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Original Article

EFFECT OF PROCESSED CHICKEN FEET CONSUMPTION IN INCREASING BLOOD CALCIUM LEVELS AMONG FEMALE ADOLESCENTS

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ABSTRACT

Objective: This study aims to examine the effect of processed chicken feet consumption for a month in increasing blood calcium levels among female adolescents.

Methods: This study was carried out using a quasi-experimental method by measuring blood calcium levels before and after the daily consumption of 100 grams of processed chicken feet for a month. Furthermore, the sample population comprised 105 female adolescents who met the inclusion and exclusion criteria. Blood calcium measurement was performed using the OCP direct colorimetric lab test, data processing used the Intention to Treat (ITT) method, and data analysis was carried out using the Wilcoxon test (α=5%).

Results: A significant difference was observed between blood calcium levels before and after the consumption of processed chicken feet over 1 mo, with an average increase of 1.10 mg/Dl.

Conclusion: Based on the results, blood calcium levels experienced an increase of 1.01 mg/Dl, equivalent to the consumption of a 500 mg/day calcium tablet.

Keywords: Adolescents, Pre-marriage, Pregnancy, Malnutrition, Macronutrients

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INTRODUCTION

Adolescence is an essential reproductive period that plays an important role in shaping the next generation's lives. The physical and psychological changes occurring during this period have been reported to serve as a foundation for subsequent reproductive health. Several studies have shown that these developmental changes are intricately associated with the fulfillment of both physical and psychological needs. However, adolescents often experience various challenges that hinder their growth in these aspects. From a psychological perspective, adolescents begin to perceive self-image, often idealizing a specific body type while neglecting essential nutritional intake. This phenomenon contributes to a significant 8-12% of this demographic experiencing nutritional problems globally [1-3]. According to the 2018 National Development Planning Agency data, Indonesia is home to 44 million adolescents, and a majority face challenges in achieving optimal functionality due to prevalent physical issues, such as stunting, malnutrition, and violence. Among the nutritional concerns, micronutrient deficiency, specifically iron and calcium, stand out as a significant issue [4, 1].

Several studies have shown that iron and calcium play essential roles in the reproductive system. Iron facilitates nutrient binding, while calcium contributes to growth, bone density, teeth health, kidney function, blood health, and the function of parathyroid as a growth hormone. Calcium deficiency can significantly affect the physical and reproductive health of adolescents [5-8]. Malnutrition in adolescents is often linked to habits, with fast food consumption and improper eating patterns being contributing factors. A previous study showed that 14.8% of individuals aged 15-19 were underweight and 12.5% were overweight with malnutrition, particularly in macronutrients [6, 9]. The prevalent practice of adolescent marriages in Indonesia significantly contributes to an upsurge in pregnancy cases, leading to elevated maternal and child mortality rates. Immature reproductive conditions and complications stemming from malnutrition, particularly iron and calcium deficiency, escalates the risk of pregnancy-related anemia and preeclampsia [1, 4, 10-12]. During pregnancy, the recommended calcium intake was 500 mg and to meet the daily requirement of 1000 mg, pregnant women are given supplements of 2 tablets (500 mg)/d with careful consideration of medical advice to avoid the adverse effects. Furthermore, it is important for pregnant women not to exceed 2500 mg of calcium/day, as excessive intake can cause bloating, constipation, kidney stones, heart palpitations, and heart rhythm disturbances. Previous reports have also reported that it can prevent the absorption of other important minerals needed during pregnancy, such as zinc and iron.

Calcium is an essential mineral during pregnancy, and women can meet their needs by consuming various calcium-rich foods. In Indonesia, particularly in West Java, chicken feet are a favorite food among adolescents. Several studies have shown that this food contains high levels of macro and micronutrients, including calcium, making them an alternative for enhancing the intake of nutrients [13]. Therefore, this study aimed to examine the effect of processed chicken feet consumption for a month in increasing blood calcium levels.

MATERIALS AND METHODS

Material

The data used in the study were primary, namely by measuring adolescent blood calcium levels before giving chicken feet and after giving chicken feet for a month. Blood calcium measurement was carried out using the OCP direct colorimetric lab test.

Study design

This study adopted a quasi-experimental method by measuring blood calcium levels before and after the daily consumption of 100 grams of processed chicken feet for 1 mo. Furthermore, the sample consisted of 105 respondents who met the inclusion and exclusion criteria. The data processing used the Intention to Treat (ITT) method by maintaining the analysis of respondents who dropped out during the procedures (5 individuals), comprising those who did not undergo blood calcium measurement after a month of processed chicken consumption.

Ethical approval

This study received ethical approval from the Poltekkes Kemenkes, Tasikmalaya, with an ethics number. DP.04.03/F. XXVI.20/190/2023.

Criteria of sample

This study adopted a quasi-experimental method by measuring blood calcium levels before and after the daily consumption of 100 grams of processed chicken feet for 1 mo. Furthermore, the sample consisted of 105 respondents who met the inclusion and exclusion criteria. The data processing used the Intention to Treat (ITT) method by maintaining the analysis of respondents who dropped out during the procedures (5 individuals), comprising those who did not undergo blood calcium measurement after a month of processed chicken consumption.

RESULTS

The equivalence of age, activity type, and Body Mass Index (BMI) among respondents was shown in table 1, ensuring these characteristics did not act as confounding factors in the study. The results showed that there was a significant difference in calcium levels before the consumption of chicken feet. Furthermore, there was no relationship between BMI and activity type, with a ρ value of 0.993 measured using the chi-square test. The difference in blood calcium levels before treatment served as an indicator of the macronutrient levels possessed by respondents.

Table 1: Respondents' characteristics

Characteristics	Frequency (%) n=105	ρ value α=5%
Age		
≥20 y	71 (67.62)	0.414
<20 y	34 (32.38)	
BMI		
<17	5 (3.71)	1
17-18.4	23 (21.90)	
18.5-25	58 (55.34)	
>25	20 (19.05)	
Activity type		
Light	26 (24.76)	0.933
Medium	77 (73.33)	
Heavy	2 (1.91)	
Calcium levels		
Before	9 (8.57)	0.000*
≥9.2	96 (91.43)	
<9.2		
Calcium levels		
After	46 (43.81)	0.064
≥9.2	59 (56.19)	
<9.2		
Increase		
≥1.1	53 (50.48)	
<0-1.1	26 (24.76)	
= 0	8 (7.62)	
<0	18 (17.14)	

*Sample homogeneity test with chi-square α=5%, A significant difference between blood calcium levels before and after the consumption of processed chicken feet over a month was shown in table 2 with an average increment of 1.10 mg/Dl. This showed that the treatment could meet the macronutrient needs, particularly calcium, among adolescents.

Table 2: Difference in blood calcium levels before and after the consumption of processed chicken feet for 1 mo

Characteristics	Frequency n=105	ρ value α=5%
Calcium levels		
Before	9	0.000*
≥9.2	96	
<9.2		
Calcium levels		
After	46	
≥9.2	59	
<9.2		

Wilcoxon test (non-normal data), α=5%

DISCUSSION

The frequency distribution of respondents' characteristics in table 1 showed that their daily activity type was not directly related to BMI. Several studies showed that BMI was closely related to dietary patterns and the types of food consumed. Individuals' nutritional status could be shown by the BMI, calculated by dividing weight (in kg) by the square of height (in m). The parameter was divided into 4 categories, including underweight (18.49 kg/m^2), normal (18.5-24.9 kg/m^2), overweight (25-27 kg/m^2), and obesity (>27 kg/m^2). In this study, 10 respondents were in the obesity category with average blood calcium levels of 7.72 mg/Dl before treatment. Based on this result, there was no significant difference (ρ value of 0.101) between the BMI classes of respondents and the increase in blood calcium levels.

The increase in blood calcium levels was calculated to assess the effect of the intervention. A small portion (8.57%) of adolescents had blood calcium levels above 9.2 mg/Dl before treatment, but after treatment, those with levels above 9.2 mg/Dl increased to 43.81%. Although the results were statistically insignificant (ρ value of 0.064), the analysis showed that 18 adolescents experienced a decrease in blood calcium levels with an average of 1.06 mg/Dl, 8

showed no increase, and 79 experienced an increase with an average of 1.22 mg/Dl.

According to previous studies, blood calcium levels were affected by various factors, including dietary patterns and intake regulation, as well as calcium absorption from food by the digestive organs. Several factors often inhibit calcium absorption, such as Vitamin D deficiency, the presence of oxalic and phytic acid in food, and the consumption of foods high in phosphorus and fiber. This contradicted iron absorption, and calcium consumption was not allowed simultaneously with iron supplement consumption [2, 3, 14-17].

Table 2 showed a significant difference in blood calcium levels before and after the consumption of processed chicken feet for 1 mo with an average increase of 1.10 mg/Dl. The content in 100 grams of chicken feet included 150 kcal energy, 19 grams protein, 0.4 grams carbohydrates, 8 grams fat, 100 IU Vitamin A, 86 mcg folic acid, 13 mg choline, 88 mg calcium, 83 mg phosphorus, 187 mg omega-3, and 2,571 mg omega-6. The treatment also had a relatively high calcium level of 88 mg/100 grams but was still lower compared to milk and its derivatives with levels above 100 mg/Dl. However, chicken feet did not cause allergic reactions compared to milk due to its lactose content by avoiding digestive disturbances that could affect calcium absorption. This treatment could be an alternative nutritious snack by considering consumption quantity due to its relatively high fat content.

Calcium is essential for female adolescents to support reproductive health. The nutrient has also been reported to aid in bone and teeth formation as well as support the nervous system, maintain cardiovascular stability, regulate blood clotting, and alleviate premenstrual syndrome (PMS) symptoms [18-20]. Female adolescents were closely associated with menstrual cycles and pregnancy. During the menstrual period, females often experience discomfort caused by hormonal changes, including myalgia, headaches, nausea, breast pain, and mood swings. These symptoms were frequently more severe in adolescents with low calcium levels compared to those with normal levels. Low calcium levels were also found in pregnant adolescents or women experiencing preeclampsia. Therefore, the nutrient was one of the macronutrient supplements given during pregnancy to prevent preeclampsia and postpartum bleeding.

Chicken feet are an alternative source of calcium; besides being easy to find, in Indonesia, chicken feet are one of the foods that teenagers like. Several studies related to the use of chicken feet and processed chicken feet found that chicken feet have a fairly high macronutrient content, including potassium, iron, and phosphorus [21].

Chicken feet have a softer texture, so consumption of feet and bones is possible. Processing is quite easy and easy to obtain into alternative chicken feet sources of macronutrients for adolescents and reproductive age. Consumption of chicken feet is safer and minimizes allergens, and the content of Ferro, calcium, phosphorus, and collagen is quite high, can prevent complications during pregnancy, and supports optimal fetal growth [20].

CONCLUSION

In conclusion, adolescents require adequate calcium intake to prepare for pre-marriage and pregnancy to reduce the risk of hypertension and preeclampsia. The results showed a significant difference in blood calcium levels before and after the consumption of processed chicken feet for a month at a rate of 100 grams/day (4-5 feet) and not directly related to BMI categories with blood calcium levels. Blood calcium levels increased by 1.01 mg/Dl, equivalent to the consumption of a 500 mg/day calcium tablet. Therefore, chicken feet could be considered an alternative supplement in preparation for a healthier pregnancy among prospective bride adolescents.

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AUTHORS CONTRIBUTIONS

N. M and E. R. conceived of the presented idea. N. M. sponsored the publication. E. R. developed the theory. Sample preparation and Informed consent.

I. K and D. E. Ethical clearance. Research permission, and contribute to sample preparation D. E. presentation in publication

D. E and Y. H. devised the project the main concept ideas and proof outline. Enumerator coordination for managing sampling (blood sample)

L. P, M. S. and B. I. data analysis, laboratory collaboration, written report. B. I manuscript written, correspondence

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

REFERENCES

1. Sandy Y, Permatasari T, Pratiwi C, Damanik K. Online food consumption dan Asupan Kalsium terhadap status gizi remaja di Kota Medan. J Gizi Pangan Soedirman. 2023 Jun 8;7(1):77-90. doi: 10.20884/1.jgipas.2023.7.1.8556.
2. Knight F, Ferguson EL, Rana ZH, Belizan J, Gomes F, Bourassa MW. Including calcium-fortified water or flour in modeled diets based on local foods could improve calcium intake for women, adolescent girls, and young children in Bangladesh, Uganda, and Guatemala. Ann N Y Acad Sci. 2023 Aug;1526(1):84-98. doi: 10.1111/nyas.15032, PMID 37391187.
3. Lubis ZI, Khamidah AN, Yuliadarwati NM. Knowledge and calcium intake to the risk of scoliosis at boarding school students. Kemas. 2023 Jan 20;18(3):392-6. doi: 10.15294/kemas.v18i3.39231.
4. Hastert M, Goetz JR, Sullivan DK, Hull HR, Donnelly JE, Ptomey LT. Calcium, fiber, iron, and sodium intake in adolescents with intellectual and developmental disabilities and overweight and obesity. Disabil Health J. 2021;14(4):101155. doi: 10.1016/j.dhjo.2021.101155, PMID 34210641.
5. Salam RA, Das JK, Irfan O, Ahmed W, Sheikh SS, Bhutta ZA. Effects of preventive nutrition interventions among adolescents on health and nutritional status in low- and middle-income countries: a systematic review. Campbell Syst Rev. 2020;16(2):e1085. doi: 10.1002/cl2.1085, PMID 37131413.
6. Nicholaus C, Martin HD, Kassim N, Matemu AO, Kimiywe J. Dietary practices, nutrient adequacy, and nutrition status among adolescents in boarding high schools in the Kilimanjaro region, Tanzania. J Nutr Metab. 2020;2020:3592813. doi: 10.1155/2020/3592813, PMID 32685204.
7. Correa Rodriguez M, Schmidt RioValle J, Ramirez Velez R, Correa Bautista JE, Gonzalez Jimenez E, Rueda Medina B. Influence of calcium and vitamin D intakes on body composition in children and adolescents. Clin Nurs Res. 2020;29(4):243-8. doi: 10.1177/1054773818797878, PMID 30168345.
8. Herdea A, Charkaoui A, Ulici A. Prevalence of 25-OH-vitamin D and calcium deficiency in adolescent idiopathic scoliosis. J Med Life. 2020;13(2):260-4. doi: 10.25122/jml-2020-0101, PMID 32728404.
9. Naja F, Itani L, Kharroubi S, Diab El Harake M, Hwalla N, Jomaa L. Food insecurity is associated with lower adherence to the Mediterranean dietary pattern among lebanese adolescents: a cross-sectional national study. Eur J Nutr. 2020;59(7):3281-92. doi: 10.1007/s00394-019-02166-3, PMID 31900578.
10. Irianti B, Tajmiati A, Astiriyani E. Status kesehatan remaja usia pranikah di wilayah puskesmas urug dan karanganyar kota tasikmalaya (Studi Deskriptif). J Midwif Inf (JoMI). 2020;1(1):1-9.
11. Bahramy P, Mohammad Alizadeh Charandabi S, Ramezani Nardin F, Mirghafourvand M. Serum levels of vitamin D, calcium, magnesium, and copper, and their relations with mental health and sexual function in pregnant Iranian adolescents. Biol Trace Elem Res. 2020;198(2):440-8. doi: 10.1007/s12011-020-02109-8, PMID 32166563.
12. Yang X, Zhai Y, Zhang J, Chen JY, Liu D, Zhao WH. Combined effects of physical activity and calcium on bone health in children and adolescents: a systematic review of randomized

controlled trials. World J Pediatr. 2020;16(4):356-65. doi: 10.1007/s12519-019-00330-7, PMID 31919756.

13. Soetan KO, Olaiya CO, Oyewole OE. The importance of mineral elements for humans, domestic animals and plants: a review. Afr J Food Sci. 2010;4(5):200-22.
14. Moraes AB, Veiga GV, Azeredo VB, Sichieri R, Pereira RA. High dietary calcium intake and low adiposity: findings from a longitudinal study in Brazilian adolescents. Cad Saude Publica. 2022;38(6):e00144521. doi: 10.1590/0102-311XEN144521, PMID 35703666.
15. Vicente F, Holanda M, Ramalho R, Mendes J, Marques Vidal P, Pereira P. Lower calcium and iron intake in adolescent gymnasts: a case of concern for youth sports nutrition. Nutrition. 2023 Jun 1;110:112020. doi: 10.1016/j.nut.2023.112020, PMID 36963267.
16. Rahmawati MM, Maryanto S, Purbowati. The correlation between calcium and iron intake with dysmenorrhea in female adolescents in SMA negeri 1 Ambarawa. J Gizi Kesehatan. 2021;13(1):94-103. doi: 10.35473/jgk.v13i1.104.
17. Mohd Sallehuddin SM, Talib RA, Salleh R, Ambak R, Pardi M, Abdul Aziz NS. Calcium and iron intakes of adolescents in Malaysia and their relationships with body mass index (BMI): findings from the adolescent nutrition survey 2017. Mal J Nutr. 2021;27(2):317-26. doi: 10.31246/mjn-2020-0054.
18. Cuadrado Soto E, Lopez Sobaler AM, Jimenez Ortega AI, Bermejo LM, Aparicio A, Ortega RM. Breakfast habits of a representative sample of the Spanish child and adolescent population (The Enalia Study): association with diet quality. Nutrients. 2020;12(12):3772. doi: 10.3390/nu12123772, PMID 33302560.
19. Sun M, Yan W, Zhao Q, Ji B, Ban B, Zhang M. Association between serum calcium and phosphorus levels and insulin-like growth factor-1 in Chinese children and adolescents with short stature. Int J Gen Med. 2020;13:1167-73. doi: 10.2147/IJGM.S276261, PMID 33244257.
20. Citrakesumasari C, Kurniati Y, Virani D. Analysis of nutrition intake based on gender in adolescents. Open Access Maced J Med Sci. 2020;8(T2):87-9. doi: 10.3889/oamjms.2020.5231.
21. Hadi NS, Yulianingsih E, labatjo R, Setiawan DI, Domili I, Anasiru MA, Arbie FY, Goi M, Amalia MR, Misnati M. The effect of the addition of chicken feet flour to crispy corn on energy density and nutritional quality. Food Research. 2022;6(2):413-22.