



Strengthening Food Security Reduces The Anemic Status of Pregnant Women and Encourages Breastfeeding Immediately after Delivery in the Coastal Area of Central Tapanuli

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Abstract

According to WHO and UNICEF recommendations, one way to prevent stunting is exclusive breastfeeding until the baby is six months old. The aim of the study was to strengthen family food security through local food and nutrition literacy using behavior-based nutrition education methods (social cognitive theory). This type of research is called action research. The research subjects were 30 pregnant women who came from food-insecure families and had incomes below the minimum wage. Prior to the intervention, the consumption of pregnant women was measured using a 24-hour food recall and measurements of haemoglobin levels. For 12 weeks, community health professionals provided home visits and face-to-face lectures for pregnant women on local food literacy and nutrition interventions. Pregnant women consumed an average of 1926.3 calories prior to the intervention, 2315.2 calories were consumed after the intervention. Before the intervention, there were 19 pregnant women with anaemia (63.3%), after the intervention, there were only 4 (13.3%). There were 20 breastfeeding mothers (66.7%) on the first day. Pregnant women's nutrient consumption and dietary diversity increased as a result of the local food literacy and nutrition intervention, which was implemented for 4 months.



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Introduction

The World Health Organisation (WHO) notes that by practising exclusive breastfeeding (ASI) for babies, it can reduce the number of child morbidity

and mortality, due to diseases that are common in children, such as diarrhoea or pneumonia, and that breastfeeding helps patients recover faster during illness.¹ Failure to breastfeed is also caused

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by factors related to the nutritional status of the mother before pregnancy, during pregnancy, and during breastfeeding. This happens because during breastfeeding, the mother's body fat mobilises to produce breast milk, and the mother's fat stores have a lower nutritional status than the body fat stores of normal mothers. Maternal nutritional status during breastfeeding is the effect of maternal nutritional status before pregnancy and during pregnancy (weight gain during pregnancy).²

The mother's diet and health during pregnancy and breast-feeding are essential for the children's growth and development. A 2021 study of 131 pregnant women in the coastal regions of the Central Tapanuli Regency revealed that 58.7% of pregnant women had anaemia and 19.1% had chronic energy deficit (CED).² Malnutrition in the mother decreases blood volume expansion, which leads to insufficient heart function (cardiac output). This lowers blood flow to the placenta, has an influence on the size of the placenta, which is not optimal, and inhibits the transfer of nutrients to the foetus, resulting in stunted foetal growth (foetal growth retardation).^{3,4} Postpartum anaemia is more common in women who had anaemia during pregnancy. Anaemia during pregnancy mainly occurs due to a low intake of iron from the mother's diet. Anaemia in breastfeeding mothers has various adverse effects, such as decreased immunity, which can ultimately result in delayed wound healing and increased susceptibility to infections such as mastitis, ductitis, and urinary tract infections, as well as decreased quality or volume of the mother's milk.⁵⁻⁷

According to the Food and Agriculture Organisation (FAO), family food security has an impact on pregnant women's malnutrition. To achieve food security at the household level, (1) families should be able to provide enough food. It is essential to (1) have access to food and (2) prepare it properly in order to meet the body's nutritional needs and prevent malnutrition. If these prerequisites are not satisfied, a household is considered to be food insecure; in other words, food insecurity is the reverse of food security.⁸ The Food Security and Livestock Service Office of North Sumatra Province (2020) reports that one-third of the province's territory is food insecure and that the average daily caloric and protein intake per person is 2,038.10 calories and 53.99 grams

of protein, whereas 57 grams of protein and 2100 calories per day are the required dietary adequacy rates.^{9,10}

One of the efforts to improve the nutritional status of pregnant women is through innovation in the diversity of food for pregnant women using local food, such as the production of white bread from a combination of arrowroot flour and wheat flour.¹¹ Implementing social cognitive theory-based initiatives for nutrition education.¹² One of the nutrition education programmes is meant to promote nutrition and food education in order to develop self-efficacy, behaviour modification, nutritional literacy, and dietary variety via the use of local foods in order to ensure family food security. Nutrition education programmes must be designed in a manner that incorporates all strategies for achieving household food security, utilising multiple synergies of interventions that promote nutrition and food education, agri-food production, water, health, hygiene, and sanitation, and community member capacity-building.^{13,14} To fulfil the nutritional needs of pregnant women, it is necessary to obtain information from health workers. It is hoped that mothers can cooperate with the nutrition education provided about nutrition for pregnant women and strengthening family food security.^{15,16}

Study Objective

This research seeks to enhance the nutritional condition of pregnant women by enhancing local food literacy and nutrition through the use of social cognitive theory.

Methodology

This research is a sort of action research or *action research* using a *Social Cognitive Theory* method in the form of interventions on the food literacy and nutrition of pregnant women in the local community and in the coastal regions of Central Tapanuli Regency, families need to take the initiative to increase food security in households with expectant mothers who are food insecure. Pregnant women who come from food-insecure families and make less than the minimum regional minimum wage are research subjects, serving as research informants (UMR). The *snowball sampling* approach was used to choose the informants. Other informants who would participate in the study were pregnant

women's relatives, community and religious leaders, health professionals, and members of the local government. Using the Maxwell approach, determine the food insecurity of a family.¹⁷

Before providing the intervention to pregnant women, community health workers were trained in motivational interviewing techniques. In seminars for pregnant women and home visits provided by community health professionals, local food literacy and nutrition intervention materials were disseminated face-to-face. The provided material addresses nutrition and health for pregnant women, macronutrient knowledge, skills in selecting and grouping local foods, sanitation and hygiene for pregnant women, and practises to strengthen food security by modifying local food processing and cultivating vegetables in the backyard of the home. Modification of local food processing, such as sea fish, that is suitable and preferred by

pregnant women. Before the intervention Pregnant women consumed local food, but it was very limited because seafood processing was not attractive to pregnant women. The material will be available for six weeks. During the six-week home visit, the community health worker will utilise motivational interviews to provide pregnant women with verbal support and strategies for overcoming any obstacles (table 1). The purpose of the visits is to assist pregnant women in carrying out agreed-upon actions, such as altering their consumption patterns in accordance with the recommended adequacy, adopting practises to strengthen food security, such as modifying local food recipes and cultivating vegetables in the backyard, and ensuring their own sanitation and hygiene. To support local food and nutrition literacy activities, pregnant women are given a family food security booklet and a recipe book for locally processed food as a helping tool.

Table 1: Schedule of Interventions Given to Pregnant Women

Group meeting (for 6 weeks)		
Week	Material	Support And Evaluation activity
1	Household food security. The material is explained using booklets and slide presentations, assisted by video playback.	Assessment of nutrition and food knowledge, consumption patterns, nutritional status, and haemoglobin of pregnant women (1st Assessment). Participants are interested in participating in this session because they gain new knowledge; they learn that family resilience is very important and there is a solution to the problem. Several participants lacked concentration in following the lesson because there were mothers with toddlers.
2	Family diet and pregnant women as well as diversity of food and sanitation and hygiene of pregnant women	This session is also well received by pregnant women.
3	Discussion about food for pregnant women. Pregnant women are asked to bring food from home and eat together with other pregnant women	Researchers and research assistants assess the pattern of the menu served. Participants are taught to assess the food served based on food groupings.
4	Food processing practises for pregnant women. Participants were divided into 5 groups, namely 2 groups for lunch, 2 groups for dinner, and 1 group for breakfast.	The menu served has started to change, consisting of at least 4 types of food (rice, animal side dishes, vegetable side dishes, and vegetables).
5	Promotion of diversification of local food recipes as good food for pregnant women	The participants were very interested because the food (sea fish and other marine products) in

6	The practise of diversifying local food recipes made from fish and other marine products	their environment could be modified according to the foods that pregnant women like. In this session, participants received eight modified recipes for processed fish and other seafood products.
7	Promotion of the importance of cultivating vegetables in the yard of the house to increase the diversity of food for families especially for pregnant women	Discuss and agree on the types of vegetables to be planted around the house yard, which is a coastal area.
8	Practise cultivating vegetables in the yard of each participant's house.	Assistance activities by researchers and research assistants are carried out during the periods of planting, maintenance, and harvesting of vegetables in order to obtain maximum results.

Visits to participants' homes for 6 weeks

Visit	Activity
First	Assessment of nutrition and food knowledge and consumption patterns of pregnant women (2nd assessment). Assessing and consulting the knowledge and behaviour of pregnant women regarding diet (the adequacy of nutritional values and the diversity of foods consumed by pregnant women) and hygiene and sanitation
Second	Assessing and assisting in strengthening family food security (modification of local food processing and vegetable cultivation in the yard of the house)
Third	Assessing and assisting the use of local food and the results of vegetable cultivation in the yard of the house
Fourth	Evaluation of knowledge, consumption, and anthropometry of pregnant women as well as examination of haemoglobin and body composition (3rd Assessment)

The research study dispersed seeds of long beans, kale, spinach, mustard greens, katuk leaves, and tomatoes for vegetable growing. First, seedlings are seeded in polybags; after two to three weeks, they are transferred for planting. Kale, mustard greens, and spinach may be harvested after three months, while katuk leaves and long beans can be harvested after four months. For the following two months, intervention actions are continuously being studied in order to evaluate exclusive breastfeeding for newborns. Together with the research participants, an evaluation is conducted to see if the study results

result in changes or give individuals advantages. To observe changes in the mother's behaviour in carrying out the activity, a checklist was carried to the pregnant woman's home during a home visit, while a questionnaire was utilised to assess the pregnant woman's knowledge. This stage also evaluates the mother's nutritional health, the effectiveness of breastfeeding during the first three months, changes in the mother's knowledge, the diet of pregnant women (nutrient intake and dietary diversity of pregnant women), and sanitation and hygiene habits.

This research has received ethical approval from the ethics committee of the Faculty of Medicine, Universitas Sumatera Utara, with number 67A/KEP/USU/2021. Informed consent was obtained from the mothers or guardians before their child was assessed in the study

Findings

The age of pregnant women is more in the 20-34 age range, as much as 76.7%; more detail can be seen in table 1. The majority of pregnant women and their husbands held a high school diploma with 11 pregnant women (36.7%) and 14 husbands (46.7%) holding this level of education. There are 10 families (33.3%) with ≥ 4 family members. Less family members implies fewer needs for the family to meet, and vice versa. Therefore, there will be a lot of wants in a big family that have to be satisfied (table 2).

Table 2: Characteristics of Pregnant Women and Families

Variabel	n	%
Age of Pregnant Woman		
1. 20 -35 yo	23	76.7
2. ≥ 35 yo	7	0.2
Education of pregnant women		
1. Elementary School	8	26.7
2. Junior High School	9	30.0
3. Senior High School	11	36.7
4. University	2	6.7
Education of Husband		
1. Elementary School	8	26.7
2. Junior High School	7	23.3
3. Senior High School	14	46.7
4. University	1	3.3
Husband's Job		
1. Laborer	2	0.7
2. Traders / entrepreneurs	6	20
3. Fisherman	21	70
4. Civil Service	1	0.3
Parity		
1-3	20	66.7
≥ 4	10	33.3
Number of family		
1. ≤ 4 people	20	66.7
2. > 4 people	10	33.3

The average energy intake of pregnant women prior to the local food literacy and nutrition intervention activities was 1926.3 calories or 75.5% of the Recommended Dietary Allowances (RDA). The average energy intake of pregnant women after the local food literacy and nutrition intervention activities was 2041.9 calories (80.1% of the RDA). The third consumption following home visits contained 2315.2 calories (80.8% of the RDA), more detail can be seen in Table 3.

The lowest number of food types consumed by pregnant women after the intervention in the third measurement was 5, compared to 3 before the intervention. However, when compared to the average number of food types consumed before and after the intervention, this number was still classified as low (table 2). The group of food types consumed the most at the first consumption dose were: cereals, eggs and oil; on the second consumption measurement are cereals, eggs, fish and oil and the third consumption measure is cereals, eggs, fish, vegetables, fruit, nuts and oil.

The Hb test results showed that following the intervention of 4 people (13.3%), the nutritional status of pregnant women with anaemia improved compared to before the intervention of 19 people (63.3%). Before the intervention, 2 people (6.7%) were determined to have CED based on right arm circumference; after the intervention, just 1 person (3.3%) was found to have CED. The iodine level of pregnant women was lower (53.3%), as shown by urine iodine analysis, as seen in table 4.

Pregnant women are given local food literacy and nutrition interventions during the three months of the intervention, and mothers are accompanied while carrying out the agreed actions. After the three months are up, pregnant women are still monitored and followed until delivery to observe breastfeeding immediately after the mother gives birth and receive medication. Mothers whose milk comes out on the first and second day are encouraged to breastfeed immediately, whereas mothers whose milk comes out for more than two days are given interim formula until their milk comes out. The breastfeeding rate shortly after delivery is shown in the table below (table 5).

Table 3: Intake and Types of Food for Pregnant Women Before and After Local Food Literacy and Nutrition

Nutrition	1st Consumption Assessment	2nd Consumption Assessment	3rd Consumption Assessment
Energy			
Minimum	1518	1745.7	2037.2
Maximum	2291	2297.1	2545.9
Average	1926.3	20141.9	2315.2
Protein			
Minimum	29.1	45.7	51.3
Maximum	69.7	68.2	65.2
Average	52.1	55.9	58,8
Ferro (Fe)			
Minimum	4,2	8.2	11
Maximum	13,3	12.7	15.2
Average	7,8	10.1	13.2
Zink			
Minimum	38	50	55
Maximum	82	73	68
Average	60	59.7	62
Food Type			
Minimum	3	2	5
Maximum	6	5	7
Average	3.9	4.3	5.9

Table 4: Results of Examination of Mother's Nutritional Status before and after Local Food Literacy and Nutrition Intervention

Nutritional status of Pregnant women	n	%
Before Intervention		
Anemia (n=30) :		
Normal	11	36.7
Anemia	19	63.3
chronic energy deficit (CED) (n = 30):		
Normal		
Deficit	28	93.3
	2	6.7
After Intervention		
Anemia (n=30) :		
Normal	26	86.7
Anemia	4	13.3
chronic energy deficit (CED) (n = 30):		
Normal		
Deficit	29	96.7

Iodium Urine (n=15)	1	3.3
Low (<150 µg/L)		
Average (150 – 246 µg/L)	8	53.3
High (> 250 µg/L)	6	40
	1	6.7

Table 5: Breastfeeding Immediately After Birth

No	The day Breastmilk comes out	Number of Respondents	
		n	%
1	1	20	66.7
2	2	5	16.7
3	3	4	13.3
4	7	1	3.3

Discussion

According to Zamriati *et al.* (2013), the higher a person's degree of education, the more likely they are to seek health care 18. The results of Chowdury's research (2015) show that the education level of the mother has a significant relationship with maternal anaemia. Female literacy has a significant relationship with the use of antenatal care services because education has an impact on awareness of using health services among the population.¹⁹ A total of 33.3% of expectant mothers had four or more births. Mothers who have been pregnant or given birth to four or more children are susceptible to a variety of illnesses, including anaemia, malnutrition, and abdominal wall laxity, which weakens the uterine muscles, resulting in ineffective contractions during childbirth and postpartum haemorrhage. Additionally, a rapid delivery might increase the likelihood of significant vaginal bleeding.²⁰

Before the exercise, the average value of the percentage of right responses was 60.7; after the activity, it was 75.8. After receiving local nutrition and food literacy interventions through face-to-face conversations and home visits or assistance for pregnant women, only a 15.1% improvement in nutritional knowledge was seen. Before the intervention, the average nutrient intake (energy, protein, Fe, and zinc) of pregnant women was in the low category. Pregnant women consume less food as a result of their mothers ignorance and

lack of understanding regarding food consumption. The mother's behaviours, which are predicted to modify her child's eating habits, may be influenced by knowledge. Another study on nutrition education for pregnant women, used booklet media to improve parenting behaviour to prevent stunting in toddlers.²¹ Education of pregnant women using leaflets and drawing sheets, increasing knowledge of pregnant women, and educational research using booklets about anaemia, increasing intake of energy, protein, and iron.^{22,23} People who lack knowledge about the nutrition of a food are responsible for the poor consumption of healthy foods. Typically, individuals consume food, especially those who lack nutritional awareness, in order to avoid feeling hungry. Therefore, the knowledge component affects the food intake of a community.²⁴ Orr *et al.* (2018) in Canada, researchers found that nursing women who are food insecure are less likely to breastfeed than mothers in food-insecure households. This is because food insecure mothers tend to consume less food, particularly sources of micronutrients like fruits and vegetables.²⁵

By assisting pregnant women in following through on agreed-upon activities and providing pregnant women with local food literacy and nutrition education, it is possible to improve pregnant women's nutritional intake. The average nutritional intake for pregnant women rose during the third consumption assessment (after the intervention). The average daily intake of these nutrients was

2315.2 cal, 58.8 g of protein, 13.2 g of Fe, and 62.0 g of zinc. The interventions agreed upon with the participants included adjustments in the diet of pregnant women, practises of enhancing food security (modification of local foods and cultivation of vegetables in the backyard), and sanitation and hygiene practises for pregnant women. Pregnant women's nutritional intake can be enhanced by four-month-long activities. This research confirms the need to enhance the availability and accessibility of food to reduce malnutrition in pregnant women through the modification of local foods (sea products) and the cultivation of vegetables in the backyard. Despite adequate food purchasing power, nutritional literacy and local food are required to increase pregnant women's awareness of the diversity of food available to them.

Evaluation of local food modification activities to participants revealed that some of the participants were capable of practicing local food processing, as evidenced by their ability to describe the processes of food processing and display images of processed goods that had been produced. Pregnant women eat processed foods, which they may utilize as snacks and side dishes during meals to cut down on the need to buy snacks from vendors. In their own households, 17 people (56%) said that they have modified local food processing. As of the time of the assessment for the vegetable cultivation activity, around 12 participants (40%) had begun to see their vegetable plants, while up to 7 people (23.3%) had consumed the vegetables that their plants had produced. Some people have not moved the seedlings from the nursery to the initial planting medium.

The lowest number of food types ingested by pregnant women after the intervention was five, compared to three before the intervention. However, when compared to the average number of food types consumed before and after the intervention, this figure was still considered low. Seven food types are consumed by pregnant women in Pasar Sorkam Village: starchy meals, green vegetables, other vegetables and fruit, fish, eggs, nuts, and milk, as well as their preparations. Pregnant women report that their fish consumption reduces during pregnancy owing to sickness and boredom with fish, including crabs, shrimp, and squid. Due to market

constraints and the lack of availability of certain types of vegetables in the study region, pregnant women consume vegetables just twice per week. Due to high pricing and poor household finances, fruit eating is uncommon. This indicates that pregnant women are not particularly fond of this food group. Food insecurity has a considerable impact on the availability of various types of food, according to research on environmental predictors of household food. Specifically, food insecurity has been found to be strongly linked with lower availability of fruits and vegetables and higher availability of energy-dense or packaged meals in sample populations.²⁶

Pregnant women who have haemoglobin levels in the blood that are less than 10.5 g/dL in the second trimester or less than 11 g/dL in the first and third trimesters are said to have anaemia. These limit levels and the discrepancy with non-pregnant women are the result of hemodilution, particularly in the second trimester. The most frequent causes of anaemia in pregnancy are iron deficiency and severe bleeding, and it is not unusual for the two to combine.²⁷ It is probable that growing children and pregnant women in food-insecure homes would experience malnutrition sooner than those in food-secure households.²⁸ Local food and nutrition Literacy is the foundation of every initiative aiming at enhancing nutrition. For the health of the mother and foetus throughout pregnancy, understanding proper nutrition and eating a balanced diet is considered essential. During pregnancy, dietary issues can affect both mother and child, necessitating specific care. Inadequate nutrition during pregnancy can result in a variety of nutritional deficits, including anemia. Therefore, adequate nutrition is an essential aspect of pregnancy that must not be disregarded. The prevalence of anaemia in moms decreased from 63.3% to 13.3% when nutrition education and local food were provided. This study demonstrates a decrease in the incidence of anemia and CED among pregnant women. Nutritional literacy and local food, with an emphasis on the consumption habits of pregnant women throughout pregnancy, can be strengthened by bolstering family food security via the practise of planting vegetables in the home's yard and adapting local food recipes so that they are healthy for pregnant women. This research is consistent with the findings of Sunuwar *et al.* (2019), who found that following

the intervention of nutrition education and an iron-rich meal plan, there was a substantial increase in hemoglobin levels in the intervention group compared to the control group.²⁹ Iodine is an essential nutrient that is very important for human growth and development, especially while still in the womb. Iodine deficiency in pregnant women can cause spontaneous abortion, congenital abnormalities, premature birth, stillbirth, perinatal infant death, developmental delays in movement, and also stunting. Iodine deficiency can be caused by a low intake of iodine or a lack of consumption of foods containing iodine. Therefore, pregnant women need to pay attention to the iodine content of the food consumed in the first 1000 days of life so as to obtain good-quality offspring and avoid stunting. The results showed that 53.3% of pregnant women had low iodine levels. The effect of health promotion is to increase pregnant women's awareness of the warning indicators of pregnancy. The desired outcomes of health education include an increase in knowledge and attitudes, and the ultimate objective is to produce changes in individual, family, and community behaviour towards sustaining healthy behaviours and actively contributing to achieving optimal health status.³⁰

The demands on pregnant women will be more than typical during the third trimester, when the interchange of almost all elements happens at a rapid rate. In order to satisfy the demands of the mother and fetus, food consumption must be increased due to the rise in overall consumption, particularly the consumption of energy-rich foods. Therefore, taking fewer calories will result in malnutrition, also known as chronic energy deficiency (CED). The contribution and incidence of CED in pregnant women will impact the growth and development of the baby, increasing the risk of low birth weight infants, among other factors (LBW). CED increases the risk of disease in pregnant women, particularly in the third trimester, which can result in low birth weight.³¹

Exclusive breastfeeding is the continuation of nursing immediately after birth; however, there are some individuals who supplement breast milk with formula and other meals. Some of the reasons mothers don't breastfeed their babies are the mother's lack of knowledge about the importance of breast milk for babies, the fact that breast milk takes a long

time to come out after giving birth, and breast milk production is small. The research was followed up until the mother gave birth, and the results showed that the majority of mothers who had given birth (60%) gave exclusive breastfeeding to their babies. According to research by Jebane and Tenagashaw (2022) in Ethiopia, the majority of moms (61.8%) began nursing breast milk within an hour of the baby's delivery. The first day after the baby was born had the highest percentage of breastfeeding, with 20 participants (66.7%).³² According to the World Health Organization, breastfeeding promptly after delivery (1-24 hours after birth) is a beneficial feeding practice for newborns.³³ Exclusive breastfeeding is the finest investment for a child's health and brains. Six months of exclusive breastfeeding significantly reduces infant mortality due to diarrhea and pneumonia.³⁴ The Global Strategy for Infant and Early Child Nutrition, WHO/UNICEF suggests four essential measures for ensuring optimum growth and development, namely: the first is to start breastfeeding as soon as possible after birth; the second is to breastfeed exclusively for the first six months of a baby's life (ASI); the third is to supplement breast milk with complementary foods (MP-ASI) between the ages of six and 24 months; and the fourth is to continue breastfeeding until the child is 24 months old or older. This highlights the fact that, from a sociocultural perspective, MP-ASI should be formulated using substances that are inexpensive and readily available in the region (indigenous foods).³⁴

Conclusion

There was an increase in nutrient intake and dietary variety among pregnant women when the intervention was implemented for four months. The prevalence of anaemia among pregnant women decreased from 19 (63.3%) to 4 (13.3%) people. On the first day following birth, 20 women (63.3% of the total) breastfed promptly, while 18 women (60%) breastfed exclusively. The results of this study can be used to design educational interventions and programmes that suit the needs of pregnant women from food-insecure families. Governmental and non-governmental organisations, health educators, and other health service providers should incorporate the construction of the health belief model into existing nutrition education programmes.

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Conflict of Interest

There are no conflict of interest.

References

- Damari B, Abdollahi Z, Hajifaraji M, Rezazadeh A. Nutrition and food security policy in the Islamic Republic of Iran: Situation analysis and roadmap towards 2021. *East Mediterr Heal J.* 2018;24(2):177-188. doi:10.26719/2018.24.2.177
- Sudaryati E, Zuska F, Masthalina H. Household food security, nutritional intake, and nutritional status of pregnant women in the central tapanuli regency. *Open Access Maced J Med Sci.* 2021;9:1560-1564. doi:10.3889/oamjms.2021.7749
- Rosso P. *Nutrition and Metabolism in Pregnancy, Mother, and Fetus.* Oxford University Press; 1990.
- Roland MCP, Friis CM, Godang K, Bollerslev J, Haugen G, Henriksen T. Maternal factors associated with fetal growth and birthweight are independent determinants of placental weight and exhibit differential effects by fetal sex. *PLoS One.* 2014;9(2):1-5. doi:10.1371/journal.pone.0087303
- Lakew Y, Biadgilign S, Haile D. Anaemia prevalence and associated factors among lactating mothers in Ethiopia: Evidence from the 2005 and 2011 demographic and health surveys. *BMJ Open.* 2015;5(4):1-7. doi:10.1136/bmjopen-2014-006001
- Liyew AM, Teshale AB. Individual and community level factors associated with anemia among lactating mothers in Ethiopia using data from Ethiopian demographic and health survey, 2016; A multilevel analysis. *BMC Public Health.* 2020;20(1):1-11. doi:10.1186/s12889-020-08934-9
- Rini S, Dewi FK. Correlation Between Postpartum Anemia and the Increase of Baby's Weight in Ledug, Kembaran, Banyumas, Indonesia. 2020;20(Icch 2019):102-105. doi:10.2991/ahsr.k.200204.024
- Food and agriculture Organization. *Moving Forward on Choosing A Standard Operational Indicator of Women's Dietary Diversity.* Food and agriculture Organization of the United Nation; 2015.
- Department of Food Security and Animal Husbandry. *Food Security and Vulnerability Atlas of North Sumatra Province 2020.*; 2020.
- Kementrian Kesehatan RI. *Peraturan Menteri Kesehatan Republik Indonesia Nomor 28 Tahun 2019 Tentang Angka Kecukupan Gizi Yang Dianjurkan Untuk Masyarakat Indonesia.* Vol 28.; 2019.
- Sudaryati E, Nasution E, Ardiani F. Nutritional Quality of Bread from Mixture of Arrowroot Flour (*Marantha arundinacea L.*) and Wheat Flour. 2018;9(PHICo 2017):186-189. doi:10.2991/phico-17.2018.17
- Bandura A. *Social Cognitif Theory.* Volume 1. (M. LPA., Kruglanski A., Higgins, E.T., eds.). Sage Publications Ltd.; 2012.
- Mcdermott J, Ait-aïssa M, Morel J, Rapando N. Agriculture and household nutrition security — development practice and research needs. Published online 2013:667-678. doi:10.1007/s12571-013-0292-6
- Hanie PE, Gerber N, Torero M. *Food and Nutrition Security Indicators : A Review.*, 2013.
- Diddana TZ, Kelkay GN, Dola AN, Sadore AA. Effect of Nutrition Education Based on Health Belief Model on Nutritional Knowledge and Dietary Practice of Pregnant Women in Dessie Town, Northeast Ethiopia: A Cluster Randomized Control Trial. *J Nutr Metab.* 2018;2018. doi:10.1155/2018/6731815
- Tsegaye D, Tamiru D, Belachew T. <p>Factors Associated with Dietary Practice and Nutritional Status of Pregnant Women in

- Rural Communities of Illu Aba Bor Zone, Southwest Ethiopia
- .
- Nutr Diet Suppl.*
- 2020;Volume 12:103-112. doi:10.2147/nds.s257610
17. Maxwell D, Carpl L, Margaret A-K, Marie R, Saul M, Clement A. *Urban Livelihoods and Food and Nutrition Security in Greater Accra, Ghana*. IFPRI Board of Trustees; 2000. doi:10.2499/0896291154rr112
 18. Zamriati WO, Hutagaol E, Wowiling F. Hubungan Pengetahuan Ibu Hamil Primigravida Trimester Ii dengan Tingkat Kecemasan Ibu Menghadapi Persalinandi Polikia Puskesmas Tuminting. *ejournal keperawatan (e-Kp)*. 2013;1:1-7.
 19. Chowdhury HA, Ahmed KR, Jebunessa F, Akter J, Hossain S, Shahjahan M. Factors associated with maternal anaemia among pregnant women in Dhaka city. *BMC Womens Health*. 2015;15(1):1-6. doi:10.1186/s12905-015-0234-x
 20. Pontoh A. Tingkat Karakteristik (Umur, Paritas, Pendidikan) Ibu Hamil Tentang Kejadian Kehamilan Resiko Tinggi. *Akad Kebidanan Griya Husada*. Published online 2018:52-59. <https://griyahusada.id/journal/index.php/midwifery/article/download/76/36>
 21. Listyarini AD, Fatmawati Y, Savitri I. Edukasi Gizi Ibu Hamil Dengan Media Booklet Sebagai Upaya Tindakan Pencegahan Stunting Pada Balita Di Wilayah Kerja Puskesmas Undaan Kabupaten Kudus. *J Pengabdian Kesehatan*. 2020;3(1):73-83. doi:10.31596/jpk.v3i1.70
 22. Wulandari RF, Susiloningtyas L, Jaya ST. Pendidikan Kesehatan untuk Meningkatkan Gizi Ibu Hamil. *J Communitu Engagem Heal*. 2021;4(1):155-161. <https://jurnal.stikes-sitihajar.ac.id/index.php/jhsp/article/view/16>
 23. Sulastijah S, Dw S, Helmyati S. Pengaruh Pendidikan Gizi dalam Upaya meningkatkan Kepatuhan Konsumsi Zat Besi Melalui Kelas Ibu Hamil. *J Gizi Klin Indones*. 2015;12(02):79-87.
 24. Berry EM. Sustainable Food Systems and the Mediterranean Diet. *Nutrients*. 2019;11(9). doi:10.3390/nu11092229
 25. Orr SK, Dachner N, Frank L, Tarasuk V. Relation between household food insecurity and breastfeeding in Canada. *Cmaj*. 2018;190(11):E312-E319. doi:10.1503/cmaj.170880
 26. Nunnery DL, Labban JD, Dharod JM. Interrelationship between food security status, home availability of variety of fruits and vegetables and their dietary intake among low-income pregnant women. 2017;21(4):807-815. doi:10.1017/S1368980017003032
 27. Saifuddin. *Buku Acuan Nasional Pelayanan Kesehatan Maternal Dan Neonatal*. Yayasan Bina Pustaka; 2002.
 28. Urgell-Lahuerta C, Carrillo-álvarez E, Salinas-Roca B. Interventions on food security and water uses for improving nutritional status of pregnant women and children younger than five years in low-middle income countries: A systematic review. *Int J Environ Res Public Health*. 2021;18(9). doi:10.3390/ijerph18094799
 29. Sunuwar DR, Sangroula RK, Shakya NS, Yadav R, Chaudhary NK, Pradhan PMS. Effect of nutrition education on hemoglobin level in pregnant women: A quasi-experimental study. *PLoS One*. 2019;14(3):1-13. doi:10.1371/journal.pone.0213982
 30. Aprisilia WR, Anita L, H KB. Pengaruh Promosi Kesehatan Tentang Tanda Bahaya Kehamilan Terhadap Pengetahuan Ibu Hamil Di Puskesmas Amurang Kabupaten Minahasa Selatan. *JIDAN (Jurnal Ilm Bidan)*. 2014;2(2):1-5. <https://ejournal.poltekkes-manado.ac.id/index.php/jidan/article/view/304>
 31. Yunita HS, Rahayuning PD, Apoina K. Anemia Dan Kek Pada Ibu Hamil Sebagai Faktor Risiko Kejadian Bayi Berat Lahir Rendah (BBLR) (Studi Di Wilayah Kerja Puskesmas Juwana Kabupaten Pati). *J Kesehatan Masy*. 2019;7(1):322-329.
 32. Jebena DD, Tenagashaw MW. Breastfeeding practice and factors associated with exclusive breastfeeding among mothers in Horro District, Ethiopia: A community-based cross-sectional study. *PLoS One*. 2022;17(4 April):1-17. doi:10.1371/journal.pone.0267269
 33. World Health Organization. *Infant and Young Child Feeding A Tool for Assessing National Practices* .; 2003.
 34. UNICEF /WHO /World Bank Group. Joint Child Malnutrition Estimates Key findings. Published online 2020. doi:10.18356/6ef1e09a-en