NUTRITION EDUCATION AND ASSISTANCE BASED ON BEHAVIOR CHANGE IN ADOLESCENT GIRLS TO IMPROVE NUTRITIONAL STATUS AND HEMOGLOBIN LEVELS

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ABSTRACT

Inappropriate nutritional behavior is a common cause of nutritional issues among adolescents, often leading to conditions like underweight and anemia. This study aimed to assess the impact of nutrition education and behavioral change-based support on the nutritional status and hemoglobin levels of adolescent girls. The study included 75 adolescent girls aged 16-18 years from Singosari Village, Gresik District, chosen through purposive sampling. Over a 30-day period, intensive nutrition education and assistance were provided, utilizing various methods such as lectures, discussions, role play, and practical exercises. The results revealed significant improvements in various aspects. Participants exhibited increased nutrition knowledge, energy and protein intake, body weight, nutritional status, and hemoglobin levels after the intervention ($p < 0.05$). The rise in knowledge was linked to higher protein intake ($p=0.009$), while adequate protein intake was associated with weight gain ($p=0.025$). Weight gain, in turn, correlated significantly with improved nutritional status based on BMI/U ($p = 0.041$). Hemoglobin levels also significantly increased, shifting from $11.6 + 0.2$ mg/dl (low) to $13.4 + 0.1$ mg/dl (normal) after the intervention. This improvement in hemoglobin levels was linked to increased energy intake ($p = 0.012$) and a change in the practice of consuming iron supplementation, shifting from no usage to weekly consumption. In conclusion, nutrition education and behavioral change-based support can effectively enhance energy, protein, and iron intake, leading to improved nutritional status and hemoglobin levels among adolescent girls.

Keywords: adolescent, education, assistance, hemoglobin, nutrition

INTRODUCTION

The nutritional status of women before conception is one of the influential factors during pregnancy and the health of the baby to be born. Malnutrition in pregnant women can be the cause of babies born having low birth weight and malnutrition in toddlers (Rahma and Nuradhiani, 2019). Malnutrition in pregnant women can also increase the risk of maternal death (UNICEF, 2018). The nutritional status and health of pregnant women are determined since adolescence or during their childbearing age (WUS) (Waskara, 2021). Currently, adolescents in Indonesia face three nutritional problems at once, including macronutrient deficiency (short and thin), micronutrient deficiency (anemia), and

overweight (overweight and obesity) (Baroroh et al. 2022).

Basic Health Research Data (RISKESDAS) in 2018 showed that the prevalence of short and very short in adolescents aged 13-15 years touched 25.7% while adolescents aged 16-18 years were 26.9%. Similarly, the prevalence of underweight and very thin adolescents, recorded as many as 8.7% of adolescents aged 13-15 years and 8.1% aged 16-18 years have underweight and very thin nutritional status. In contrast, the prevalence of adolescents with overweight and obese nutritional status aged 13-15 years was 16.0% and 13.5% aged 16-18 years. In addition to macronutrient problems, the problem of micronutrient deficiency such as anemia in adolescents in Indonesia is also fairly

high. The prevalence of anemia in adolescents is 32% (Ministry of Health RI, 2018).

Adolescents are prone to nutritional problems. Biologically, adolescents need more intake for organ growth and maturation (Bahar et al., 2020). Especially adolescent girls who periodically experience menstruation, so they are at greater risk of anemia (Hidayati et al. 2019). UNICEF (2017) collected data and obtained results, there were changes in consumption patterns and physical activity in adolescents, including adolescents doing the wrong food restrictions because they want to maintain weight, liking contemporary foods that tend to be high in calories and fast food, and the tendency of adolescents to choose foods that are not diverse are factors that play a role in three nutritional problems in Indonesian adolescents. There are also other supporting factors are social and educational inequality, to mental health problems.

UNICEF Indonesia in collaboration with the Government of Indonesia has begun pioneering a youth nutrition program designed to address three adolescent nutrition problems. This program applies a life cycle framework that aims to break the inter-generational chain of malnutrition. The program consists of three types of interventions, there are iron supplementation tablet containing iron and folic acid on a weekly basis to prevent anemia, nutrition education and behavior change. Providing nutrition education or nutrition education is one of the right methods to share information for adolescents and is supported by intensive mentoring which is an effort to change adolescent behavior. Research by Walilulu et al (2018), revealed that nutrition education has an effect on increasing knowledge and efforts to prevent nutritional problems. This study aims to examine the effect of education and nutrition assistance based on behavior change in adolescent girls on improving nutritional status and hemoglobin levels.

METHOD

The research design is quasi-experimental with pre- and post-one group design. This study involved 75 adolescent girls selected by purposive sampling with inclusion criteria aged 16-18 years, physically and mentally healthy, not on a certain diet / strict diet and came from Singosari village, Gresik. The research began from July to September 2022 in Singosari Village, SMK DharmaWanita and SMK Semen Gresik. Interventions in the form of providing TTD once a week, education and mentoring are carried out for 30 days on active days and holidays with monitoring and evaluation carried out once a week. The main points of nutrition education provided are about the control and prevention of anemia, healthy eating behavior for adolescents. The material was delivered by researchers using the method of lectures and discussions at school gradually once a week for one month (30 days) with details of 4 times the provision of educational materials as well as 4 times taking blood added tablets together in class. Nutrition assistance is focused on monitoring iron supplementation tablet consumption practices and changes in healthy food consumption patterns. Blood tablets are given once a week and taken together in class. The actual consumption of respondents before the intervention was collected using the 24-h-recall method, then monitoring of respondents' consumption patterns was carried out by recording food (food record) and sending photos of food consumed through Whatsapp groups then recorded by enumerators. The results of recording Data collected during the study included the level of knowledge assessed through pre-test and post-test. Pre-test assessment is carried out before education and assistance and post-test is carried out at the end after the last intervention. In addition, consumption patterns, nutritional status (BMI / U) and hemoglobin levels. The tools used include questionnaire questions, 24-h-recall form and estimated food record, weight scale, microtoa and Easy Touch GCHb 3 in 1 hemoglobin test kit to measure Hb levels. Measurement of Hb levels was carried out by the research team. The stages of data analysis collected include normality tests, paired t tests to test for differences between before TTD, education and assistance and after intervention. Next, test pearson correlation to test the relationship between variables. This research has passed the ethical feasibility test by the ethics commission of Universitas Muhammadiyah Gresik No. 124/KET/II.3.UMG/KEP/A/2022.

RESULTS AND DISCUSSION

Characteristics of Respondents

A total of 75 young women were selected as respondents in this study. By age, 46.6% of respondents were 16 years old, 36.7% were 17 years old and 16.7% were 18 years old. All respondents came from Singosari Village, which is one of the stunting loci in Gresik Regency.

Nutritional Knowledge

Adolescence is a transition period from childhood to adulthood which includes biological changes, psychological changes, and social changes (Wulandari, 2014). Some studies say that education or counseling is one effective way to introduce balanced nutrition consumption patterns for adolescent girls (Ningsih, 2018). The knowledge gained by young women through education will influence attitudes, which then determine their behavior (Najahah, 2018; Nugraha et al. 2021).

The level of nutritional knowledge in this study was measured through pre-test and post-test results. As many as 58.7% of respondents had a lack of knowledge before being educated. After intensive education and assistance, nutritional knowledge increased significantly until 100% of respondents had a good level of knowledge (p = 0.0001) (Figure 1).
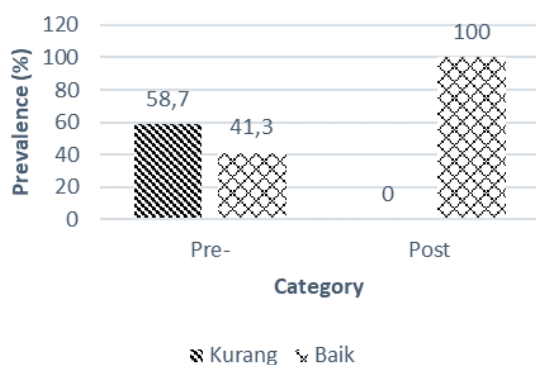
Figure 1. The Level of knowledge of respondents before and after the intervention

In this study, the intervention focused on intensive education and assistance related to behavior change. Education is aimed at increasing knowledge from adolescent girls related to healthy eating behavior and control and prevention of anemia for adolescents so that adolescents can live healthy, grow optimally and be free from anemia. Community-based nutrition education

methods have been widely applied with the aim of improving healthy living behaviors, preventing the emergence of diseases and improving the degree of health). Research by Jamaluddin et al (2020) shows that community-based nutrition education has positive results in the diversity of consumption patterns, hemoglobin levels, and children's attendance at school.

Knowledge is one of the domains that influence human behavior. Changes in behavior based on knowledge will be more consistent than behavior that is not based on knowledge (Notoadmojo, 2013). In practice, respondents with good knowledge do not always have good healthy living practices due to internal and external influences (Veriza &; Riyadi, 2018). In this study, intensive assistance was applied as an effort to monitor good behavior that had been conveyed during education. Efforts made include respondents being given a food notebook, every meal students were asked to send photos of food consumed. If there is a discrepancy, respondents are motivated and counseled to meet needs according to their abilities.

Consumption Patterns

The results of recording energy intake before the intervention showed that as many as 66.7% of respondents had energy intake with the category of severe deficit, 9.3% moderate deficit, 8% mild deficit and 16% sufficient with the average energy intake of respondents as 1201 + 34.6 kcal. Not much different from energy intake, more than 50% of respondents protein and carbohydrate intake were categorized as weight deficit (Table 1). This can be the cause of growth and development of young women is not optimal.

Table 1. Classification of respondents' energy and nutrient intake before intervention

Category	Energy Intake (%)	Protein Intake (%)	Fat Intake (%)	Carb Intake (%)
Severely Deficit (<70%)	66,7	56	9,3	70,7
Moderate Deficit (70-79%)	9,3	22,7	4	13,3
Mild Deficit (80-89%)	8	13,3	6,7	8
Adequate (90-120%)	16	8	52	8
Over intake (>120%)	0	0	28	0

Adolescents need a greater intake of nutrients than during childhood. However, teenagers tend to have a diet that is not in accordance with needs. After being educated and mentored for one month, there was a significant increase in energy, protein, fat and carbohydrate intake (Table 2).

Table 2. Results of recording respondents' food intake (24-h recall and estimated food record)

Category	Pre-	Post-	Δ	*P value*
Energy intake (Kkal)	$1201 \pm 34,6$	$1334 \pm 37,9$	$133 \pm 15,2$	0,0001*
Protein intake (g)	$45,6 \pm 0,7$	$50,2 \pm 0,9$	$4,5 \pm 0,7$	0,0001*
Fat intake (g)	$51,0 \pm 1,2$	$55,0 \pm 1,2$	$3,9 \pm 0,8$	0,0001*
Carb. intake (g)	$164,8 \pm 9,6$	$171,4 \pm 5,4$	$6,5 \pm 7,6$	0,393

Keterangan : uji *t berpasangan signifikan pada α < 0,05*

Young women's energy intake increased after education and mentoring by 133+ 152 kcal (Table 2). The increase in total energy cannot be separated from the increase in intake of energy-contributing nutrients, namely protein (Δ=4.5 + 0.7 g), fat (Δ=3.9 + 0.8 g) and carbohydrates (Δ=6.5 + 7.6 g). The increase in protein intake occurred due to changes in the selection of vegetable and animal protein sources that previously rarely consumed vegetable protein to choose fried tempeh as a source of animal protein with a frequency of 4-6 times per week.

The selection of animal protein sources from respondents also changed, which previously on average liked sausages (ready-to-eat foods) consumed 4-6 times per week turned into various processed chicken. Based on data on the composition of Indonesian food, the protein content of sausages is lower than processed chicken. The protein content in 100 g of sausage is only 14.5 g while in fried chicken has a protein content of between 31-35 g per 100 g depending on the body part of the chicken (thigh = 32.1 g; wings = 35 g and breast = 34.2 g). The amount of protein content in processed chicken is twice as much compared to sausages. Consumption of protein that is less and not diverse will greatly impact the condition of growth and development of adolescents (Wulandari, 2014).

Fat intake in respondents also increased. This is related to an increase in protein intake, where the source of protein is also a source of fat. Ready-to-eat sausages sold in the market contain 27 g of fat per 100 g while chicken has various contents according to its part (thigh = 15.7 g; wings = 15.2 g and breast = 16.2 g). Although chicken seems to have less fat content than sausage, the most common chicken processing is fried (such as crispy chicken, chicken katsu, geprek chicken) so as to increase the amount of fat intake from the oil used. Based on the oil absorption table, the absorption of cooking chicken oil is 16%.

Teenagers are one of the groups that dominate the consumption of ready-to-eat foods. The high consumption of ready-to-consume food products is associated with practical products and delicious taste (Godatwar et al. 2015). The level of nutritional knowledge has an impact on a person's attitude and behavior in food selection and the formation of eating habits. Lack of nutritional knowledge about a good diet and lack of understanding of the role of nutrients from various types of food will cause problems not only in nutritional status and health, but also affect intelligence and productivity (Soekirman, 2011).

The nutritional status of adolescent girls is determined by BMI / U which begins with measuring the weight and height of respondents. The average body weight of respondents before the intervention was 53.4 + 2.1 kg. After following the intervention there was a significant weight gain to 54.5 + 2.02 kg (p = 0.0001*) (Table 2). The height measurement result was 1.56 + 0.01 m and did not change between before and after the intervention.

**Table 3.** The results of anthropometric measurements

Variabel	Pre	Post	*P value*
BW (Kg)	$53,4 \pm 2,1$	$54,5 \pm 2,02$	0,0001*
Height (m)	$1,56 \pm 0,01$	$1,56 \pm 0,01$	1

Keterangan: uji *t berpasangan signifikan pada α < 0,05*

The results of nutritional status classification based on BMI / U before the intervention showed that as many as 42.3% of respondents were underweight, 26.7% Normal, 24% overweight and 8% obese. After the intervention, the prevalence of underweight adolescent girls decreased to 34.7%

and those with normal nutritional status increased to 33.3% (Table 3).
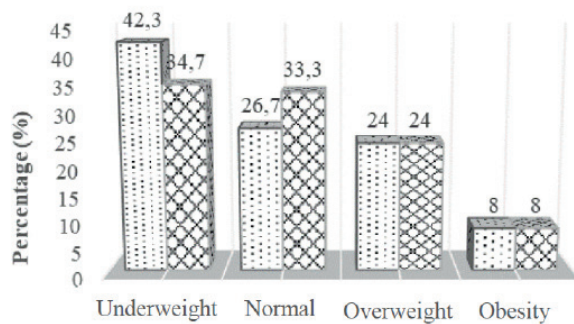
Figure 2. Classification of nutritional status of respondents before and after the intervention

Weight gain is associated with improved nutritional status based on BMI/U (p = 0.04*). The diet of adolescent girls will determine the amount of nutrients needed for growth including weight gain (Mokoginta et al. 2016). Weight gain is also linear with increasing BMI values, so that improvements in nutritional status can be achieved.

The number of overweight and obese adolescent girls did not change between before and after the intervention. This is because research focuses more on improving the quality of consumption (sufficient quantities and diverse types) but does not increase physical activity. The message of the Nusantara Movement to Press Obesity Rates (GENTAS) from the Ministry of Health in an effort to reduce the prevalence of more nutrition is to regulate diet, one of which is the amount of food sources of protein equivalent to food sources of carbohydrates, increase consumption of fruits and vegetables besides that it also increases body movement (physical activity and physical exercise) (Ministry of Health RI, 2017).

In this study, there was an increase in the amount of protein intake as well as an increase in the frequency of fruit and vegetable consumption. Before the intervention, only 30% of respondents consumed fruit daily. After intensive education and assistance, the number of respondents who consumed fruit every day increased to 47% both directly consumed and consumed in the form of juice. As for vegetable consumption, as many as

23.7% of respondents consumed vegetables every day before the intervention and increased to 40%.

Recommendations for fruit and vegetable consumption in someone who experiences more nutrition are at least equivalent to protein and carbohydrates. Consumption of fruits and vegetables in greater quantities has a dual function, namely as a source of fiber and a source of vitamins and minerals. The fiber content in fruits and vegetables can provide satiety in a longer time and can help the body eliminate piles of food in the large intestine. Vitamins and minerals in vegetables and fruits are useful for maintaining health, especially counteracting free radicals due to excess fat accumulation in people who are obese (Ministry of Health RI, 2017).

Hemoglobin Level

The results of measuring respondents' hemoglobin levels before the intervention showed that as many as 62.7% of respondents had anemia with an average hemoglobin level of respondents 11.6 + 0.2 g / dL. After education and assistance and regular consumption of blood-added tablets once a week, the average hemoglobin level increased significantly to 13.4 + 0.1 g/dL (p = 0.0001*). The pearson correlation test showed that increased hemoglobin levels were significantly associated with increased energy intake (p = 0.012*), and were associated with increased TTD consumption. After this research was completed, the task of monitoring TTD consumption was returned to the school.

Research Susanti et al. (2016) explained that iron supplementation on a weekly basis has the same effectiveness in increasing hemoglobin levels in adolescent girls with daily consumption of TTD during menstruation. Giving TTD to adolescents is recommended once a week with an excess level of adherence to higher supplement consumption.

CONCLUSION

Based on the results of the study above, providing education and nutritional assistance based on intensive behavior change can increase knowledge, increase energy, protein, fat and carbohydrates and regular consumption of TTD once a week. The improvement of knowledge

and daily consumption patterns and blood-added tablets is significantly related to improvements in nutritional status (BMI / U) and hemoglobin levels in adolescent girls.

BIBLIOGRAPHY

Bahar, B., Jafar, N., & Amalia, M. (2020). Gambaran asupan zat gizi dan status gizi remaja pengungsian Petobo Kota Palu. *Jurnal Gizi Masyarakat Indonesia (The Journal of Indonesian Community Nutrition)*, 9(1), 017-029.

Baroroh, U., Latifah, U., & Hidayah, S. N. (2022). Peningkatan pengetahuan dan keterampilan remaja tentang gizi isi piringku sebagai upaya menurunkan triple burden malnutrition. *Jurnal Masyarakat Mandiri,* 6(5), 3561-3571.

Godatwar, P., Khan, N., & Sevatkar, B. (2015). Epidemiological study of junk food habit as a risk factor for grahani dosha. *Journal of Ayurveda Physicians & Surgeons (JAPS)*, 2(1).

Hidayati L.S., Kusumawati, E., Lusiana, N., & Mustika, I. (2019). Anemia defisiensi besi dan indeks massa tubuh terhadap siklus menstruasi remaja putri. *Jurnal Kesehatan*, 12(1), 30-40.

Jamaluddin, Z., Choufani, J., Masterson, A. R., Hoteit, R., & Sahyoun, N. R. (2020). *A Community-Based School Nutrition Intervention Improves Diet Diversity and School Attendance in Palestinian Refugee Schoolchildren in Lebanon.* Current developments in nutrition, 4(11), 1-9.

[Kemenkes RI] Kementerian Kesehatan Republik Indonesia. (2017). *Panduan Pelaksanaan Gerakan Nusantara Tekan Angka Obesitas (GENTAS)*. Jakarta: Direktorat Jendral Pencegahan dan Pengendelauan Penyakit Kementerian Kesehatan RI.

_____.(2018). *Hasil Utama Riset Kesehatan Dasar 2018.* Jakarta: Balai Penelitian Pengembangan Kementerian Kesehatan RI.

Mokoginta, F.S., Budiarso, F., & Manampiring, A.E. (2016). Gambaran pola asupan makanan pada remaja di Kabupaten Bolaang Mongondow Utara. *Jurnal E-Biomedik*, 4(2), doi. org/10.35790/ebm.v4i2.14618.

Najahah, I. (2018). Pengaruh Penyuluhan Gizi Seimbang pada Remaja Putri terhadap Tingkat Pengetahuan Remaja Putri di Pondok Pesantren Islam Nw Penimbung. *Media Bina Ilmiah*. 12 (10), 467-474. doi.org/10.33758/mbi. v12i10.79

Ningsih, T.H.S. (2018). Pengaruh Edukasi Pedoman Gizi Seimbang terhadap Pengetahuan dan Sikap Remaja Putri Kuru. Journal Of Midwifery Science. 2 (2), 90-99.

Notoadmojo, S. (2013). *Pendidikan dan Perilaku Kesehatan*. Jakarta: Rineka Cipta.

Nugraha, N.P., Ilmi A.A., & Patima. (2021). Metode Edukasi Gizi Berbasis Komunitas Pada Anak Usia Sekolah: Telaah Literatur. *Alauddin Scientific Journal of Nursing*. 2(2), 118-134.

Puspitaningrum, W., Agusyahbana, F., Mawarni, A., & Nugroho, D. (2017). Pengaruh media booklet terhadap pengetahuan dan sikap remaja putri terkait kebersihan dalam menstruasi di Pondok Pesantren Al-Ishlah Demak Triwulan II Tahun 2017. *Jurnal Kesehatan Masyarakat (Undip)*, 5(4), 274-281.

Rahma, A., Nuradhiani, A. (2019). Peningkatan pengetahuan tentang pemberian asi eksklusif dan pendampingan balita gizi buruk dan stunting di Gresik, Jawa Timur. Ghidza Media Jurnal, 1(1), 63-71. http://dx.doi.org/10.30587/ ghidzamediajurnal.v1i1.1081

Soekirman. (2011). Taking the Indonesian nutrition history to leap into betterment of the future generation: development of the Indonesian Nutrition Guidelines. *Asia Pacific Journal of Clinical Nutrition*, 20(3), 447-451.

Susanti, Y., Briawan, D., Martianto, D. (2016). Suplementasi besi mingguan meningkatkan hemoglobin sama efektif dengan kombinasi mingguan dan harian pada remaja putri. *Jurnal Gizi Pangan*. 11(1), 27-34.

Veriza. E. dan Riyadi. S. (2018). Hubungan Pengetahuan dan Sikap dengan Motivasi Ibu Hamil tentang Pemeliharaan Kesehatan Gigi dan Mulut di Puskesmas Putri Ayu Kota Jambi. *Jurnal Bahan Kesehatan Masyarakat*. 2(1): 1-5.

Walilulu, S.H., Ibrahim, D. dan U, M.T. (2018) Pengaruh Edukasi terhadap Tingkat Pengetahuan dan Upaya Pencegahan Stunting AnakUsia Balita. *Jurnal Penelitian Kesehatan Suara Forikes*, 9(4), 269-272.

Wasaraka, Y.N.K. (2021). Tingkat pengetahuan remaja putri mengenai stunting di Akademi Keperawatan RS Marthen Indey. *Healthy Papua-Jurnal keperawatan dan Kesehatan*. 4(2), 244-248.

Wulandari, A. (2014). Karakteristik pertumbuhan perkembangan remaja dan implikasinya terhadap masalah kesehatan dan keperawatannya. *Jurnal Keperawatan Anak*, 2(1), 39-43.