Impact of supplementary feeding program (PMT) in chronic energy deficiency (CED) pregnant women

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Abstract
Background: CED in pregnant women is an early indication of stunting in toddlers. Screening program conducted in 2018 found that 21.9% of pregnant women in the Tegal Timur District has CED. The supplementary feeding program (SFP) was an intervention carried out by the government through the Ministry of Health Indonesia. This study aims to determine SFP’s effect on mid-upper arm circumference (MUAC) and bodyweight among pregnant women with CED in Tegal Timur.

Methods: This study used a mixed-method, combining retrospective cohort and systematic review. This study compared MUAC and bodyweight before and after SFP, using secondary data from the Tegal Timur Health Centre report. The early screening in September and October 2019 showed that 33 pregnant women suffered from CED. They started consuming SFP biscuits for 90 days (487.3 kcal/pack/day) from November 2019-January 2020. For the systematic review, a search was carried out in Science Direct, PubMed, Researchgate, and Google Scholar using the “supplementary feeding program” as the keyword. The inclusion and exclusion criteria and the systematic review protocols were agreed before determining which articles will be included. Descriptive and comparative analyses were performed using SPSS. The Wilcoxon test was performed to compare the MUAC and bodyweight before and after SFP. The systematic review analysis was narrated by comparing each characteristic of the included articles.

Results: Statistically significant increases in MUAC and bodyweight were found. The MUAC increased from 21.4±0.9 cm to 22.03±1.01 cm (p=0.0001), while the body weight increased from 43.2±3.4 kg to 46.3±3.9 kg (p=0.0001). At the end of the SFP, the number of pregnant women with CED decreased from 100% to 81.1%. Conclusion: The SFP has a significant effect on MUAC and body weight in pregnant women with CED. Other studies in the systematic review support this result. The SFP biscuit sandwich affects both MUAC and bodyweight.

Keywords: CED, pregnant women, MUAC, bodyweight.
Introduction

The first 1000 days of life, including the pregnancy period, is a golden age for children. Nutrition plays an essential role in maximising growth and development during this period. Therefore, nutritional needs have to be fulfilled. The indicators determining foetus growth can be assessed by measuring the mother’s nutritional status. The mid-upper arm circumference (MUAC) can evaluate the mother’s nutritional level during pregnancy. The pregnant women’s normal nutritional status will show as MUAC of >23.5 cm. In contrast, pregnant women with lower MUAC need an intervention to achieve normal nutritional status. Both mother and the baby will suffer the consequences of CED during pregnancy. The risk of maternal death among pregnant women with CED increases compared to pregnant women without CED. Additionally, the baby is at high risk of not fulfilling their growth and development target according to its age. Thus, the baby will experience several disturbances, including low birth-weight and stunting. Some nutrient deficiencies found in a baby with low birth weight can be catch up with providing exclusive breastfeeding. However, low birth weight baby with stunting can not do the same. Stunting is a global issue with interventions at the international and national level targeting female adolescents, pregnant women, and under-five children. The intervention targeting pregnant women with CED includes specific and sensitive programs. The provision of SFP is considered an effective program to tackle CED among pregnant women from the government. The supplementary food is a prepacked biscuit with specific energy content given to and consumed by pregnant women for 90 days. This program costs massive funding; thus, this intervention’s effectiveness needs to be investigated.

The Basic Health Survey (RISKESDAS) 2018 reported the proportion of pregnant women with CED in Indonesia was 17.7%. Based on the graph and similar reports, the proportion of pregnant women with CED in Central Java was above the national average. Reports from the World Health Organization (WHO) showed that the proportion of CED in Indonesia is one of the highest in neighbouring countries. According to a report from the Health Department of Tegal city, the proportion of pregnant women with CED was 16.5%. Yet, within the Tegal Timur Health Centre alone, the proportion of women with CED reached 22.7%. This number exceeds the national average. Pregnant women with CED also received the SFP biscuit called SFP-Recovery for 90 days full. The Ministry of Health Indonesia considers CED as a public health problem that has to be intervened if the proportion reached or above 10%.

A study on pregnant women with CED in Sumatra showed increases in body weight and haemoglobin levels in pregnant women after consuming high protein biscuit and high vitamin C juice. Furthermore, another qualitative study in Palembang investigated the SFP-Recovery with an approach to the input, process, and output. The results showed that the SFP-Recovery given to pregnant women in Palembang was as planned. Still, additional data, reports, and collaboration with health cadres are needed to supervise and assess the output after the intervention.
The study aims to describe the implementation of SFP-Recovery within the Tegal Timur Health Centre and its effectivity to increase bodyweight and MUAC of pregnant women with CED. Additionally, due to data limitation during the pandemic situation, a systematic review was included to add results from other similar studies in different regions.

Subjects and Methods

Subject

The population of interest in this study is pregnant women within the Tegal Timur Health Centre’s working area. The inclusion criteria include CED, in no less than 12 weeks of pregnancy, no medical history of degenerative diseases, for example, diabetes. The exclusion criteria were missing consumption of SFP-Recovery biscuits. A total of 33 participants were selected through a total sampling method.

Variables

The dependent variable in this study is MUAC and the bodyweight of the participants. At the same time, the independent variable was the provision of the SFP-Recovery biscuit sandwich. Additional variables were participants’ characteristics, including age and blood pressure.

Setting

The selected participants from September-October 2019 received SFP-Recovery biscuit for 90 days consumption. They started to consume the biscuit in November 2019 to January 2020. Before the consumption, the MUAC and bodyweight of the participants were measured.

Design

This is a retrospective cohort study to investigate the effect of an intervention on a variable and systemic literature review of SFP-recovery impact for pregnant women. The alternative hypothesis in this study is the effects of the intervention on participants’ MUAC and body weight.

Materials

The SFP-Recovery used in this study is a biscuit with an energy content of 487.3 kcal. The MUAC was measured by midwives using MUAC tape with an accuracy of 0.1 cm. A digital scale with 0.1 kg accuracy was used to measure the body weight.
Data Source

The present study was using secondary data to do the analysis. A primary data collection was set out to be conducted in March to April 2020 with an ethical clearance number of 328/KEPK-FKM/UNIMUS/2020. But due to the pandemic, secondary data was used instead. The data source is the reports from the Health Department of Tegal city in the form of MUAC report books, a supplementary biscuit program for pregnant women with CED, and an archive of pregnant women focused on reports in Tegal Timur Health Centre.

Statistical Analysis

A descriptive analysis was performed to obtain the mean, standard deviation, minimum and maximum score. The same analysis is also used to determine the percentage of pregnant women with CED based on age, blood pressure, and MUAC. The bodyweight and MUAC were not normally distributed. To analyse the difference of score before and after the intervention, a Wilcoxon test was performed.

Systematic Literature Review

The limitation during the COVID-19 pandemic and lockdown period in the research area caused a limitation of data. Thus, this study added a systematic review. A search was carried out on Science Direct, Researchgate, PubMed, and Google Scholar using keywords: “supplementary feeding program for pregnancy”, “food supplementation program for pregnancy”, “program suplementasiuntukibuhamil”, and “dampaksuplementasiuntukibuhamil”. The citation manager used in this study was Mendeley. The inclusion criteria for the articles include articles from 2011-2020, investigate the effect of SFP on nutritional status among pregnant women; SFP refers to the SFP-Recovery in the form of a biscuit, published in a national or international journal of science. Meanwhile, the exclusion criteria include published articles that contain a summary of grey literature. The research questions include the journal’s source, research design, location, sample characteristics, follow-up, and outcomes.

Figure 2. Study Selection Flowchart

![Study Selection Flowchart](Figure2.png)
Results

Study Population and Characteristics

A total of 33 pregnant women were provided with SFP-Recovery for 90 days of consumption. Table 1 shows the demographic characteristics and the percentage of pregnancy at risk.

Table 1. The Characteristics of Pregnant Women and The Percentage of Pregnancy At Risk

<table>
<thead>
<tr>
<th>Age</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at risk</td>
<td>31</td>
<td>93.9</td>
</tr>
<tr>
<td>At risk</td>
<td>2</td>
<td>6.1</td>
</tr>
<tr>
<td>Systolic pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal (90-120)</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>High (≥120)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Diastolic Pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal (60-80)</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>High (≥80)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>CED after SFP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CED</td>
<td>27</td>
<td>81.8</td>
</tr>
<tr>
<td>Normal</td>
<td>6</td>
<td>18.2</td>
</tr>
</tbody>
</table>

Most of the pregnant women were categorised as pregnancy at risk. All pregnant women with CED before the SFP consumption for 90 days decreased to just 81.8%. The increases in MUAC and bodyweight are shown in Table 2.

The Effect of Supplementary Feeding Program on Nutritional Status

A test for MUAC and bodyweight difference indicated a significant increase after 90 days of SFP biscuit sandwich consumption. A rise of 0.89 cm of MUAC and 3.12 kg of body weight was reported.

Table 2. The Increase of MUAC and Bodyweight

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUAC before SFP</td>
<td>33</td>
<td>21.49</td>
<td>18.3</td>
<td>22.5</td>
<td>0.0001*</td>
</tr>
<tr>
<td>MUAC after SFP</td>
<td></td>
<td>22.38</td>
<td>19.8</td>
<td>23.9</td>
<td></td>
</tr>
<tr>
<td>Weight before SFP</td>
<td>33</td>
<td>43.19</td>
<td>38</td>
<td>53</td>
<td>0.0001*</td>
</tr>
<tr>
<td>Weight after SFP</td>
<td></td>
<td>46.31</td>
<td>40.5</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

*) Wilcoxon test

Systematic Review of Supplementary Feeding Program for Pregnant Women

Similar researches were conducted in other regions with a different technique and calculated results. Of the following seven studies, all used a quasi-experimental design. Two of the studies used a control group as a comparison while the rest did not—most of the studies recruited pregnant women in their second trimester as the participants. The supplementary food given in five studies was a biscuit sandwich from the Ministry of Health Indonesia.
### Table 3. Study Characteristics for Issues Related to SFP for Pregnant Women

<table>
<thead>
<tr>
<th>Authors</th>
<th>Journal</th>
<th>Study design</th>
<th>Setting and Key Sample</th>
<th>Types of PMT</th>
<th>Follow up</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASP.Chandradewi(8)</td>
<td>Jurnal Kesehatan Prima</td>
<td>Quasi-experimental</td>
<td>52 pregnant women in their second and third trimester in Labuan Lombok</td>
<td>Biscuit with local ingredients</td>
<td>90 days</td>
<td>We observed a significant increase in body weight (p&lt;0.001 paired t-test); the mean increase was 5.8 ± 2.007 kg.</td>
</tr>
<tr>
<td>Rosa Hadiana Putri, AASP Chandradewi, Reni Sofiyatin, Made Darawati(9)</td>
<td>Jurnal Kesehatan Prima</td>
<td>Pre-experimental, The one group pre-test post-test</td>
<td>15 pregnant women in their second trimester in Ampenan</td>
<td>Biscuit with local ingredients</td>
<td>Day 0, 31, 61, 91</td>
<td>We observed a significant increase in body weight (p&lt;0.001 paired t-test) with mean of increases of 2.9;2.3;1.9 to 7±1.5 kg. The mean of increases in MUAC was 1.0;0.4;0.2 to 1.6 cm.</td>
</tr>
<tr>
<td>Rika Andriani, Martha Irene Kartasurya, Sri Achadi Nugraheni(10)</td>
<td>Jurnal Manajemen Kesehatan</td>
<td>Experiment pre-post-test design with control group. Tekn</td>
<td>102 pregnant women in Tegal District</td>
<td>Biscuit sandwich</td>
<td>90 days</td>
<td>A significant increase in body weight compared to control group (p&lt;0.001 independent t-tests), mean of the increase was 5.865±0.174 kg.</td>
</tr>
<tr>
<td>Rahmasari Utami, I Made Alit Gunawan, Irianton Artonang(11)</td>
<td>Jurnal Nutrisia</td>
<td>Quasi-experimental pre-post-test without control</td>
<td>20 pregnant women in their second trimester in Sleman</td>
<td>SFP-R Biscuit Sandwich</td>
<td>Day 0, 31, 61, 91</td>
<td>A significant increase of body weight (p&lt;0.001 paired t-test), mean of increases were 1.42;1.22;1.23 to 3.87 kg. The mean of increases in MUAC were 0.4;0.13;0.22 to 0.75 cm after 90 days of SFP. The mean of increase in haemoglobin level in the intervention group was 1.29 gr/dL, higher than the control group (0.97 gr/dL) with a p-value of 0.032. Control group (p=0.015 independent t-test). If the protein content in the biscuit is calculated, the intervention control is way higher than the control group.</td>
</tr>
<tr>
<td>Sairuroh, Mohammad Zen Rahfiludin, Martha Irene Kartasurya(12)</td>
<td>Media Kesehatan Masyarakat Indonesia</td>
<td>Quasi-experimental pre-post-test control group design</td>
<td>102 pregnant women in their trimester in Tegal District</td>
<td>SFP-R Biscuit Sandwich</td>
<td>90 days</td>
<td>A significant increase in body weight (p&lt;0.001 independent t-test). If the protein content in the biscuit is calculated, the intervention control is way higher than the control group.</td>
</tr>
<tr>
<td>Vivi Silawati, Nurpadilah(13)</td>
<td>Journal of Health Science and Physiotherapy</td>
<td>Quasi-experimental pre-post t-test without control</td>
<td>16 pregnant women in their first trimester in Tangerang</td>
<td>SFP-R Biscuit Sandwich</td>
<td>90 days</td>
<td>A significant increase in body weight (p&lt;0.001 paired t-test), the mean increase was 2±1.1 kg.</td>
</tr>
<tr>
<td>Nanik Setiyowati, Yuliana Noor Setiawati Ulvie(14)</td>
<td>Jurnal Gizi UNIMUS</td>
<td>Quasi-experimental pre-post-test design</td>
<td>29 pregnant women in the second trimester in Bantarbolang</td>
<td>SFP-R Biscuit Sandwich</td>
<td>Day 0, 31, 61, 91</td>
<td>We observed a significant increase in body weight (p&lt;0.001 Wilcoxon test). The mean of increases in MUAC was 0.14;0.4;1.0.43 (0.97 cm after 90 days of SFP).</td>
</tr>
</tbody>
</table>
The same SFP was used in this study, while the other two studies investigated the effectivity of using local ingredients as SFP. This study is similar to four other studies with 90 days follow up after the start of SFP consumption. While the rest of the studies did a follow up after 30, 60, and 90 days during a monthly pregnancy check-up at the health centre. Overall, the effectivity of SFP was measured through the increases of bodyweight, MUAC, and haemoglobin. The highest body weight increase was 7±1.5 kg among pregnant women who received SFP in Ampenan, while the lowest increase was among pregnant women in Tangerang (2±1.1 kg). The highest increase of MUAC was among pregnant women in Ampenan (1.6 cm), while the lowest increase was in Sleman (0.75 cm).

Discussion

The supplementary feeding program for pregnant women with CED launched in 2010 to increase the nutrient intake in the form of a pre-packaged biscuit sandwich. Hence the name SFP biscuit sandwich.(15) This definition shifted in accordance to technical guidance released by the Ministry of Health in 2018, supplementary food for pregnant women is a nutrient supplementation in the form of a biscuit sandwich made with a unique formulation and fortified with vitamins and minerals which was given to pregnant women with CED.(16) According to the latest technical guidance, the supervision form not only focused on the distribution of the biscuit but also on the detailed progress of the nutritional status parameters. The provision of SFP-R biscuit sandwich for pregnant women is categorised as a specific effort to tackle stunting in under-five children during the first 1000 days of life. It has been a particular concern since 2018, when the prevention of stunting was carried out nationally.(17)

The nutritional status among pregnant women was assessed by observing the increase of body weight every month and MUAC ≥23.5 cm. The increases in body weight and MUAC (p<0.05 *Wilcoxon test in Table 2) showed that supplementary food to pregnant women statistically affects body weight and MUAC positively. The nutritional status of pregnant women is affected by many factors, including food intake, psychology, social aspect, economy, etc. However, this study is limited due to the inability to measure those variables. Therefore, the increases in body weight and MUAC should be interpreted with caution. It cannot be confirmed that the consumption of SFP biscuits solely caused these results. Nevertheless, this result is supported by other studies conducted in other regions as the effect of SFP consumption.(8)(9)(10)(11)(12)(13)

The increase in pregnant women’s bodyweight with initial good nutrition status (18.5-22.9) was around 10-15 kg. In the first trimester, the increase was only 1-2 kg, as of the result in this study was mostly the increase during the second and third trimester (0.35-0.5 kg/week0 [18]. The results showed an increase of 3.12 kg (Table 2) after 90 days of SFP consumption, even though an increase of at least 4 kg was expected.(18) Some participants recorded a lower increase after 90 days.

Pregnant women with CED are also common in Cambodia. It was reported that the proportion of pregnant women with low MUAC, indicating malnutrition, was 18% in Phnom Penh, 22.5% in Kratie, and 22.9% in Ratanakiri. The national prevalence was around 20%. They have poor eating behaviour, and even during pregnancy, the quality or quantity of food intake does not improve.(19) Both the
mother and the baby will suffer the consequences of CED. During pregnancy or labour, or even during the growth and development of the baby. Investigated risks include low birth-weight, miscarriage, premature delivery, even maternal death, and stillbirth.(20) A prospective report on pregnant women in Nepal observing pregnant women starting before the conception until a year after the birth showed that the age, parity, MUAC, nutrition intake, and comorbid in the early pregnancy were closely related to the risk of death during pregnancy and one year postpartum.(21) A study in Thapathali Maternity Hospital supports this result, which showed a logistic regression test result stating that pregnant women’s body weight is the most vital affecting factor on low birth-weight (OR 2.84 95% CI 1.32-5.99.(22)

During the commencement of the recruitment process, the overall participants were not categorised as at-risk based on age and blood pressure (Table 1). However, all of the participants suffer from CED. And even though there was an increase statistically (Table 2), there were 81.8% of participants who still suffer from CED after 90 days of SFP. The mean increase in MUAC is only 0.89 cm. This is lower than the effect of SFP in Ampenan and Bantarbolang, though higher than Sleman. This should be an essential evaluation for the stakeholders. SFP’s objective is not only to increase MUAC and body weight but also to maximise the effort to ensure good nutrition status and increased body weight in accordance with the pregnancy phase. The goal that should be achieved in the provision of SFP is not only 100% distribution of the SFP but should be focused on whether pregnant women indeed consume the SFP and consume an adequate amount of nutrition from other foods in accordance to their needs.

Acknowledgement

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References


