C., Manges, A. R., Finlay, B. B., & Prendergast, A. J. (2019). The Human Microbiome and Child Growth—First 1000 Days and Beyond. *Trends in Microbiology*, 27(2), 131–147. <https://doi.org/10.1016/j.tim.2018.09.008>
- Setyarahma, A. F., Kartasurya, M. I., & Aruben, R. (2016). Hubungan Asupan Makanan dengan Penambahan Berat Badan pada Remaja Hamil Usia 15-19 Tahun (Studi pada Kelurahan Rowosari Kota Semarang). *Jurnal Kesehatan Masyarakat Universitas Diponegoro*, 4(3), 18634. <https://www.neliti.com/publications/18634/>
- Siregar, E. D. P., Amir, A., & Irawati, N. (2022). The consumption of protein, zinc, and vitamin a associated with ferritin levels in pregnancy. *Jurnal Gizi Dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics)*, 10(3), Article 3. [https://doi.org/10.21927/ijnd.2022.10\(3\).100-108](https://doi.org/10.21927/ijnd.2022.10(3).100-108)

- Sukianto, R. E., Marjan, A. Q., & Fauziah, A. (2020). Hubungan tingkat stres, emotional eating, aktivitas fisik, dan persen lemak tubuh dengan status gizi pegawai Universitas Pembangunan Nasional Jakarta. *Ilmu Gizi Indonesia*, 3(2), 113. <https://doi.org/10.35842/ilgi.v3i2.135>
- Susanto, I., Lipoeto, N. I., & Aji, A. S. (2021). Factors Associated With Rates of Gestational Weight Gain Among Pregnant Women in West Sumatera, Indonesia. *Current Developments in Nutrition*, 5(Supplement\_2), 821–821. [https://doi.org/10.1093/cdn/nzab046\\_118](https://doi.org/10.1093/cdn/nzab046_118)
- Syari, M., Serudji, J., & Mariati, U. (2015). Peran Asupan Zat Gizi Makronutrien Ibu Hamil terhadap Berat Badan Lahir Bayi di Kota Padang. *Jurnal Kesehatan Andalas*, 4(3), <https://doi.org/10.25077/jka.v4i3.355>
- Tebbani, F., Oulamara, H., & Agli, A. (2021). Food diversity and nutrient intake during pregnancy in relation to maternal weight gain. *Nutrition Clinique et Métabolisme*, 35(2), 93–99. <https://doi.org/10.1016/j.nupar.2020.09.001>
- Trimawati, T., & Wakhid, A. (2018). Studi Deskriptif Perilaku Emotional Eating Mahasiswa yang Mengerjakan Skripsi di Universitas Ngudi Waluyo Ungaran. *Jurnal Smart Keperawatan*, 5(1), 52. <https://doi.org/10.34310/jskp.v5i1.164>
- Usrina, N., Abdurrahman, F. B., Abdullah, A., Zakaria, R., & Maidar, M. (2021). Pengaruh Asupan Energi dan Protein ibu Hamil Selama Trimester III Terhadap Keluaran Kehamilan: Studi Kohort. *Sel Jurnal Penelitian Kesehatan*, 8(2), Article 2. <https://doi.org/10.22435/sel.v8i2.4831>
- WHO. (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet (London, England)*, 363(9403), 157–163. [https://doi.org/10.1016/S0140-6736\(03\)15268-3](https://doi.org/10.1016/S0140-6736(03)15268-3)
- Wijaksana, I. K. E. (2016). Infectobesity Dan Periodontitis: Hubungan Dua Arah Obesitas Dan Penyakit Periodontal. *Odonto: Dental Journal*, 3(1), Article 1. <https://doi.org/10.30659/odj.3.1.67-73>
- Zhang, J., Zhang, Y., Huo, S., Ma, Y., Ke, Y., Wang, P., & Zhao, A. (2020). Emotional Eating in Pregnant Women during the COVID-19 Pandemic and Its Association with Dietary Intake and Gestational Weight Gain. *Nutrients*, 12(8), 2250. <https://doi.org/10.3390/nu12082250>