



Anchovy fish biscuits improve adolescents nutritional status

Kiki Uniatri Thalib^{a,*}, Suryani As'ad^b, Healthy Hidayanti^c, Mardiana Ahmad^a, Andi Nilawati Usman^a

^a Department of Midwifery, Postgraduate School, Hasanuddin University, Indonesia

^b Department of Nutrition, Faculty of Medical, Hasanuddin University, Indonesia

^c Department of Public Health, Faculty of Nutrition, Hasanuddin University, Indonesia

ARTICLE INFO

Article history:

Received 28 June 2021

Accepted 30 July 2021

Keywords:

Fish
Anchovy
Biscuits
Nutrition
Young women

ABSTRACT

Aim: This study determines how giving fish anchovy biscuits (*Stolephorus* sp) improves nutritional status in Adolescent Girls at Vocational High School 01 Rangas, Mamuju Regency.

Research methods: It was a quantitative research Quasi Experiment by Nonequivalent Control Group design where there are 2 test groups, namely the control group and the intervention group. The intervention group was given fish anchovy biscuits, while the control group was given Placebo biscuits. The dose given is four pieces of biscuits in a day for 12 weeks. The study population was all female teenagers in class XII Vocational High School 01 Rangas, Mamuju Regency. This research was conducted from January to April 2020. The sampling technique uses purposive sampling by considering inclusion and exclusion criteria to obtain a sample of 60 people. Nutritional status measurements were carried out twice before and after the intervention using a digital weighing instrument and height measurement. Data were analyzed using the Wilcoxon test and the Mann–Whitney test.

Results: This study shows that the statistical test results obtained values ($p = 0.001$, $p < 0.05$), which means that there is an influence of fish anchovy biscuits on improving the nutritional status of Adolescent Girls at Vocational High school 01 Rangas Mamuju Regency.

Conclusion: The results of data analysis and evaluation results on the Fish anchovy Biscuit intervention show a difference in improving the nutritional status after being given the fish anchovy Biscuit intervention on Young Women in Vocational High School 01 Rangas, Mamuju Regency.

© 2021 SESPAS. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Adolescence is the stage of the human life cycle where they face various types of physiological changes. Adolescence is the threshold of maturity, physiological, psychological, and social maturity from childhood to adulthood. Childhood and adolescence are rapid growth and final maturity of human development.¹

According to (WHO) a Teenager is a child who reaches 10–19. Teenagers are vulnerable to nutritional problems because it is a transition to adulthood marked by physical, psychological, and other psychosocial changes. The group is in a phase of rapid growth, so nutrients require relatively significant amounts.²

According to 2018 Riskesdes data shows that 25.7% of adolescents aged 13–15 years and 26.9% of adolescents aged 16–18 years with concise nutritional status besides 8.7 adolescents aged 13–15 years and 8.1% of adolescents aged 16–18 years with thin and fragile conditions while the prevalence of overweight and obesity by 16.0% adolescents aged 13–15 years and 13.5% in adolescents aged 16–18 years.³

Nutrition problems, namely lack of or more nutrition, will increase susceptibility to disease, especially the risk of non-communicable diseases, and if this problem continues into adulthood and marriage, it will risk affecting the fetus's health in the womb. A study says nutrition problems in adolescents are associated with dietary habits and eating patterns. In addition, the impact of malnutrition in adolescents, especially iron, can cause anemia. Iron is needed to form hemoglobin, around 73% of the iron in the body, which is stored as ferritin reserves.⁴

One of the inexpensive alternative ingredients is iron, protein, fat, and calcium derived from fish which is processed into flour/biscuit. This fish anchovy is one of the efforts to overcome calcium deficiency. The nutritional content of fresh fish anchovy is energy 77 kcal, protein 16 g, 9.71 g of fat, 500 mg of calcium, 500 mg of phosphorus, 0.05 mg of iron.

According to Mervina in Nur Asyik (2018) research, fish anchovy is one of the byproducts of fish processing products that has not been maximally utilized until now, especially for food. Making fish meals based on fish anchovy can be an alternative form of food. Fish anchovy flour as a substitute for wheat flour in biscuit making is one of the good alternative uses, especially for nutritional quality.⁵

Before the fish anchovy Biscuit intervention, respondents were tested in Makassar laboratory with the results of 100 g of fish anchovy biscuit containing quite complete nutrients such as fat, protein, iron, and calcium. The content of substances in fish anchovy biscuits is relatively high with energy 277 kcal, protein about 60 g per 100 g, iron 1.40 per 100 g, and fat 9.71 per 100 g.

Peer-review under responsibility of the scientific committee of the 3rd International Nursing, Health Science Students & Health Care Professionals Conference. Full-text and the content of it is under responsibility of authors of the article.

* Corresponding author.

E-mail addresses: thalibku18p@student.unhas.ac.id, pmc@agri.unhas.ac.id (K.U. Thalib).

<https://doi.org/10.1016/j.gaceta.2021.10.038>

0213-9111/© 2021 SESPAS. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Table 1
Distribution of respondent characteristics.

Respondent characteristics		Research respondent groups					p-Value*
		Intervention		Mean ± SD	Control		
		F	(%)		F	(%)	
Age	17 years	24	80	1.20 ± 0.40	25	83.3	0.744
	18 years	6	20		5	16.7	
Parental Education	Elementary school	1	3.3	3.63 ± 1.21	4	13.3	0.710
	Middle school	5	16.7		7	23.3	
	High school	8	26.7		8	26.7	
	Diploma	6	20		3	10	
	undergraduate	10	33.3		8	26.7	
Income	1,000,000–2,000,000	5	16.7	2.50 ± 0.93	4	13.3	0.617
	2,100,000–3,000,000	9	30		12	40	
	3,100,000–4,000,000	12	40		11	36.7	
	4,100,000–5,000,000	4	13.3		3	10	
	>5,000,000	0	0		0	0	

* Homogeneity of variance.

So based on the description above, researchers want to know and examine more deeply how the effect of providing fish anchovy biscuits on improving the nutritional status of young women in Vocational High School 01 Rangas Mamuju Regency.

Research methods

Research design

The type of research used is Quasi *Experiment*; the intervention and control groups were not randomly selected. The population in this study were 200 young women in class XII Vocational High School 01 Rangas, Mamuju, while the number A sample of 60 with fulfilling the inclusion and exclusion criteria; girls of Class 2 vocational school, no history of infectious diseases, having menstrual cycles, willing to be a Respondent. Exclusion criteria; teens with Fish anchovy Allergy, teenagers outside the working area of the Rangas Community Health Center.

Place and time of research

This research was conducted at Vocation high school 01 Rangas, Mamuju Regency, West Sulawesi Province, in January–April 2020.

Method of collecting data

Researchers carried out data collection and were assisted by two teachers of class XI teacher 01 Rangas Vocational School and using a pre–post-test questionnaire. Retrieval of nutritional status data by measuring height and weight before intervention and re-measuring after administering the intervention.

Data analysis

Determinant factor data and sample tested the homogeneity of the respondents'. It was conducted a *test of homogeneity of variance*. Test *Wilcoxon* and the Mann–Whitney were used to assess fish anchovy biscuits' effect on nutritional status.

Results

The data shows the distribution of the respondents in the intervention group, and the control group has similar data. The majority age was 17 years with a value of $p > 0.05$ (0.744). In contrast, for the average parental education, the highest level of education is in the intervention group, and the highest level of junior high school and undergraduate is in the control group with a p value (0.710).

Table 2

Differences in adolescent nutritional status before and after treatment in the intervention group and control group.

Z-score	N	Mean ± SD		Mean difference	p-Value
		Pre	Post		
Control	30	−0.53 ± 1.69	−0.36 ± 1.60	−0.413	0.374 ^a
Intervention	30	−0.80 ± 1.74	0.33 ± 1.37	1.13	0.002 ^a
p-Value		0.517 ^b	0.076 ^b	0.001	

^a Wilcoxon.

^b Test Mann–Whitney.

Source: Primary Data, 2020.

Parental income, in the intervention group, the average parental income is between 3,100,000 and 4,000,000, while the average parental income in the control group is 2,100,000–3,000,000 with a p -value in both groups > 0.05 (0.617), which means the control and intervention groups have homogeneous or almost similar data distribution (Table 1).

Bivariate analysis

The conclusion from the analysis of differences in adolescent nutritional status before and after treatment in the intervention group and the control group obtained a value of $p < 0.05$ (0.001), which means there is a difference in the average difference between the nutritional status of adolescents in the intervention group and the nutritional status of adolescents in the control group (Table 2).

Discussion

Based on the statistical test in Table 2, the BMI results in the control group showed no significant difference before and after the intervention was given with a p -value of 0.374, different results were obtained in the intervention group where there were significant differences before and after the fish anchovy biscuit intervention with a p -value of 0.002.

Nutritional status is the body's condition in matters affected by diet, the level of nutrition in the body, and that level to maintain normal metabolic integrity.⁶

A person's nutritional status is influenced by consumption, absorption, and nutrients from food for a long time. One of the nutritional status assessments can be seen in anthropometric measurements, namely body weight, and height. In the teenage period, 50% of the height and 20% of body weight as adults have been reached. The lack of macro and micronutrients will have an impact on growth and will inhibit sexual maturation.

Fish anchovy flour contains enough complete nutrients such as fat, protein, iron, and calcium. The nutrient content in fish anchovy flour is relatively high with an energy of 277 kcal, protein around 60 g per 100 g, fat 2.3 per 100 g (Ministry of Health, Republic of Indonesia, 2005). The use of fish anchovy flour as a substitute for wheat flour in biscuit making is a good alternative, especially in terms of nutritional quality.⁷

A study showed that the formulation in fish anchovy cookies fulfills the standard requirements for Permenkes with iron content in the range of 4.04–5.32 mg/100 g. The more the substitution of fish anchovy is increased, the high iron content of fish anchovy flour and iron bound to the protein structure of the food is not easily lost due to heat, light, and differences in pH.⁸

Adolescents are vulnerable to nutritional problems because it is a transition from childhood to adulthood that is marked by physical, biological, and psychological changes. Besides that, the group is in a fast phase (Growth Spurt) so that nutrients are needed in relative quantities. So that adolescent nutrition is vital in proper growth and development as a prerequisite for achieving full development potential. Suboptimal nutrition can contribute to stunted growth and disruption when adolescents experience rapid growth and development, so good nutrition is vital.

In addition, a study showed that protein intake has a significant relationship with the nutritional status of adolescents in addition to protein as a source of energy also has a function that cannot be replaced by other nutrients where one of the functions of protein in the body is to build and maintain cells and body tissues.²

One of the functions of protein in the body is to build and maintain cells and body tissues. According to other studies, iron deficiency (77.6%) affects adolescents' nutritional status. In the fish anchovy content, there is good nutrition for adolescent nutrition, one of which is protein, iron, fat, and calcium to increase adolescent body weight. Fish anchovy rich in calcium can strengthen bones, and the results of the research of food nutritionists revealed that the fish anchovy contains the highest calcium among other fat products such as milk, eggs, meat, cheese, and butter.⁴

According to Lorena et al. (2016), Indicators of the nutritional status of BMI published by WHO are classified as low weight: <-3 standard deviations (SD); low weight; <-2/>-3SD; normal weight; >-2 SDS/<+1 elementary obesity; >1 SD/<+2SD; obesity; >+2 elementary/+3 elementary; severe obesity; >+3SD. Body mass index (BMI) is a simple way to monitor nutritional status. BMI is a person's body weight index concerning height, determined by dividing body weight into units of kilograms by the square of height in units of meters squared.⁷

The analysis results found that the administration of fish anchovy biscuits to adolescents can improve adolescent nutritional status and increase it significantly. Nutritional status, including body weight and height with IMT and Z-score, significantly increased due to protein content, fat, and calcium contained in anchovies is quite good. It is in line with research conducted by. Effect of supplementary feeding and fish anchovy biscuits on calorie levels um pregnant women find that there are differences in the average value of calcium levels um in the fish anchovy biscuit group where before giving 10.69 ± 2.64 and after being given fish anchovy biscuits 14.43 ± 2.10 with *p*-value 0.002. This study result is that young women can consume fish anchovy biscuits to prevent poor nutritional status. In addition to the reasonably good nutritional value contained in fish anchovy, it is also economical, practical, and easy to consume at any time as a snack every day.

Conclusion

The results of data analysis in the intervention group were differences in the improvement of nutritional status after being given fish anchovy biscuits to young women in vocational high school 01 Rangas, Mamuju Regency.

Conflicts of interest

The authors declare no conflict of interest.

References

1. Kankana DA. Comparative Study on Nutritional Status of Adolescents Girls of Different Rural Area of West Bengal. *Anthropology*. 2016;4.
2. Sari RI, Sartika AD. Faktor-Faktor Yang Berhubungan dengan Status Gizi Remaja Usia 12-15 Tahun di Indonesia (Analisis Data Sekunder PT RISKESDAS, 2019; 2019. p. 359–66.
3. Kemenkes. RISKESDAS 2018: executive summary; 2018.
4. Turki MA, Osman AK, Alajmi BM, Almutairi RK, Salman AA, Sudersana DK. Factors Influencing the Nutritional Status of Adolescent Girls in Riyadh /Saudi Arabia. *Res J Life Sci Bioinformatics, Pharm Chem Sci*. 2018;4:262–75.
5. Asyik N, Ansharullah RH. Formulasi Pembuatan Biskuit Berbasis Tepung Komposit Sagu dan Tepung Ikan Teri. Nur Asyik Ansharullah Halida Rusdin. 2018;5(Nomor 1, Kendari):Hal.3.
6. Kankana D. Influence of Socio-Economic Status on the Nutritional status of Rural Adolescent Girls. *Anthropology*. 2016;4:3–7.
7. Cuesta LL, Analia Rearte B, Rodrigez S, Niglia M, Scipioni H, Rodriguez D, et al. Anthropometric and biochemical assessment of nutritional status and dietary intake in school children aged 6-14 years, Province of Buenos Aires, Argentina. *Arch Argent Pediatr*. 2018;116:34–46.
8. Ramadhan R, Nuryanto N, Wijayanti HS. Kandungan gizi dan daya terima cookies berbasis tepung ikan teri (*Stolephorus sp*) sebagai PMT-P untuk balita gizi kurang. *J Nutr Coll*. 2019;8:264–73.