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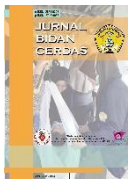

Nutritional Optimization: Chronic Energy Deficiency Intervention for Pregnant Women by Consuming Sandwich Biscuits and Chicken Eggs

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ABSTRACT

Introduction: Chronic Energy Deficiency (CED) is a prolonged nutritional condition resulting from insufficient energy intake, which can increase the risk of anemia, preeclampsia, infections, and impaired fetal growth. CED also contributes to preterm birth, low birth weight (LBW), and congenital anomalies and raises the risk of cognitive decline and chronic diseases later in life. **Objective:** To explore the effectiveness of nutritional optimization through consuming sandwich biscuits and boiled eggs among pregnant women with CED. **Method:** This study employed a true experimental design with two pretest-posttest groups, involving 20 pregnant women in their second and third trimesters with CED. The intervention group (n=10) consumed 3 sandwich biscuits and 2 boiled eggs daily, while the control group (n=10) consumed 3 sandwich biscuits daily, both for 30 days. Measurements included upper arm circumference (UAC) and body weight (BW), analyzed using independent t-tests and paired t-tests. **Results:** The intervention group showed a significant increase in UAC (from 22.1 to 23.9 cm) and BW (from 43.2 to 45.4 kg), with mean differences of 1.8 cm and 2.2 kg, respectively (p=0.000). The control group also showed significant increases in UAC (from 22.2 to 23.6 cm) and BW (from 43.8 to 45.3 kg), with mean differences of 1.4 cm and 1.5 kg, respectively (p=0.000). **Conclusion:** The combined consumption of sandwich biscuits and boiled eggs significantly improves UAC and BW, indicating its potential to reduce CED risk in pregnant women. Further research is needed to understand better CED, particularly in relation to UAC and BW changes.

INTRODUCTION

Chronic Energy Deficiency (CED) in pregnant women is a nutritional deficiency issue characterized by inadequate intake of both macro and micronutrients over an extended period, possibly even before pregnancy, leading to health disorders. (Fatmawati & Munawaroh, 2023). The Public Health Program includes activities measured by 4 (four) indicators, one of which is the percentage of pregnant women with CED. The Riskesdas survey in 2018 recorded CED among pregnant women (aged 15-49 years) at 17.3%, with an expected annual decrease of 1.5%. In West Java, the incidence of CED was recorded at 6.4%, while DKI Jakarta had the lowest percentage of pregnant women with CED at 3.1%. Conversely, the provinces with the

highest percentages of pregnant women with CED were Papua Barat (40.7%), Nusa Tenggara Timur (25.1%), and Papua (24.7%) (Dirjen Kemenkes, 2022).

The prevalence of CED among pregnant and non-pregnant women in West Java Province in 2023 was 11.6% (95% CI 8.2-16.1) and 19.9% (95% CI 19.1-20.7), respectively (BKPK Kemenkes RI, 2023). Meanwhile, the prevalence of CED among pregnant and non-pregnant women in Bogor City in 2018 was 11.22% (95% CI 4.24-26.52) and 12.58% (95% CI 10.13-15.52), respectively. The age characteristics of pregnant women were highest in the age groups 15-19 years (22.38%), 20-24 years (19.66%), 25-29 years (13.54%), 35-39 years (3.35%), and 40-44 years (6.39%) (Kemenkes, 2019). The prevalence of CED among pregnant women in trimester II-III at TPMB Mathilda Dyah Astuti was found to be 21% (Data from TPMB Mathilda, 2021). Early detection of CED occurs when long-term energy supplies are recorded with Mid-Upper Arm Circumference (MUAC) below 23.5 cm (Dirjen Kemenkes, 2022) and pregnant women also experience minimal weight gain (Rika Fitri Diningsih et al., 2021). Conditions that lead to CED include weight less than 40 kg or appearing thin, and MUAC less than 23.5 cm or falling within the red band of the MUAC tape (Fatmawati & Munawaroh, 2023).

CED in pregnant women can lead to risks such as intrauterine fetal death (IUFD), miscarriage, and premature birth, intra uterin growth retardation (IUGR), CED in pregnant women can lead to risks such as congenital defects, low birth weight (LBW) babies, and even neonatal death. Mothers at risk may also experience weakened muscle strength that assists in the birthing process, potentially resulting in prolongehd labor, partus prematurus iminens (PPI), CED in pregnant women can also lead to risks such as postpartum hemorrhage and maternal death (Rishel & Armalini, 2022). The long-term impacts include suboptimal physical growth (stunting), impaired brain development, and less-than-optimal metabolism, which can increase the risk of infectious diseases in adulthood (Indonesia, 2021). CED in pregnant women is primarily caused by conditions where the mother experiences energy deficiency before pregnancy, and her energy requirements increase due to heightened metabolism during pregnancy. One of the main factors contributing to CED is inadequate food consumption, particularly foods that serve as energy sources. Other factors include the family's inability to provide nutritious meals and pregnant women's lack of awareness regarding balanced nutrition. The occurrence of CED in pregnant women is also associated with low knowledge about nutrition and insufficient energy intake (Mahendika et al., 2020).

During the first trimester of pregnancy, energy requirements increase to approximately 2,430 kcal per day, with protein needs reaching around 60 grams daily. In the second and third trimesters, energy requirements continue to rise to about 2,550 kcal per day, while protein needs increase to approximately 70 grams daily. Pregnant women require an additional intake of approximately 340-450 calories per day during the second and third trimesters of pregnancy (Ummi Kulsum & Dyah Ayu Wulandari, 2022). Supplementary Feeding is proven to address nutritional deficiencies in pregnant women by providing the necessary macro and micronutrients. In 2020, the coverage of supplementary feeding for pregnant women with CED in Indonesia reached 89%. The aim of supplementary feeding is to enhance energy and protein intake for pregnant women over a period of 90 days (Dirjen Kemenkes, 2022).

Sandwich biscuits are a nutritional supplement in the form of layered biscuits specially formulated and fortified with vitamins and minerals provided to pregnant women categorized as having CED. They are packaged in units where each package contains 3 biscuits. The nutritional composition per package or 100 grams includes:

Energy 510 kcal; Carbohydrates 56 grams; Protein 16 grams; Fat 26 grams; Vitamins (A, B1, B2, B3, B5, B6, B9, B12, C, D, E, and folate); Minerals (iron, calcium, selenium, zinc, sodium, iodine, phosphorus, and water). Sandwich biscuits serve as supplementary food that influences the increase in MUAC. Changes in MUAC for pregnant women experiencing CED occur after consuming 56 packages of sandwich biscuit regularly (Sisi et al., 2021). Another effort to reduce the incidence of CED in pregnant women is by increasing consumption of protein-rich foods, such as eggs (Sonia & Khodijah, 2017). In this study, local chicken eggs, readily available at the research site, are utilized. The nutritional content of boiled local chicken eggs includes: Energy 155 kcal; Carbohydrates 1.1 grams; Protein 13 grams; Fat 11 grams; Vitamins (B6, B12, C, D); Minerals (iron, calcium, magnesium). The research aims to identify nutritional optimization through the intervention of consuming sandwich biscuits and eggs among pregnant women with CED.

METHODS

This study applies a true experimental method. The research design utilizes a non-equivalent control group with pretest and posttest measurements conducted for each group. The population consists of 30 pregnant women experiencing CED at TPMB Mathilda Dyah Astuti, Bogor City, West Java in 2022. A sample of 20 pregnant women in trimesters II and III was selected using the following criteria: 1) willingness to consume pineapple cream sandwich and boiled chicken egg; 2) pregnant women with MUAC <23.5 cm and BMI <Ha 18.5 kg/m^2; and 3) no allergy to pineapple cream sandwich and boiled chicken egg biscuits. The sample was divided into: 10 pregnant women with CED in the intervention group and 10 pregnant women with CED in the control group. The independent variable in this study is "pineapple cream sandwich and boiled chicken egg biscuits." The dependent variables include: 1) increase in mid-upper arm circumference (MUAC) and 2) increase in body weight (BW).

The sandwich biscuits used in this study comply with government standards, which are layered biscuits formulated with special ingredients and enriched with essential vitamins and minerals aimed at pregnant women diagnosed with CED. They are packaged in wrappers (1 package containing 3 pieces of biscuits). As for the eggs, they are locally sourced chicken eggs readily available at the research site, cooked in boiling water until fully cooked with the shells intact.

The treatment for both groups was conducted over 30 days with the following details: 1) Before treatment (H-0), MUAC and body weight were measured for both the intervention and control groups; 2) In the intervention group, participants were given sandwich biscuits three times a day at 10:00 AM, 1:00 PM, and 5:00 PM, with each serving containing 1 piece, as well as boiled chicken eggs twice a day at 10:00 AM and 5:00 PM, with each serving containing 1 egg; 3) In the control group, sandwich biscuits were provided at 9:00 AM, 12:00 and 4:00 PM, with each serving containing 1 piece; 4) After treatment (H-31), MUAC and body weight were measured again for both the intervention and control groups. During the treatment period, respondents completed a checklist form daily to record their compliance in consuming sandwich biscuits and boiled chicken eggs. MUAC data were collected using MUAC tapes with a threshold of 23.5 cm, while body weight measurements were conducted using a digital Bioelectrical Impedance Analysis (BIA) a scale that can measure weight with a precision of 0.1 kg and can handle weights up to 150 kg.

Before data analysis, normality tests and homogeneity tests were conducted using the Shapiro-Wilk test. The results showed that all MUAC and body weight data had normal and homogeneous distributions ($p>0.5$). Univariate analysis involved

frequency distribution tables to describe MUAC and body weight variables. The Independent T-test was used to analyze differences between the intervention and control groups, while paired T-tests evaluated the impact of the intervention on dependent variables.

RESULTS

The research findings are presented in the following tables:

Table 1. Frequency Distribution of Characteristics of Pregnant Women with CED at TPMB Mathilda Dyah Astuti, Bogor City, West Java in 2022 Based on Age, Education, Occupation, and Parity

Characteristic	Control Group (n=10)		Intervention Group (n=10)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Age				
20-25	3	30	3	30
26-30	6	60	4	40
31-35	1	10	3	30
36-40	0	0	0	0
Education				
Elementary School	2	20	3	30
Junior High School	5	50	5	50
Senior High School	3	30	2	20
Occupation				
Unemployed	10	100	9	90
Self-employed	0	0	1	10
Parity				
0	2	20	1	10
1	4	40	5	50
2	3	30	0	0
3	1	10	4	40

Table 1 shows that the most common age characteristic among Pregnant Women with CED is 26-30 years, with 6 (60%) in both the control and intervention groups. The highest educational attainment is completion of junior high school for 5 (50%) in each group. Regarding occupation, the majority are unemployed, with 10 (100%) and 9 (90%) respectively. The most common parity characteristic is parity 1, with 4 (40%) and 5 (50%) in each group.

Table 2. Frequency Distribution of MUAC Before and After Treatment of Pregnant Women with CED

Group	Mean		Min-max		SD	
	Before	After	Before	After	Before	After
Intervention	22.1	23.9	21.8-22.6	23.5-24.8	2.4	4.3
Control	22.2	23.6	21.9-22.6	23.5-24.0	2.4	1.7

Table 2 shows that the average MUAC score in the intervention group before receiving fortified sandwich biscuits and boiled eggs was 22.1, and after was 23.9. In contrast, in the control group, the average MUAC score before receiving fortified sandwich biscuits was 22.2, and after was 23.6. After receiving the fortified supplementary food

for Pregnant Women with CED, the average MUAC score was higher in the intervention group compared to the control group.

Table 3. Frequency Distribution of Body Weight Before and After Treatment of Pregnant Women with CED

Group	Mean		Min-max		SD	
	Before	After	Before	After	Before	After
Intervention	43.2	45.4	41.9-45.0	43.9-47.5	10.2	11.3
Control	43.8	45.3	42.9-45.1	44.4-46.8	8.5	8.9

Table 3 shows that the average body weight score in the intervention group before receiving fortified sandwich biscuits and boiled eggs was 43.2, and after was 45.4. In contrast, in the control group, the average body weight score before receiving fortified sandwich biscuits was 43.8, and after was 45.3. After receiving the fortified supplementary food for Pregnant Women with CED, the average body weight score was higher in the intervention group compared to the control group.

Table 4.Differences in MUAC Changes Before and After Consumption of Fortified Sandwich Biscuits and Boiled Eggs of Pregnant Women with CED

Group	Measurement	Mean + SD	Change	P-value
Intervention	Before	22.1 + 2.4	1.8	0.000
	After	23.9 + 4.3		
Control	Before	22.2 + 2.4	1.4	0.000
	After	23.6 + 1.7		

Table 4 shows a significant increase in MUAC with a p-value of 0.000 < 0.05 in both groups. The mean change obtained was 1.8 in the intervention group and 1.4 in the control group. This indicates that after consuming 3 pieces of fortified sandwich biscuits/day + 2 boiled eggs/day, or just consuming 3 pieces of fortified sandwich biscuits/day for 30 days, both interventions can increase MUAC measurements for Pregnant Women with CED at TPMB Mathilda Dyah Astuti, Bogor City, West Java, in 2022. However, there is a difference in the mean change between the two groups, with the intervention group showing 0.4 higher increase compared to the control group.

Table 5. Differences in Body Weight Changes Before and After Consumption of Fortified Sandwich Biscuits and Boiled Eggs of Pregnant Women with CED

Group	Measurement	Mean + SD	Change	P-value
Intervention	Before	43.2 + 10.2	2.2	0.000
	After	45.4 + 11.3		
Control	Before	43.8+ 8.5	1.5	0.000
	After	45.3 + 8.9		

Table 5 shows a significant increase in body weight with p-value of 0.000 < 0.05 in both groups. Each group experienced an average increase of 2.2 in the intervention group and 1.5 in the control group. This indicates that after consuming 3 pieces of fortified sandwich biscuits + 2 boiled eggs/day, or just consuming 3 pieces of fortified sandwich biscuits per day for 30 days, both interventions can effectively increase body weight for Pregnant Women with CED at TPMB Mathilda Dyah Astuti, Bogor City, West

Java, in 2022. However, there is a difference in the mean change between the two groups, with the intervention group showing a 0.7 kg higher increase compared to the control group.

Table 6. Effect of Consuming Sandwich Biscuits and Boiled Eggs on MUAC Improvement of Pregnant Women with CED

Treatment	Intervention Group		Intervention Control		Difference	P-value
	Mean	SD	Mean	SD		
Before	22.1	2.4	22.2	2.4	0.1	0.000
After	23.9	4.3	23.6	1.7	0.3	

Table 6 shows that there is p-value of 0.000 < 0.05, indicating significance in both group. This means that after consuming 3 pieces of sandwich biscuits per day + 2 boiled eggs per day, or just consuming 3 pieces of sandwich biscuits per day for 30 days, both interventions have an effect on increasing MUAC among pregnant women with CED at TPMB Mathilda Dyah Astuti, Bogor City, West Java in 2022. The difference of 0.1 before treatment and 0.3 after treatment indicates that the effectiveness of consuming sandwich biscuits and boiled eggs provides a higher effectiveness in increasing MUAC compared to consuming only sandwich biscuits.

Tabel 7. The Effect of PMT Treatment with Sandwich Biscuits and Boiled Eggs on Weight Gain of Pregnant Women with CED

Treatment	Intervention Group		Intervention Control		Difference	P-value
	Mean	SD	Mean	SD		
Before	43.2	10.2	43.8	8.5	0.6	0.000
After	45.4	11.3	45.3	8.9	0.1	

Table 7 shows that there is p-value of 0.000 < 0.05, indicating significance in both groups. This means that after consuming 3 pieces of sandwich biscuits per day + 2 boiled eggs per day, or just consuming 3 pieces of sandwich biscuits per day for 30 days, both interventions have an effect on increasing weight among pregnant women with CED at TPMB Mathilda Dyah Astuti, Bogor City, West Java in 2022. The difference of 0.6 before treatment and 0.1 after treatment indicates that the effectiveness of consuming sandwich biscuits and boiled eggs provides a higher effectiveness in increasing weight compared to consuming only sandwich biscuits.

DISCUSSION

Giving Protein Energy Malnutrition Treatment in the form of sandwich biscuits and boiled eggs to pregnant women with CED has shown a positive impact on the average Mid-Upper Arm Circumference (MUAC) values. The data indicates that before receiving treatment, the average MUAC score in the intervention group was 22.1, which then increased to 23.9 after receiving treatment. Meanwhile, the control group showed an average MUAC score of 22.2 before treatment, which increased to 23.6 after receiving treatment. The difference in the increase in average MUAC scores before and after receiving treatment demonstrates a significant contribution to improving nutritional status. The average MUAC score in the intervention group was higher compared to the control group.

This study followed a similar approach to previous research, employing an independent T-test to compare two groups: the intervention group and the control

group. However, in the treatment involving the consumption of 28 packets of sandwich biscuits, the results indicated that the p-value before the intervention for both the control and intervention groups was 0.342, which is higher than the significance level α (0.05). This suggests that there was no significant difference between the two groups before the intervention, indicating that MUAC (Mid-Upper Arm Circumference) in the control group was still within the CED category. However, after the intervention and with both groups having consumed a total of 56 packets of sandwich biscuits, the analysis showed a p-value of 0.000, which is lower than the significance level α (0.05). This indicates a significant impact on MUAC among pregnant women who regularly consumed sandwich biscuits. Therefore, this study provides evidence supporting the effectiveness of PMT biscuits in improving MUAC among pregnant women with CED compared to the control group that did not receive a similar intervention (Sisi et al., 2021).

Similar to other studies, it was also found that 73.68% of pregnant women experiencing CED received supplementary food (sandwich biscuits) for 4 months. Additionally, the average increase in MUAC measurements among pregnant women with CED who received supplementary food for 90 days was 2 cm. Data analysis was conducted using the Chi-Square statistical test with a significance level of α=0.05 (Hernawati & Kartika, 2019). This study differs from previous studies that used duck eggs, which showed significant changes in MUAC measurements after consumption of duck eggs. The results of this study reveal that consuming duck eggs has a significant impact on MUAC measurements (Sonia & Khodijah, 2017).

The results of this study are also consistent with research conducted by Juliasari in April 2020 at Puskesmas Putih Doh using secondary data from the medical records of pregnant women throughout 2020. The study found that 17.9% of respondents received sandwich biscuits while 82.1% did not. Among the respondents, 98.5% experienced weight gain, while 1.5% did not. Statistical analysis showed a p-value of <0.005, indicating a significant relationship between sandwich biscuits and weight gain among pregnant women with CED at Puskesmas Putih Doh in 2020 (Juliasari & Ana, 2020). Another study aligned with this research found that univariate analysis revealed the average Mid-Upper Arm Circumference (MUAC) before treatment was 21.9 cm ± 1.3 cm, while after receiving PMT, it increased to 22.4 cm ± 1.31 cm. Statistical testing showed that providing additional sandwich biscuits significantly improved the nutritional status (MUAC) of pregnant women with chronic energy deficiency (p = 0.000). The supplementation of sandwich biscuits was also effective in enhancing the nutritional status of pregnant women experiencing chronic energy deficiency. The results of the study involving 90 pregnant women with CED and anemia who were given biscuits showed a difference in MUAC between the control group and the treatment group using the Mann-Whitney U test (P=0.000) (Setiyowati & Ulvie, 2019).

The same findings were reported in a study conducted at Puskesmas Samboja comparing an intervention group receiving sandwich biscuits and spinach omelet with a control group receiving only sandwich biscuits. Before the provision of spinach omelet as supplementary food, the average weight of the intervention group was 43.2 kg and the control group was 42.2 kg. After the provision of spinach omelet, the average weight of the intervention group increased to 47.16 kg and the control group increased to 45.54 kg. Providing spinach omelets as supplementary food has been shown to effectively increase weight in pregnant women suffering from chronic energy deficiency (CED), as evidenced by significant p-values (< α: 0.05) for both the intervention group (0.005) and the control group (0.017). Spinach omelet is considered effective in increasing weight among pregnant women with CED because it contains

good nutritional substances that are easily digestible, such as eggs and spinach. (Mudzalifah et al., 2023).

The intervention provided had a greater effect in increasing weight compared to the absence of intervention. This underscores the importance of intervention in influencing weight changes among the research subjects. The significant difference between the two groups indicates that factors associated with the intervention have a substantial impact on weight gain compared to factors present in the control group. These findings provide valuable information for healthcare practitioners or researchers to consider the effectiveness of the intervention in enhancing weight gain in the studied population.

This study is expected to serve as a guideline for managing CED in pregnant women. Regular consumption of sandwich biscuits has proven effective in increasing weight. Before receiving Protein Energy Malnutrition Treatment with sandwich biscuits and boiled eggs, the average weight in the intervention group was 43.2 kg, which increased to 45.4 kg after the intervention. In comparison, the control group had an average weight of 43.8 kg before receiving sandwich biscuits, which increased to 45.3 kg after the intervention. Following sandwich biscuits given to pregnant women with CED, a more significant average weight gain was observed in the intervention group. Sandwich biscuits have demonstrated their capability to increase the weight of pregnant women with CED. These research findings are consistent with previous studies conducted at the Pijoan Baru Inpatient Clinic, which reported that before receiving supplementary food in the form of sandwich biscuits, the average weight of pregnant women was 50.400 kg, ranging from 47 kg to 56 kg. After receiving sandwich biscuits, the average weight increased to 54.280 kg, ranging from 53 kg to 59 kg. There was a significant impact of providing supplementary food in the form of sandwich biscuits on weight gain among pregnant women with MAM at the Pijoan Baru Inpatient Clinic in 2022 (Lismawati & Marlin, 2024).

Pregnant women experiencing chronic energy deficiency continue to consume additional food in the form of three pieces of sandwich biscuits per day until the third trimester, obtained from the community health center. They also consume other carbohydrate-rich foods such as rice, noodles, potatoes, bread, and similar items. A daily intake of 60 grams of protein and 1 gram of fat is recommended, which can be obtained from meat, fish, milk, eggs, tofu, tempeh, and nuts. It is advised to consume approximately 3 servings of protein daily and about 1 tablespoon of fat at each meal to provide energy and support fetal brain development. Sources of vitamins and minerals are obtained from vegetables, fruits, and dairy products (Silawati & Nurpadilah, 2019).

The effectiveness of providing Protein Energy Malnutrition Treatment in the form of sandwich biscuits and boiled eggs is evidenced by the improvement in MUAC (Mid-Upper Arm Circumference) scores and weight gain. This indicates an increase in muscle mass and fat tissue in the upper arm, which are important indicators of improved nutritional intake and better nutritional status in pregnant women with CED. Thus, sandwich biscuits contributes positively to the health and development of the fetus, as well as the well-being of pregnant women. However, it's important to note that the differences in average MUAC scores between the intervention and control groups before and after sandwich biscuits administration are not solely attributed to the sandwich biscuits intervention it self. Other factors such as overall diet, compliance with dietary recommendations, and individual metabolic differences could also influence these outcomes. Therefore, while sandwich biscuits has shown beneficial effects, a comprehensive understanding of all influencing factors is crucial for

interpreting these results accurately (Santi et al., 2023). Other factors such as differences in dietary patterns and socio-economic conditions between the intervention and control groups can also influence the outcomes. These factors play a significant role in nutritional status and health outcomes among pregnant women with CED (Rishel & Armalini, 2022). Therefore, stricter variable controls or more precise study designs are needed to ensure that differences in MUAC scores are indeed caused by the sandwich biscuits (Indriyani & Anggraini, 2024; Fatmawati & Munawaroh, 2023).

In addition, it's important to remember that the average MUAC score is just one of many indicators that can be used to evaluate the nutritional status of pregnant women. A more comprehensive study might consider other indicators such as weight status, height, and specific nutrient levels in the blood to gain a more complete understanding of the impact of sandwich biscuits interventions on the nutritional status of pregnant women with CED (Noviriyanti et al., 2024; Sri Lestari et al., 2023). Therefore, while the increase in average MUAC scores in the intervention group demonstrates the positive potential of providing PMT (Protein Energy Malnutrition Treatment) with sandwich biscuits and boiled eggs, deeper evaluation and further studies are necessary to validate these findings and fully understand the comprehensive impact of the intervention on maternal health and fetal development.

Based on the data analysis, there is a significant difference between the intervention and control groups in terms of weight gain. From the observations, the intervention group showed a mean difference of 2.2, while the control group had a mean difference of 1.5. The p-value of 0.000 is much smaller than the pre-set significance level of 0.05. These results indicate that the intervention provided has a substantial effect on increasing weight. Intervening of pregnant women with CED by consuming three pieces of sandwich biscuits daily significantly impacts both MUAC and weight gain. Moreover, incorporating two boiled eggs daily further enhances the effectiveness of the intervention in promoting nutritional improvement among pregnant women.

CONCLUSION AND RECOMMENDATIONS

It can be concluded that providing in the form of sandwich biscuits and boiled eggs has an impact on increasing MUAC (Mid-Upper Arm Circumference) and weight among pregnant women with CED. However, it should be noted that the differences in average MUAC and weight between the groups undergoing intervention and control were assessed both prior to and following the study treatment are not solely attributable to the sandwich biscuits intervention itself. Other factors such as differences in dietary patterns and socio-economic conditions between the intervention and control groups can also influence the results. Therefore, stricter variable controls or more meticulous study designs are necessary to ensure that differences in MUAC scores are genuinely caused by the intervention. Furthermore, further in-depth research is needed to better understand the factors contributing to changes in weight.

REFERENCES

BKPK Kemenkes RI. (2023). Survei Kesehatan Indonesia (SKI) Dalam Angka. In *Badan Kebijakan Pembangunan Kesehatan*. Retreived from https://www.badankebijakan.kemkes.go.id/ski-2023-dalam-angka/

Dirjen Kemenkes. (2022). Laporan kuntabilitas kinerja instansi pemerintah (LAKIP) ditjen kesehatan masyarakat tahun 2021. *Kementerian Kesehatan Republik Indonesia*, 1–68. http://www.kesmas.kemkes.go.id/assets/upload/dir_60248a365b4ce1e/files/Laporan-Kinerja-Ditjen-KesmasTahun-2017_edit-29-jan-18_1025.pdf

Fatmawati, F., & Munawaroh, M. (2023). Hubungan Pengetahuan, Status Gizi Dan Pola Makan Dengan Kejadian Kekurangan Energi Kronik Pada Ibu Hamil Di Upt Puskesmas Bojonegara Tahun 2022. *SENTRI: Jurnal Riset Ilmiah*, *2*(6), 1873–1882. https://doi.org/10.55681/sentri.v2i6.977

Hernawati, Y., & Kartika, R. (2019). Hubungan Pemberian Makanan Tambahan Pada Ibu Hamil Dengan Kurang Energi Kronis Di Wilayah Kerja Puskesmas Ibrahim Adjie Kota Bandung. *Jurnal Sehat Masada*, *13*(1), 40–46. https://doi.org/10.38037/jsm.v13i1.76

Indriyani, R., & Anggraini, N. A. (2024). Peningkatan Perilaku Pencegahan KEK (Kekurangan Energi Kronik) Pada Ibu Hamil. *Jurnal Abdi Kesehatan Dan Kedokteran*, *3*(1), 1–13. https://doi.org/10.55018/jakk.v3i1.42

Juliasari, F., & Ana, E. F. (2020). Pemberian Makanan Tambahan (PMT) Dengan Kenaikan Berat Badan Ibu Hamil KEK. *Jurnal Maternitas Aisyah*, 27–31. Retreived from https://journal.aisyahuniversity.ac.id/index.php/Jaman/article/view/405

Kemenkes, RI. (2019). *Laporan Riskesdas Jawa Barat 2018*. Jakarta: Kementerian Kesehatan R.i. Retreived from https://repository.badankebijakan.kemkes.go.id/id/eprint/3857/

Kementerian Kesehatan R.I. (2021). Profil Kesehatan Indonesia 2020. Jakarta: Kementerian Kesehatan R.I. Retreived from https://www.kemkes.go.id/app_asset/file_content_download/Profil-Kesehatan-Indonesia-2020.pdf

Lismawati, & Marlin, D. (2024). Pengaruh Pemberian Makanan Tambahan terhadap Penambahan Berat Badan pada Ibu Hamil Kurang Energi Kronis (KEK). *Jurnal Ners. 8*, 1807–1813. Retrieved from https://journal.universitaspahlawan.ac.id/index.php/ners/article/view/25738

Mahendika, D., Yuliani, M., Minarti, Supriatin, & Dyntia Ivantarina. (2020). Hubungan Asupan Energi dan Pengetahuan Gizi dengan Kejadian Kurang Energi Kronis (KEK) pada Ibu Hamil. *Health Sciences Journal*, *4*(1), 112–123. http://studentjournal.umpo.ac.id/index.php/HSJ%0AHUBUNGAN

Mudzalifah, S. N., Pasiriani, N., & Hariyani, F. (2023). Efektivitas Pemberian Makanan Tambahan Omlet Daun Katuk Terhadap Peningkatan Berat Badan Pada Ibu Hamil Kurang Energi Kronik Di Puskesmas Samboja. *SAINTEKES: Jurnal Sains, Teknologi Dan Kesehatan*, *2*(4), 516–523. https://doi.org/10.55681/saintekes.v2i4.206

Noviriyanti, Suprida, & Effendi, H. (2024). Faktor yang Berhubungan dengan Kejadian Kekurangan Energi Kronik pada Ibu Hamil. *Lentera Perawat*, *5*(1), 66–72. https://doi.org/10.52235/lp.v5i1.273

Rika Fitri Diningsih, Wiratmo, P. A., & Erika Lubis. (2021). Hubungan Tingkat Pengetahuan Tentang Gizi Terhadap Kejadian Kekurangan Energi Kronik (Kek) Pada Ibu Hamil. *Binawan Student Journal*, *3*(3), 8–15. https://doi.org/10.54771/bsj.v3i3.327

Rishel, R. A., & Armalini, R. (2022). Hubungan Pengetahuan Dan Sikap Ibu Hamil Tentang Gizi Dengan Kejadian Kekurangan Energi Kronis (KEK) Di Puskesmas Sikapak Kota Pariaman Tahun 2022. *Nan Tongga Health And Nursing*, *17*(2), 82–94. https://doi.org/10.59963/nthn.v17i2.117

Santi, Masrin, Murlan, & Verawati. (2023). Efektivitas Program Pemberian Makanan Tambahan (PMT) berupa Biskuit Terhadap Status Gizi Ibu Hamil Kek di Wilayah Kerja Puskesmas Nambo Tahun 2022. *Jurnal Penelitian Sains Dan Kesehatan Avicenna*, *2*(1 SE-Artikel), 68–75. https://jurnal.itk-avicenna.ac.id/index.php/jkma/article/view/40

Setiyowati, N., & Ulvie, Y. S. N. (2019). Pengaruh PMT Biskuit Sandwich Terhadap Ibu Hamil Kurang Energi Kronis di Puskesmas Bantarbolang Kabupaten Pemalang. *Jurnal Gizi*, *8*, 1–9. https://doi.org/10.26714/jg.8.1.2019.%25p

Silawati, V., & Nurpadilah. (2019). Pemberian Makanan Tambahan dan Susu terhadap Penambahan Berat Badan Pada Ibu Hamil KEK. *Journal of Health Science and Physiotherapy* 79–85. Retrieved from https://www.neliti.com/publications/422565/pengaruh-pemberian-makanan-tambahan-dan-susu-terhadap-penambahan-berat-badan-pad

Sisi, S. C. A. A., Anni Suciawati, & Rukmaini. (2021). Efektivitas Pemberian Biskuit Pmt Terhadap Peningkatan Lingkar Lengan Atas Ibu Hamil Di Puskesmas Rengas Dengklok Kabupaten Karawang Tahun 2021. *Jurnal Penelitian Dan Kajian Ilmiah Kesehatan Politeknik Medica Farma Husada Mataram*, *7*(2), 104–110. https://doi.org/10.33651/jpkik.v7i2.253

Sonia, I., & Khodijah, U. P. (2017). Pengaruh Konsumsi Telur Bebek Terhadap Ukuran Lingkar Lengan Atas (LILA) di Wilayah Kerja Puskesmas Pamulihan Tahun 2017. *Prosiding Seminar Nasional Kebidanan*, 41–49. Retrieved from https://www.ejurnal.stikesrespati-tsm.ac.id/index.php/semnas/article/view/226/159

Sri Lestari, D., Saputra Nasution, A., & Anggie Nauli, H. (2023). Faktor-Faktor yang Berhubungan dengan Kejadian Kurang Energi Kronik (KEK) pada Ibu Hamil di Wilayah Kerja PUSKESMAS Bogor Utara Tahun 2022. *Promotor*, *6*(3), 165–175. https://doi.org/10.32832/pro.v6i3.241

Ummi Kulsum, & Dyah Ayu Wulandari. (2022). Upaya Menurunkan Kejadian KEK pada Ibu Hamil Melalui Pendidikan Kesehatan. *Jurnal Pengemas Kesehatan*, *1*(01), 27–30. https://doi.org/10.52299/jpk.v1i01.6