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Evaluation of the functional egg supplement program for pregnant women with chronic energy deficiency

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Abstract

Purpose: This study aims to determine the effect of functional egg administration on changes in nutritional status, protein intake, and babies born. **Methods:** A study analytical with a cross-sectional design that was seen retrospectively. In-depth interviews were conducted with key informants and supporters to support research data. **Results:** Analysis found that consumption of functional eggs was not statistically related to nutritional status, weight, and length of the child's body but was descriptively related. Functional egg consumption is associated with increased energy and protein intake with p values 0.005 and 0.011 ($p < 0.05$). There was an increase in body weight, MUAC, and nutritional status of chronic energy deficiency (CED) pregnant women becoming NON-CED, thereby reducing the birth of LBW and LBL. **Conclusions:** Functional eggs are not used as additional food; they become the mother's central protein intake. There is a need to increase commitment among organizers, implementers, and targets in implementing programs to break the stunting chain.

Keywords: chronic energy deficiency; functional egg supplementary feeding program; stunting

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INTRODUCTION

Pregnant women are a vulnerable group whose nutritional intake must be met so that there are no health problems for the mother and fetus in the future *(intergenerational impact)* [1]. The presence of cases of chronic energy deficiency (CED) in pregnant women can have a negative impact on the health of the mother and the baby to be born. This is evidenced by the increase in the prevalence of LBW and PBLR in Sleman Regency, which increases yearly; in 2018, the prevalence of LBW was 5.37%, rising to 5.56% in 2019. Meanwhile, the prevalence of PBLR increased in 2018 from 9.85% to 10.22% in 2019 [2].

Pregnant women with CED are positively correlated with the incidence of anemia and increase the risk of babies with low birth weight, miscarriage, premature birth, and even death in mothers and newborns [3]. Meanwhile, research shows that children born with LBW are at risk of stunting as much as 1.74 times more than children born with normal weight [4].

Research shows that 4 out of 6 pregnant women in Indonesia have an average protein consumption that is still below the EAR (*Estimated Average Recommendation*) [5]. The 2016-2017 national consumption survey stated that 1 in 5 pregnant women still experience malnutrition. Efforts to improve the nutritional status of pregnant women have also been carried out by the Sleman Regency Office through one of the *Pecah Ranting* (Prevention of Stunting-Prone) innovations since 2018 through the Provision of Additional Food (PMT) in the form of functional eggs to pregnant women who experience CED spread throughout the Sleman Regency area. Functional eggs are modified eggs richer in protein and low in fat and cholesterol. (Biochemistry Nutrition Laboratory Test results, Faculty of Animal Husbandry, UGM, 2019). Based on this, this study was conducted to determine the effect of consuming additional food in the form of functional eggs on changes in nutritional status, the amount and type of protein intake, and babies born to pregnant women with CED in the Sleman Regency area so that it can be used as evaluation material for policy programs at the Sleman Health Office.

METHODS

This is an analytical study with a cross-sectional design viewed retrospectively. This study was conducted on pregnant women with CED who received functional egg PMT for 90 days with a total sample calculation of 48 people. In-depth interviews were conducted *with* the main informants and supporters to support the research data. The study was located in the working area of the Sleman Regency Health Center in April 2020. The inclusion criteria for the study were pregnant women with CED who received functional eggs for 90 days until the child was born. The exclusion criteria were pregnant women who received eggs and dropped out before 90 days, and the birth of their child was unknown. The variables studied were the consumption of functional eggs as the dependent variable. In contrast, the independent variables were nutritional status, amount and type of energy and protein intake, weight and length of the baby at birth, and confounding variables were maternal age and pregnancy parity. The data were analyzed using the Spearman Rank test and continued with multiple linear regression.

RESULTS

Table 1 shows that 93.75% of pregnant women experienced CED, while 6.25% already had a non-CED nutritional status. After the intervention, the number of respondents with non-CED nutritional status increased to 54.17 %. Table 1 shows that after the respondents gave birth, the low birth weight (LBW) was 12.50 %, while 87.50% were born normally above 2500 grams. The body length of low birth weight (PBLR) was relatively high, at 47.92 %.

In Table 2, it can be seen that the average maternal weight (46.65 ± 5.40 kg) increased to (49.09 ± 5.46 kg) until the third month, reaching (50.83 ± 6.08 kg) and the total increase in maternal weight during the observation period was 4.18 kg. Meanwhile, the results in the first-month average LILA was (21.56 ± 1.64 cm) in the second month, increased to (22.29 ± 1.63 cm) and increased in the third month (22.92 ± 1.73 cm). The average increase in LILA increased by 1.36 cm until the end of the observation.

Functional egg contribution compared to daily intake

In Table 2, respondents most often consume as much as 58.3% of chicken eggs daily. Meanwhile, in Table 2, it can be seen that respondents who often consume eggs, 1x/day and 2x/day, meet energy intake as much as 8.86% and meet protein intake as much as 17.06% compared to total daily intake consumption. Meanwhile, respondents who sometimes consume eggs at least once a week or more meet an energy intake of 3.49% and protein intake of 7.05% compared to the total daily intake. The protein most often consumed is chicken eggs, which are as much as 58.3% daily, followed by chicken meat, which is only around 12.5%.

So, additional food in the form of functional eggs has not been used only as additional food but meets half of the mother's daily protein intake.

Table 1. Frequency distribution of respondent characteristics

Variables	(n)	(%)
Age		
No risk (20-35 years)	38	79.17
At risk (>20 or <35 th)	10	20.83
Gestational age		
Trimester I	1	2.08
Trimester II	47	97.92
Parity		
Primapara (1 child)	18	37.50
Multipara (2x/more)	30	62.50
Initial nutritional status		
CED	45	93.75
Non-CED	3	6.25
Final nutritional status		
CED	22	45.83
Non-CED	26	54.17
Baby birth weight		
LBW	6	12.50
Normal	42	87.50
Baby birth length		
PBLR	23	47.92
Normal	25	52.08
Energy intake		
Not enough	36	75
Good	9	18.75
More	3	6.25
Protein intake		
Not enough	10	20.83
Good	22	45.83
More	16	33.33
Functional egg consumption		
Good 2 grains/day	18	37.50
Less than >2 grains/day	30	62.50
Functional egg consumption		
Frequently (<1x/day)	28	58.3
Sometimes >1x/day	19	39.58

Table 2. Changes in body weight, LILA of pregnant women, and % protein intake compared to daily intake

BB month to		Min	Max	Mean ± SD
Month 1		36.3	57.4	46.65 ± 5.40
Month 2		37.9	57.6	49.09 ± 5.46
Month 3		36	62	50.83 ± 6.08
Weight Gain		-3.6	15	4.18 ± 3.13
LILA month to		**Min**	**Max**	**Mean ± SD**
Month 1		18	24	21.56 ± 1.64
Month 2		18.5	25	22.29 ± 1.63
Month 3		18.9	25.5	22.92 ± 1.73
LILA Increase		0	4.5	1.36 ± 0.97
% Egg intake		**Min**	**Max**	**Mean ± SD**
Often	Energy	3.9	18.4	8.86 ± 3.98
	Protein	6.1	34.4	17.06± 6.19
Some-times	Energy	0.49	8.46	3.49 ± 2.31
	Protein	1.14	19.24	7.055% ± 5.28

Bivariate and multivariate analysis

Based on the Spearman rank analysis in Table 3, none of the following variables have a relationship because they get a p-value> 0.05. Only two variables have a relationship, the energy intake variable, which is 0.0053 (p <0.05). Meanwhile, protein intake also shows a relationship with functional egg consumption with a value of 0.0111 (p <0.05).

Multivariate analysis was conducted to see the effect of energy and protein intake variables by considering other variables. The analysis model used in this study was multiple linear regression. The results were interpreted by looking at the 95% *confidence interval value* and the level of significance $p < 0.05$. In the first model, the following equation was obtained: The amount of egg consumption (y) = 54.45 + 0.032 (Energy intake) + 0.028 (Protein intake) + € (Other factors). In this model, the p-value is 0.032 (< 0.05), so the Energy Intake and Protein Intake variables simultaneously affect the amount of egg consumption variable. While the R square value functions to see how strong/large this model can affect its dependent variable. R squared = 0.1429 (14.29 %). So, it can be explained that the consumption of functional eggs can affect energy and protein intake by 14.29 %, while other variables influence 85.71%.

Table 3. Relationship between egg consumption and independent variables and external variables

Variables	Correlation Coefficient (rho)	p-value
Gestational age	-0.1360	0.3565
Parity	0.1742	0.2362
Initial nutritional status	-0.0730	0.6222
Final nutritional status	-0.0158	0.9153
Baby birth weight	0.1765	0.2302
Baby birth length	0.0449	0.7616
Energy intake	0.3966	0.0053*
Protein intake	0.3634	0.0111*

Supporting data through in-depth *interviews*

Interviews were conducted with three pregnant women respondents as the main informants and the nutrition officer as the supporting informant. Interviews were conducted to find obstacles during providing functional egg supplementary food experienced by recipient respondents, pregnant women, and implementing officers of nutrition experts at the Health Center.

The interview results included: 1) Support for the Functional Egg Supplement Program. According to key informants and supporters, the program is quite good and helps mothers meet their nutritional intake. Various parties appreciate and strongly support its sustainability; 2) Acceptability and compliance in

consuming Functional Eggs are high because respondents know they must consume nutritious food during pregnancy, especially if the mother is experiencing CED. In this case, the target is quite aware of what is happening to her and begins to accept the provision of functional eggs. However, in its implementation, with a period of 90 days and the recommendation of eggs 2x/day, it is quite boring for mothers. The support of the family and the mother's nutritional knowledge is quite helpful in increasing compliance with egg consumption. The implementer expressed the same thing as a supporting informant: some complained of boredom; 3) Consumption of protein other than functional eggs is still done. Based on information from the main informant, they still consume other proteins besides functional eggs. 4) Functional Eggs are different from regular chicken eggs. The informant stated that functional eggs taste better because they have more yellow eggs, like duck eggs; 5) There is a need for program sustainability. Key informants and supporters agree that this program should continue. Improvements in the implementation system are needed, starting with the commitment of organizers, implementers, and egg providers to the target of pregnant women. Also, suggestions for menu variations to prevent boredom are needed.

DISCUSSION

Based on the results above, consuming functional egg supplementary foods has no significant relationship with the nutritional status of CED pregnant women. In line with research on supplementary feeding programs has not provided the expected results in changing the nutritional status of pregnant women to normal [6]. The existence of health promotion program interventions cannot influence a community in the long term. The ineffectiveness of the impact of a health intervention such as PMT (Supplemental Feeding) is caused by various influencing factors such as time constraints, logistics, education, economic status, and ease of obtaining food for different respondents [7].

There is a relationship between functional egg consumption and energy and protein intake. The results of this study indicate that pregnant women who consume two eggs per day contribute 17.06 % of their daily protein intake. According to research, additional protein needed by pregnant women is around 14-18% more than everyday needs [8]. The group that received egg intervention consumed fewer foods containing high sugar, such as chocolate, candy, and bread, than those without intervention [9]. Additional food in the form of eggs is expected to be outside the mother's main food. However, the results showed that the highest protein consumption was functional eggs, as much as 58.3%, followed by tempeh, as much as 43.75%. Animal protein consumed daily is at least 1x chicken, only 12.5%. The lack of animal protein consumption compared to vegetable protein can cause less than optimal iron absorption in mothers [10]. The provision of additional food has not been utilized as an addition. Still, it has instead shifted to being the leading food to reduce the intake of other types of protein, or without the additional food, pregnant women with CED rarely consume protein foods.

Mothers who routinely consume functional eggs give birth to fewer children with LBW and PBLR. This is in accordance with research showing that the better the mother's nutritional intake during pregnancy, the greater the weight and length of the baby born [11]. Lack of intake during pregnancy is associated with congenital disabilities, changes in the structure and function of the fetal brain, and premature birth. Eggs contain high levels of choline, which can help in the development and growth of the placenta related to the transfer of Docosahexaenoic acid (DHA) nutrition and is beneficial in brain and memory development [12]. Research on pregnant women in the third trimester who routinely consume choline supplements shows that choline intake improves the cognitive function of their offspring [13]. During pregnancy, the mother's choline supply decreases. This is because pregnancy releases a lot of choline to the fetus through the placenta, causing the choline supply during pregnancy to decrease. Pregnant women are recommended to consume two eggs daily and foods containing choline that the body needs during pregnancy [14] so that the functional egg consumption program has met the requirements as additional food for pregnant women in terms of function, benefits, taste, nutrients, and availability of food ingredients.

Compliance in implementing the functional egg consumption program is influenced by many factors, including family support, especially from husbands, mothers, and the environment, which also play an important role during the program. This is in accordance with the research explained in [15] that a person's participation will grow because it is induced by extrinsic motivation in the form of persuasion, influence, and encouragement from outside. Family and environmental support is essential in (*reinforcing*) the formation of maternal behavior to become a source of strength, encouragement, and calm in forming healthy behavior [16].

The obstacle faced in 90 days of providing functional eggs is boredom. It is undeniable that consuming two eggs daily causes the target's boredom. Boredom affects compliance in consuming functional eggs because product variations, sensory properties, and the success of socialization in pregnant women can influence a person's compliance in consuming food. The existence of variations in additional food products can reduce the element of boredom or saturation with additional food products during the intervention period [17]. In addition, providing counseling motivation through special emphasis on nutritional education can increase compliance in consuming nutritious food [18]. Holding classes for pregnant women by inserting motivation, knowledge, and health education must be developed to improve the perception of benefits, reduce the perception of obstacles, and increase family support for compliance in consuming supplements (additional food) [19].

The informant information stated that consumption of other proteins outside of functional eggs was still carried out. Several informants stated that consumption of functional eggs was used as snacks during the intervention. On the other hand, functional eggs were used not as additional food but as the main source of protein every day. Descriptive results showed that chicken eggs had the highest ranking in the mother's daily protein intake. This means that almost half of the protein needs of pregnant women are met by functional eggs, causing the diversity of food consumption to be less diverse.

According to informants, functional egg innovation is different from ordinary chicken eggs. These functional eggs contain more protein and omega-3 and are low in fat and cholesterol. Based on the taste, it is also stated that the taste of functional eggs is better than ordinary chicken eggs, and the appearance of the eggs is more yellow, so they tend to be similar to duck eggs. Functional eggs have received positive responses from various parties. To maximize the program results, it is necessary to improve coordination and increase commitment between the organizers, the Health Office, the implementers, the nutrition officers at the Health Center, the *outsourcing party* providing eggs, and the targets, pregnant women in CED. Close support between these parties will facilitate the implementation of the program so that it can achieve the expected goals. The renewal of the functional egg evaluation monitoring instrument needs to be completed again so that the data is more detailed and valid, thus facilitating the evaluation of the follow-up program. l support and efforts to improve nutritional knowledge to increase additional food intake must be carried out by program implementing officers.

CONCLUSION

There is no relationship between functional egg consumption and maternal nutritional status. During the program's implementation, egg consumption changed 54.17 % of the nutritional status of CED mothers to non-CED. The increase in maternal weight during the program was around 4.18 kg, and the increase in LILA was 1.36 cm. Functional egg consumption affects maternal energy and protein intake. Mothers who routinely consume eggs at least 1x/day contribute a fairly large protein intake of 17.06% and energy of 8.86%, while the rest is obtained from other foods. The type of animal protein intake consumed the most is eggs, 58.3%, while chickens consumed only 12.5%, so functional eggs have not been used as additional food but are still the main protein consumed by mothers.

There is no relationship between functional egg consumption and *the output of* birth weight and length of babies. Mothers who routinely consume functional eggs give birth to fewer children with LBW and PBLR. Additional functional egg food can affect energy and protein intake by 14.29 %, while other variables influence 85.71%. The existence of a program to provide additional functional egg food for pregnant women with special economic conditions has a positive impact on program recipients. So, it is necessary to increase commitment between organizers, implementers, and targets in implementing the program to break the chain of *stunting*.

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