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Management Of Chronic Energy Deficiency (Ced) In Pregnant Women: Literature Review

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ABSTRACT

Chronic Energy Deficiency (CED) in pregnant women is a condition experienced by pregnant women due to an imbalance in energy and protein nutritional intake, so that the substances needed by the body are not met. LiLA which is below 23.5 cm indicates that the pregnant woman has CED. This literature review aims to examine the management of CED in pregnancy by reviewing several research articles. This literature review method involves searching for articles using several databases via Google Scholar and Pubmed. Interventions that can be carried out include meeting nutritional needs and energy intake by providing additional foods high in calories and high in protein based on local ingredients.

Keywords: pregnant woman, chronic energy deficiency, protein intake.

INTRODUCTION

Chronic Energy Deficiency (CED) in pregnant women occurs due to an imbalance between energy and protein intake, resulting in a lack of essential nutrients. During pregnancy, maternal nutritional needs increase significantly, as the nutrients consumed must meet both the mother's physiological needs and the developmental needs of the fetus.(Puspitasari et al., 2021)The nutritional status of pregnant women can be assessed by measuring the upper arm circumference (MUAC). A MUAC measurement of less than 23.5 cm indicates that the pregnant woman is experiencing CED.(Rahayu & Purnomo, 2024).

According to the World Health Organization (WHO) 2018, anemia and KEK in pregnancy on a global scale are 35-75%, and occur more frequently in the third trimester.(Sukmawati et al., 2020)Data from the 2023 Indonesian Health Survey shows that the prevalence of CED in pregnant women in Indonesia is 16.9% among women aged 10-54. Mountainous Papua Province has the highest prevalence rate at 44.7%, while North Kalimantan Province has the lowest prevalence rate at 5.2%.(Rahayu & Purnomo,

2024)According to the Central Java Statistics Agency (BPS) (2021), the number of SEZs in Central Java Province in 2021 was 38,602 people.(Central Java Statistics Agency, 2021)Data from the Semarang City Health Office states that cases of pregnant women with KEK in Semarang City in 2021 were 10.43%.(Health Office, 2021)

Pregnant women with CED often give birth to babies with low birth weight. This is in line with research.Andriani and Masluroh, using a cross-sectional analytical method, stated that pregnant women who face KEK have a twelve point four two nine times greater risk of giving birth to a low birth weight baby than those who do not.(Khazanah et al., 2023).The impact of chronic energy deficiency (CED) is clearly visible in children who experience stunting. Ismawati's research demonstrated this through a simple test on thirty stunted toddlers. She measured their height and consulted a book on Maternal and Child Health. The book revealed a link between a history of CED in pregnant women and stunting seen in toddlers aged 24 to 59 months. (Ismawati et al., 2021).

During pregnancy, chronic energy deficiency (CED) can lead to preeclampsia. Women with preeclampsia are at greater risk of developing CED because their nutritional status can affect blood pressure. High blood pressure and poor nutrition can trigger eclampsia, which threatens both mother and child. CED during pregnancy can complicate labor, prolong labor, and increase the risk of premature birth and postpartum hemorrhage. This condition can also increase the need for cesarean sections. This is in accordance with Kusumawati's research on risk factors influencing labor procedures at Dr. Moewardi Hospital, Surakarta, Semarang, with 170 samples. The results showed a relationship between the nutritional status of pregnant women and the delivery procedures performed.(Alyssa Atikah Putri & Shella Salsabila, 2023).

KEK is influenced by a number of factors, namely economic conditions, close spacing between pregnancies, the age of the mother at risk, energy intake, protein intake, number of births and the mother's knowledge about pregnancy health.(Heryunanto et al., 2022). Nutritional needs and energy intake are something that must be met during pregnancy.due to a significant increase in energy needs.A pregnant woman's diet can affect the health of the fetus and the continuation of the pregnancy. The Energy Adequacy Intake (EAI) for pregnant women is 2,400 kcal/day, higher than the average adult EA of 2,100 kcal/day, with an additional 300 kcal/day.(Ministry of Health of the

Republic of Indonesia, 2019)Protein is one of the important substances for the human body that influences the occurrence of KEK during pregnancy.(Heryunanto et al., 2022)This condition is supported by researchMarjan,Aprilia and Fatmawati in Gunung Sindur, Bogor, who stated that there is a correlation between protein intake and the incidence of KEK in pregnant women.(Marjan et al., 2021)Another study conducted by Pratiwi using the Analytic Cross Sectional method at the Payung Sekaki Community Health Center in Pekanbaru stated that protein deficiency results in pregnant women having a 1080 times greater risk of experiencing KEK.(Ayu Sri Pratiwi, 2020).

Managing chronic energy deficiency (CED) in pregnant women is crucial. This condition can improve maternal and child health and reduce maternal and infant mortality rates. Prevention and management of CED can include nutritional supplementation and supplemental feeding (PMT) for pregnant women as an alternative food or snack to meet their nutritional needs.(Ministry of Health of the Republic of Indonesia, 2023).

The aim of this literature review is to examine and analyze in depth the management of KEK in pregnant women which is in accordance with previous research through a review of several existing studies.

METHOD

The method used was a literature review, searching for references through electronic media using several databases such as Google Scholar and PubMed regarding the management of CED in pregnant women. Secondary data sources were articles or journals related to the topic. The keywords used were "chronic energy deficiency," "pregnant women," "chronic energy deficiency," "pregnant women," and "protein intake." After reviewing the articles, 10 articles were obtained regarding various CED management strategies in pregnant women.

RESULTS AND DISCUSSION

Chronic Energy Deficiency Syndrome (CED) in pregnant women occurs when there is insufficient energy and protein in their diet. This deficiency deprives the body of what it needs. One way to assess a pregnant woman's nutritional health is by measuring her limb height (LILA). If the measurement is below 23.5 cm, she is suffering from chronic energy deficiency syndrome (CED). Addressing this condition is crucial for the well-

being of both mother and child, as it can reduce maternal and infant mortality rates. Ten studies have been compiled on how to manage CED, all aimed at improving the nutrition of pregnant women.

No	Title	Researchers	Year	Journal	Method	Results
1	The Effectiveness of the Supplementary Food Provision Program (PMT) in the Form of Biscuits on the Nutritional Status of Pregnant Women in the Nambo Community Health Center Work Area in 2022	Supriyadi, Rasma, Mayurni Firdayana Malik, Misdayanti	2023	Avicenna Journal of Science and Health Research Vol. 2 No. 3 September 2023	This study used a quasi-experimental design with a one-group before-and-after design. In this design, the sample was given a pre-test first, followed by an intervention, and finally, a post-test in one group without a control group. The study population was 31 pregnant women with chronic energy deficiency (CED) in the Nambo Community Health Center (Puskesmas) working area. The sample consisted of pregnant women with CED who received PMT (Food Supplement) in the form of biscuits during September-October 2022. The sampling technique used was total	The average difference in LiLA of pregnant women before and after receiving PMT in the form of biscuits was 0.5032 with a standard deviation of 0.2429. Based on the results of the Pired Samples T-test, a p-value of 0.001 was obtained. This indicates that providing PMT biscuits is effective in improving the nutritional status of LiLA of pregnant women with special needs (KE) in the

					sampling, involving 31 pregnant women.	Nambo Health Center working area.
2	Effectiveness of moringa biscuit (Moringa oleifera) and snakehead fish (Channa striata) in improving the nutritional status of pregnant women with chronic energy deficiency	Evi Setyawati, Sri Sumarmi, Nurasmi, Irnawati, Lin O Hutagaol	2024	African Journal of Reproductive Health	This study was a randomized controlled trial conducted in two stages. The first stage was conducted in 2020, while the second stage was implemented in 2021 in Sigi Regency, Central Sulawesi Province, Indonesia. Thirty pregnant women with CED were divided into two groups. Five biscuits (60 g) were given daily for three months to mothers in the intervention group, while the control group was given biscuits without moringa and snakehead fish. Analysis consisted of paired t-test statistics.	The results showed that the provision of biscuits significantly improved the nutritional status of pregnant women with CED, with an average Central Body Mass Index (BMI) of (P 0.000). In contrast, the upper arm circumference did not differ between the intervention and control groups (P 0.247). This indicates that the consumption of moringa biscuits and snakehead fish contributed to a higher average energy

						and nutrient intake in pregnant women with CED.
3	The Effect of Purple Sweet Potato (Ipomoea Batatas) on Weight Gain in Pregnant Women with Chronic Energy Deficiency	Nurul Amalina, Devi Rosima	2022	Maternal Child Health Care Journal Volume 4. No.1	This study employed a quasi-experimental design with a one-group pretest-posttest design. The study was conducted in December 2021, with a sample size of 15 participants. Purposive sampling was used as the sampling technique. Data analysis was performed using a paired sample t-test with a 95% confidence level.	The results of the study showed that the average weight of pregnant women before consuming purple sweet potatoes was 45.86 kg and after consuming purple sweet potatoes increased to 46.81 kg. There was a significant effect of giving purple sweet potatoes on increasing the weight of pregnant women with KEK, with a p value of 0.0005.
4	Analysis of protein content and	Razita Lauzah Diningru	2024	SAGO Journal of Nutrition and Health, 5(3A),	This study used a quasi-experimental method with a post-	The results of the protein content test

	organoleptic test of milk pie substituted with jackfruit seed flour	m, Ruli Bahyu Antika		594-603.	test only control group design. Protein content testing was conducted at the Jember Polytechnic Food Analysis Laboratory, and organoleptic testing was conducted at the Tenggarang Community Health Center in Bondowoso Regency. A total of 12 samples were collected from pregnant women with special needs (KE) who require high protein sources (3 control samples, 9 experimental samples).	showed that the substitution of jackfruit seed flour had a significant effect on the protein content of milk pie (p = 0.16). The results of the organoleptic test showed that the substitution of jackfruit seed flour had a significant effect on the organoleptic quality (color p = 0.000, aroma p = 0.000, texture p = 0.000, taste p = 0.000) of milk pie.
5	Intervention for Pregnant Women with Chronic Energy Deficiency (CED) With the Continuity	Rully Hevrialni, Yan Sartika	2021	Journal of Health Research Bandung Health Department Polytechnic Vol 13 No 2	This study was a quasi-experimental study with a one-group pretest and posttest design, comparing the average values before and after the intervention. The	The results of the study showed that the average LiLA in 15 pregnant women who received PMT in the form of

	of Midwifery Care Approach (Comc) In Stunting Prevention				study sample consisted of 30 pregnant women divided into two groups: 15 in the intervention group with assistance and 15 in the group without assistance. The sample was selected using a purposive sampling technique. The study was conducted from January to December 2020 at a community health center in Pekanbaru. Data were collected to assess Hb levels, LiLA, and body weight using an observation sheet.	nuggets made from catfish and tempeh was 23.2 cm with a standard deviation of 0.2. Based on statistical tests, a p-value of 0.008 was obtained, indicating a significant effect of providing PMT nuggets (catfish and tempeh) on increasing the LiLA of pregnant women at the Rumbai Community Health Center, Pekanbaru City.
6	Tarap ice cream innovation to increase mother's weight Pregnant with kek (less Chronic	Ika Yulianti, Doris Noviani, Nur Citra, Niken Rahmawati	2023	Journal Caring for the Community Volume 5 Number, March 2023	This activity involved processing tarap fruit into ice cream, which was then given to pregnant women with KEK status for two weeks. Evaluation was conducted by	There is a significant relationship between giving ice cream from tarap fruit and the increase in weight of pregnant

	energy) in North Kalimantan				measuring the pregnant women's weight after the intervention.	women with KEK after 14 days. With a p-value of 0.040.
7	Giving red bean, peanut and soybean formula drinks to the nutritional status of pregnant women with chronic energy deficiency (CED)	Nendhi Wahyuni a Utami, Tita Husnitaw ati Majid, Dewi Marhaeni Diah Herawati	2017	Indonesian Journal of Clinical Nutrition, Vol. 14, No. 1, July 2017: 1-9	This study used an open-label randomized controlled trial (RCT) and was conducted in Sleman Regency from January to March 2016. The subjects were 84 pregnant women with malnutrition and 14-28 weeks' gestation who met the inclusion and exclusion criteria. LiLA and BMI measurements were taken before and after administration of formula drinks.	There was an increase in body weight and LiLA in pregnant women in both groups, with a more significant increase in the treatment group compared to the control group ($p<0.005$). The group receiving the peanut-based formula drink showed a greater improvement in nutritional status than the other groups, as well as protein and energy intakes that exceeded the RDA compared to the other

						groups.
8	The Effect of Sandwich Biscuit PMT on Pregnant Women with Chronic Energy Deficiency at the Bantarbolang Community Health Center, Pemalang Regency	Nanik Setiyowati, Yuliana Noor Setiawati Ulvie	2019	Journal of Nutrition Volume 8 Number 1 2019	This study was a quasi-experimental study with a one-group pre-posttest design. Subjects were pregnant women with chronic energy deficiency syndrome (CED) in the second trimester. Measurements were taken before and after the intervention. Before the intervention, the MUAC was measured, followed by a 3-month supplementary feeding (PMT) in the form of sandwich biscuits. The MUAC was measured monthly on the 30th, 60th, and 90th days after the MUAC was administered.	The average nutritional status of pregnant women with special economic conditions (KE) was measured using the LiLA. Before being given sandwich biscuits as a supplementary food supplement, the average LiLA increased to 22.4 cm. This indicates the effect of sandwich biscuits on improving the LiLA status of pregnant women with special economic conditions (KE).
9	The Effect of Providing	Fenny Rahmano	2023	Hospitality Scientific	This study used a quasi-experimental	The results of the Wilcoxon

	Supplementary Food (PMT) Yellow Pumpkin And Effect of Snakehead Fish on the Nutritional Status of Pregnant Women With Disadvantages Chronic Energy (CED)	or Astuti, Yuliani Budiyarti		Journal, 12(2), 605-614.	design with a non-equivalent group design and a one-group pretest-posttest. The study population included all pregnant women with special economic conditions (KE) in February 2023, with sampling using a total sampling technique.	test showed a Z value for LiLA of -3.866 and a Z value for body weight of -3.753 with a p value of 0.000, which means that there is an effect of PMT in the form of pumpkin and snakehead fish on the nutritional status of pregnant women with KEK.
10	The Effectiveness of Local Food Ingredients (Sago Flour, Red Bean Flour, and Red Fruit Juice) as Basic Ingredients for Providing Additional Food for Pregnant	Rahayu Khairiah, Juliana	2023	Scientific Journal of Nursing, 9(3), 117-123.	This study used a quasi-experimental design with a one-group pretest-posttest design. The sample consisted of 30 pregnant women with special needs (KE) at the Malawili Community Health Center, Aimas District, Sorong, from September to October 2022. The sampling technique used was total sampling.	The average weight of pregnant women with special economic conditions (KE) before the intervention was 44.92 kg, while after the intervention it increased to 49.83 kg. Consumption of local food

	Women with Chronic Energy Deficiency on Weight Gain in Pregnant Women with Chronic Energy Deficiency					ingredients such as sago flour, red bean flour, and red fruit juice as the basic ingredients of PMT was proven effective in increasing the weight of pregnant women, with a p value of 0.000.

A review of several research articles has shown that managing chronic energy deficiency (CED) in pregnant women can be achieved by meeting nutritional and energy needs. Energy intake can be achieved through the provision of high-energy supplements such as carbohydrates, healthy fats, and protein. Providing high-calorie and high-protein supplements based on local ingredients can be an intervention for managing CED. Some possible interventions include:

PMT with biscuits

Biscuits are a favorite food for pregnant women facing CED. They are soft, easy to digest, and a convenient snack for many in Indonesia. For pregnant women, biscuits are a simple alternative when they need nutrition.(Nabilla et al., 2022).

According to the Minister of Health Regulation Number 51 of 2009(2016)Regarding Nutritional Supplement Product Standards, supplementary food for pregnant women with CED consists of biscuits made from wheat flour, non-hydrogenated vegetable fat, sugar, milk, eggs, nuts, and dried fruit. The biscuits contain protein, linoleic acid, carbohydrates, and are enriched with eleven vitamins and seven minerals necessary as supplementary food for pregnant women with CED.(Ministry of Health Regulation, 2016).

Moringa and snakehead fish biscuits

Moringa leaves are rich in nutrients. They contain protein, calcium, iron, and vitamins A, B, and C. Moringa leaves contain 5.1 grams of protein, which can be used as a dietary supplement to increase weight gain in pregnant women with CED.(Ministry of Health, 2017).

Snakehead fish is rich in protein, particularly albumin, which aids healing and strengthening the body. It is low in carbohydrates and fat. It provides 16.2 grams of protein per serving, with only 0.5 grams of fat. This makes it a good choice for nutritional support, especially for pregnant women facing nutritional deficiencies.(Ministry of Health, 2017).

Purple sweet potato

Purple sweet potatoes are not only a delicious addition to the diet, but they also serve as a valuable source of energy, thanks to their carbohydrates and protein. Furthermore, purple sweet potatoes are rich in essential vitamins and minerals that contribute to overall health. In particular, these brightly colored tubers are rich in vitamins A, C, thiamine (vitamin B1), and riboflavin, which play important roles in various bodily functions. In terms of minerals, purple sweet potatoes provide iron, phosphorus, and calcium, all of which are essential for maintaining strong health. Their nutritional profile is particularly beneficial for pregnant women, as they can help meet increased dietary needs during this crucial period.(Amalina & Rosima, 2022).

According to research conducted by Alhusna and Rahmadyanti(2024)using the quasi-experimental method, it was shown that there was an increase in body weight in pregnant women who experienced KEK after consuming sweet potatoes for one month.(Ise Alhusna, 2024).

Jackfruit seed flour milk pie

Milk pie is a new PMT (Food and Nutritional Supplement) that can be developed using local ingredients because it has a higher protein content than other types of cookies. Milk

pie also uses eggs as a source of animal protein, which meets the recommendations of the Local Food PMT-P.(Ministry of Health of the Republic of Indonesia, 2023).

In 100 grams of jackfruit seeds (concrete) there is a total energy262 kcal, 2.3 grams of protein, 5.4 grams of fat, 51.1 grams of carbohydrates, 60 mg of calcium, 80 mg of phosphorus, 0.8 mg of iron, 10 mg of vitamin C, and 40.5 grams of water which can be used as an alternative source of protein for pregnant women with KEK through PMT based on local ingredients(Ministry of Health, 2017).

Nuggets made from catfish and tempeh

Consuming catfish can help meet the nutritional needs of pregnant women. Catfish is rich in iron, protein, and omega-3 fatty acids. Its high protein content (17 grams) and total calorie content (132 kcal) are highly beneficial for pregnant women, especially those experiencing CED.(Ministry of Health, 2017).

Tempeh, a nutritious food made from fermented soybeans, serves as a good source of plant-based protein that helps build and repair damaged cells in the body. Its high protein and zinc content is particularly beneficial for supporting overall growth and development.(Ministry of Health, 2017). According to Susianto's research(2023)using the quasi-experimental method in Karangmuncang Village, Cigandamekar District, Kuningan Regency, showed that there was an effect of providing additional tempeh nugget food on weight gain with malnutrition.(Susianto et al., 2023).

Tarap ice cream

Tarap is a native plant of Kalimantan which is famous for its nutritional content which includes protein, fat, carbohydrates, calcium, phosphorus, iron, and various essential vitamins such as retinol, beta carotene, niacin, thiamine, riboflavin, vitamin A, and vitamin C. The flesh of the fruit gives off a unique aroma and a delicious sweet taste, ultimately not only being a delicious food complement, but also a valuable source in traditional medicine, known for its pharmacological benefits.(Noorfarahzilah et al., 2020).

To create added value, tarap can be innovated into a delicious ice cream that appeals to a wide audience, including pregnant women who often face challenges with solid and spicy

foods due to digestive issues associated with pregnancy. Ice cream made with high-quality ingredients and high nutritional value can be a profitable food choice.(Yulianti et al., 2023).

Red bean, peanut and soybean formula drink

Legumes serve as a readily accessible source of plant-based protein. Varieties such as kidney beans, peanuts, and soybeans provide approximately 300 kcal of energy along with numerous nutrients, including 17 grams of protein, 13 milligrams of iron, 150 milligrams of calcium, 30 milligrams of magnesium, 200 milligrams of folic acid, 300 RE of vitamin A, 0.2 milligrams of vitamin B12, and 10 milligrams of vitamin C per 300 ml serving. These nutritional components make legumes a popular addition to nutritious foods and beverages to meet increased nutrient needs, especially for pregnant women experiencing chronic kidney disease (CED).(Utami et al., 2017).

PMT Sandwich Biscuits

Biscuits are a popular food product used as a supplement for pregnant women experiencing CED. Biscuits are a practical snack for Indonesians, with their soft, easy-to-digest texture making them a suitable alternative for pregnant women experiencing CED.(Nabilla et al., 2022).

Sandwich biscuits can be an alternative food supplement to overcome KEK in pregnant women by providing additional calories, protein, and important nutrients such as iron, folic acid, and calcium.(Setiyowati & Ulvie, 2019). According to research by Lismawati and Marlin(2024)At the Pijoan Baru Inpatient Health Center, 10 people stated that there was a significant influence between providing additional food with sandwich biscuits on weight gain in pregnant women with KEK.(Lismawati & Marlin, 2024).

Yellow pumpkin and snakehead fish

Pumpkin is a nutrient-rich vegetable containing protein, fat, carbohydrates, and various vitamins, including A, B, and C, as well as essential minerals like iron, calcium, and phosphorus. Its bright yellow color indicates its high beta-carotene content, which plays a vital role in protecting the body from free radicals.(Astuti & Budiarti, 2023).

Snakehead fish is a rich source of protein, especially albumin, which plays a vital role in the healing process and boosting the body's immunity. With its low carbohydrate and fat content, snakehead fish serves as a valuable nutritional supplement for pregnant women facing malnutrition.(Astuti & Budiarti, 2023).

Sago Flour, Red Bean Flour, and Red Fruit Juice

Local food ingredients such as red bean flour, sago flour, and red fruit juice, sago flour, and meah fruit juice can be used as additional food for pregnant women. 100 grams of sago flour contains 353 calories. Red bean flour contains high protein, in 100 grams of red bean flour there are 375.28 calories, 17.24 grams, 2.21 grams and 71.08 grams of carbohydrates(Khairiah & Juliana, 2023).

These two foods can be mixed with red fruit, which contains nutrients such as protein, carbohydrates, calories, healthy fats, and antioxidants. Therefore, sago flour, red bean flour, and red fruit juice can accelerate weight gain in pregnant women experiencing CED.(Khairiah & Juliana, 2023).

Literature reviews reveal various approaches to addressing the problem of CED during pregnancy, particularly through providing nutrient-rich foods that increase calorie and protein intake. Protein plays a crucial role in supporting the body, ultimately significantly influencing the likelihood of CED in pregnant women (Heryunanto et al., 2022). This idea is further strengthened by research conducted by Avliya Quratul Marjan and colleagues in Gunung Sindur, Bogor, who identified a clear correlation between protein consumption and the occurrence of CED among pregnant women (Marjan et al., 2021). Furthermore, a study by Ayu Sri Pratiwi, using an analytic cross-sectional method at the Payung Sekaki Community Health Center in Pekanbaru, found that insufficient protein intake increases the risk of CED in pregnant women by an alarming 1080%.(Ayu Sri Pratiwi, 2020).

CONCLUSION AND SUGGESTIONS

Based on the literature review that has been obtained regarding the management of KEK in pregnant women, it was found that interventions for handling KEK can be carried out by fulfilling nutritional needs and energy intake through providing additional foods high

in calories and protein based on local sources, namely soybeans, moringa leaves, sweet potatoes, jackfruit seeds, tarap, red beans, peanuts, pumpkin, snakehead fish, patin fish, tempeh, sago flour, red bean flour, and red fruit juice which can be innovated into biscuits, pudding, ice cream, and others.

Suggestions for the next literature review are that it is desirable to be able to use a larger database that includes national and international articles that are relevant to the title and also to select articles published in the last 10 years so that the references used are more recent.

BIBLIOGRAPHY

Alyssa Atikah Putri, & Shella Salsabila. (2023). The Impact of KEK Disease on Pregnant Women. Student Scientific Creativity Journal, 1(3), 246–253. https://doi.org/10.55606/sscj-amik.v1i3.1525

Amalina, N., & Rosima, D. (2022). The Effect of Purple Sweet Potato (Ipomoea Batatas) on Weight Gain in Pregnant Women with Chronic Energy Deficiency. Maternal Child Health Care, 4(1), 637. https://doi.org/10.32883/mchc.v4i1.2234

Astuti, FR, & Budiarti, Y. (2023). The Effect of Providing Yellow Pumpkin and Snakehead Fish Supplements (PMT) on the Nutritional Status of Pregnant Women with Chronic Energy Deficiency (CED). Hospitality Scientific Journal 605, 12(2), 605–614.

Ayu Sri Pratiwi. (2020). Risk of Chronic Energy Deficiency (CED) in Pregnant Women in the Payung Sekaki Community Health Center Work Area, Pekanbaru. Encyclopedia of Journals, 2(2), 184–192. http://jurnal.ensiklopediaku.org

Central Java BPS. (2021). Number of Pregnant Women, Conducting K1 Visits, Conducting K4 Visits, Chronic Energy Deficiency (KEK), and Receiving Iron Tablets (Fe) in Central Java Province, 2016-2021 - Statistical Table - Central Java Province Statistics Agency. https://jateng.bps.go.id/id/statistics-table/1/MjQyMiMx/jumlah-ibu-hamil--melakukan-kunjungan-k1--melakukan-kunjungan-k4--kurang-energi-kronis--kek---dan-mendapat-tablet-zat-besi--fe--di-provinsi-jawa-tengah---2016-2021.html

Dinkes, S. (2021). Prevalence of KEK, Anemia, and Stunting.

https://dinkes.semarangkota.go.id/content/post/324

Heryunanto, D., Putri, S., Izzah, R., Ariyani, Y., & Kharin Herbawani, C. (2022). Overview of Chronic Energy Deficiency Conditions in Pregnant Women in Indonesia, Causative Factors, and Impacts. PREPOTIF: Journal of Public Health, 6(2), 1792–1805. https://doi.org/10.31004/prepotif.v6i2.4627

Ise Alhusna, R. (2024). ANALYSIS OF PURPLE JALAR SUBIS ON WEIGHT GAIN OF PREGNANT WOMEN WITH KEK. Journal of Telenursing (JOTING) Volume 6, Number 1, January-June 2024, 15(1), 37–48.

Ismawati, V., Kurniati, FD, Suryati, S., & Oktavianto, E. (2021). The Incidence of Stunting in Toddlers Is Influenced by a History of Chronic Energy Deficiency in Pregnant Women. Syifa' MEDIKA: Journal of Medicine and Health, 11(2), 126. https://doi.org/10.32502/sm.v11i2.2806

Ministry of Health of the Republic of Indonesia. (2019). Nutritional Adequacy Rates for the Indonesian People. Minister of Health Regulation Number 28 of 2019, Number 65(879), 2004–2006.

Ministry of Health of the Republic of Indonesia. (2023). Technical Guidelines for Supplementary Food for Toddlers and Pregnant Women. Jakarta: Directorate of Community Nutrition, Ministry of Health of the Republic of Indonesia, 6(August), 78–81. https://kesmas.kemkes.go.id/assets/uploads/contents/others/20230516_Juknis_Tatalaksana_Gizi_V18.pdf

Ministry of Health. (2017). Food Composition Table—Indonesia (List of Food Composition). In Indonesian Food Composition Table.

Khairiah, R., & Juliana. (2023). Effectiveness of Local Food Ingredients (Sago Flour, Red Bean Flour, And Red Fruit Juice) as A Base for Supplementary Feeding of Chronically Energy-Deficient Pregnant Women on Weight Gain of Chronically Energy-Deficient Pregnant Women. Scientific Nursing Scientific Journal of Nursing, Vol 9, No. https://www.journal.stikespemkabjombang.ac.id/index.php/jikep/article/download/1597/961

Khazanah, W., Andriani, A., Hadi, A., & Miko, A. (2023). Education on the use of

moringa leaves as processed products for supplementary feeding (PMT) for toddlers in Deunong Village, Aceh Besar. PADE Journal: Community Service & Education, 5(2), 86. https://doi.org/10.30867/pade.v5i2.1549

Lismawati, & Marlin, D. (2024). The Effect of Supplementary Feeding on Weight Gain in Pregnant Women with Chronic Energy Deficiency (CED). 8, 1807–1813.

Marjan, AQ, Aprilia, AH, & Fatmawati, I. (2021). Analysis of Determinant Factors Associated with the Incidence of Chronic Energy Deficiency (CED) in Pregnant Women in the Gunung Sindur Area, Bogor. Integrated Health Journal, 12(1), 39–47. https://doi.org/10.32695/jkt.v12i1.117

Nabilla, DY, Sabta Aji, DA, Nufaisah, A., Saputri, W., Aprilia, V., Rahayu, HK, & Salfarino, R. (2022). Development of High-Protein and Iron-Rich "Prozi" Biscuits for Pregnant Women as an Effort to Prevent Stunting. Amerta Nutrition, 6(1SP), 79–84. https://doi.org/10.20473/amnt.v6i1sp.2022.79-84

Noorfarahzilah, M., Jau-Shya, L., Mansoor, AH, Jahurul, MHA, Umi Hartina, MR, Zainol, MK, & Hasmadi, M. (2020). Physicochemical properties of tarap (Artocarpus adoratisimus) starch. Food Research, 4(3), 602–611. https://doi.org/10.26656/fr.2017.4(3).337

Minister of Health Regulation. (2016). Minister of Health Regulation No. 51 of 2016. https://peraturan.bpk.go.id/Details/114009/permenkes-no-51-tahun-2016

Puspitasari, M., Mitra, M., Gustina, T., Rany, N., & Zulfayeni, Z. (2021). Providing Supplementary Food to Pregnant Women with Special Needs at the Karya Wanita Community Health Center in Pekanbaru. Manarang Health Journal, 7(2), 141. https://doi.org/10.33490/jkm.v7i2.325

Rahayu, AN, & Purnomo, W. (2024). Factors Associated with the Incidence of Chronic Energy Deficiency in Pregnant Women in Indonesia. 2024, 7(3), 562–568. http://journal.unpacti.ac.id/index.php/JPP

Setiyowati, N., & Ulvie, YSN (2019). The Effect of Sandwich Biscuit PMT on Pregnant Women with Chronic Energy Deficiency at the Bantarbolang Community Health Center, Pemalang Regency. Journal of Nutrition, 8, 1–9. https://doi.org/10.26714/jg.8.1.2019.%25p

Sukmawati, Sunarto, Rowa, SS, & Maghfira, A. (2020). Acceptability and Protein and

Iron Content of Instant Formula Drinks for Pregnant Women with Chronic Energy Deficiency (CED). Food Nutrition Media, 29, 1–23.

Susianto, S., Iswarawanti, DN, Mamlukah, M., Khaerudin, MW, & Mahendra, D. (2023). The Effect of Providing Tempeh Nugget Supplements as a Local Food on the Weight and Height of Stunted Toddlers. Bhakti Husada Health Sciences Journal, 14(02), 309–316. https://doi.org/10.34305/jikbh.v14i02.850

Utami, NW, Majid, TH, Marhaeni, D., & Herawati, D. (2017). Journal of Peanut Formula. Indonesian Journal of Clinical Nutrition, 14(1), 1–9.

Yulianti, I., Noviani, D., Citra, N., & Rahmawati, N. (2023). Tarap Ice Cream Innovation to Increase Weight Gain of Pregnant Women with KEK (Chronic Energy Deficiency) in North Kalimantan. Jurnal Peduli Masyarakat, 5(1), 173–178. https://doi.org/10.37287/jpm.v5i1.1593