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The Effect of Cognitive-Social Theory-Based Nutrition Education on Self-Efficacy, Motivation, Knowledge, and Breakfast Practice of Anemic Female Adolescents in Luwu Regency, South Sulawesi Province

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ABSTRACT

The cognitive-social theory (SCT) is often used as a principle of health behavior change that is influenced by cognitive, behavioral, and environmental factors. Therefore, this study aimed to determine the effect of nutrition education based on SCT on self-efficacy, motivation, knowledge, and breakfast practice of female adolescents with anemia in Luwu Regency, South Sulawesi Province. This study used a quasi-experimental method with a pre-post test and control group design. The sample inclusion criteria included female adolescents aged 10-18 years from 4 Junior High Schools. A total of 62 samples were obtained and grouped randomly at the location. The intervention group (n=31) was given a module and nutrition education for 90 minutes with a total of 12 meetings, and the participants' parents were involved in discussions, while the control (n=31) was given 12 types of leaflets every week for 3 months. Questionnaires, Food Frequency, and 24-hour recall (3 days before and after education) were analyzed using the SPSS software with independent-sample T-test, paired-sample T-test, Wilcoxon, Mann Whitney, and Chi-square. There was a significant difference in self-efficacy, motivation, knowledge, and breakfast practice after the administration of nutrition education based on cognitive-social theory in the intervention group (p=0.000). Based on these results, there were differences in these parameters after nutrition education between both groups (p=0.000). Nutrition education based on SCT has a positive effect on changes in self-efficacy, motivation, knowledge, and breakfast practice of anemic adolescents. Furthermore, more support is needed from teachers, parents, and stakeholders in improving the health of adolescents.

1. Introduction

The World Health Organization (WHO) in 2019 showed that the prevalence of anemia among women in the childbearing age, ranging from 15 to 49 years, was estimated at 29.9% [1]. Furthermore, the 2018 Basic Health Research report showed that the prevalence of the condition in Indonesia (15-24 years) was 32% [2]. The main causes of anemia include deficiency in iron [3] and macronutrients [4], as well as infectious diseases, and breakfast habits [5]. Geographical location has also been reported to affect its incidence, such as in mountain communities [6], where the consumption of plant-based sources is more dominant [7], [8]. Adolescents with the habit of skipping breakfast have a higher risk of suffering from anemia [9]. Based on several studies, adolescence is a period of physical, cognitive, and psychosocial change that affects the body's nutritional needs [10]. The act of skipping breakfast tends to lead to the excessive consumption of unhealthy foods, thereby causing the lack of protein, fruits, and vegetables [11]. Previous studies also revealed that practicing this habit before school activities can cause anemia [12], [13] due to the lack of examples from parents, unavailability of breakfast, and waking up late [14]. Factors, such as the distance between home and school, the stability of household food availability, and economic accessibility also play a role in the occurrence of the habit. Individuals who regularly eat breakfast have healthier behavior [15]. Furthermore, changes in health behavior are influenced by the environment as well as cognitively through efforts to increase knowledge and practice using nutrition education programs [16].

In previous studies, providing nutrition education has been proven to improve knowledge and attitudes among adolescents. The cognitive-social theory of nutrition education states that behavioral, cognitive, and environmental factors contribute to changes in health attitudes. The theory is often used as a principle for understanding behavior where these factors interact systematically for changes. A total of 4 out of the 12 related studies show, a significant decrease in body mass index and decrease in fat in the intervention group compared to the control among obese adolescents [17]. A nutrition education model based on cognitive-social theory on a small island in Makassar City had a positive effect on the behavior change of undernourished young females in 2021 [18]. Therefore, this study aimed to determine the effect of nutrition education based on cognitive-social theory on self-efficacy, motivation, knowledge, and breakfast practices of anemic adolescents in Luwu Regency.

2. Method and Material

This study was carried out in Luwu Regency, South Sulawesi Province, Indonesia, using a quasi-experimental method with pre-test, post-test, and control group design. The sample size was calculated based on variables used in previous studies variables with a drop-out rate of 20%. A total of 62 participants were selected using the simple random sampling method, and they were equally divided into two groups, namely intervention and control. The inclusion criteria were anemic female adolescents aged 11-18 years (Hb<12 mg/dL) who were active in school. This study used 4 schools, including The One Roof State Junior High School 1 in Bonglo and Sanggalangi as well as State Junior High School 1 and 4 in Bastem. The intervention group was given nutrition education in the form of a module, "Aksi Bergizi: Hidup Sehat Sejak Sekarang Untuk Remaja Kekinian (ISBN 978-602-416-650-2) UNICEF" (Nourishing Action: Healthy Living From Now on For Today's Adolescents (ISBN 978-602-416-650-2) UNICEF), which was combined with "Menjadi Remaja Kekinian yang Sehat dan Aktif untuk Mengatasi Gizi Kurang yang memiliki HAKI (Hak Cipta) dengan nomor 000232421" (Becoming Healthy and Active Today's Adolescents to Overcome Malnutrition) with IPR (Copyright) of 000232421, followed by discussion with parents. Meanwhile, the control group in this study was given 12 types of leaflets every week for 3 months.

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This study was carried out based on the approval of the Ethics Committee of Universitas Hasanuddin with reference Number 8594/UN4.14.1/TP.01.02/2022. Data were collected with questionnaires on self-efficacy, motivation, and knowledge using Likert (>48 for good, 40-48 for moderate, and <40 for less), Likert (>64 for good, 48-64 for moderate, and <48 for less), and Guttman (>80% for good, 60-80% for moderate, and <60% for less) scales, respectively. Meanwhile, breakfast practices were assessed based on the Ministry of Health Regulation No. 28 of 2019 on nutrient adequacy ratio (NAR) recommended for Indonesian society. The consumption level was placed in the good category when respondents consume 315-630 kcal or 15-30% of the daily recommended energy intake of female adolescents aged 10-18 years, namely 2100 kcal. It was considered less and more when respondents consume <15% and >30% of NAR, respectively.

The instruments in this study were a questionnaire, 24-hour food recall (3 days before and 3 days after education), and a hemoglobin level measurement tool (Easy Touch GCHb). Furthermore, data were collected before and after the nutrition education intervention, and the experiment lasted for 3 months from August to November 2022. Nutrition education was given in the intervention group once a week for 90 minutes in 12 meetings, and leaflets were shared once a week in the control. The goal was to compare the intervention group and the control after the nutrition education. All data obtained from the questionnaire and 3x24-hour recall were then extracted and analyzed using the SPSS program. A normality test was carried out, followed by analyses using an independent-t test, paired-t test as well as Wilcoxon, Mann-Whitney, and Chi-square tests.

3. Result

Table 1 shows that based on age, 82.2% of respondents were aged 13-15 years old (51). Furthermore, the highest educational level of 22 fathers (34.4%) and 25 mothers (39%) was Junior High School. Based on occupation, 55 fathers (88.7%) were farmers and 52 mothers were housewives (83.9%).

Table 1. Frequency Distribution of Respondents' Characteristics

Respondents' Characteristics	Intervention n = 31 people		Control n = 31 people		Total n = 62 people		p-value
	n	%	n	%	n	%	
Age group							
10-12	6	19.4	3	9.7	9	14.5	
13-15	23	74.2	28	90.3	51	82.2	0.000
16-18	2	6.5	0	0	2	3.1	
Father's Education							
No School	3	9.7	2	6.5	5	8.1	
Elementary School	5	16.1	7	22.6	12	19.4	0.478
Junior High School	10	32.3	12	38.7	22	35.5	
Senior High School	11	35.5	10	32.3	21	33.9	
Higher Education	2	6.5	0	0	2	3.2	
Father's Occupation							
Civil Servant	1	3.2	0	0	1	1.6	
Seller	3	9.7	0	0	3	4.8	0.000
Employee	3	9.7	0	0	3	4.8	
Farmer	24	77.4	31	100.0	55	88.7	
Mother's Education							
No School	1	3.2	0	0	1	1.6	
Elementary	10	32.2	9	29.0	19	30.6	

School								
Junior High School		10	32.2	15	48.4	25	40.3	0.905
Senior High School		9	29.0	7	22.6	16	25.8	
Higher Education		1	3.2	0	0	1	1.6	
Mother's Occupation								
Civil Servant		1	3.2	0	0	1	1.6	
Seller		1	3.2	2	6.5	3	4.8	0.000
Housewife		25	80.6	27	87.1	52	83.9	
Farmer		4	12.9	2	6.5	6	9.7	

Source: Primary Data, 2022
Chi-SquareTest

Table 2 shows that there was a difference in Hb levels in the intervention group after the nutrition education (p=0.000) with an increase of 1.84 mg/dL, while the control experienced a decrease of 0.02 mg/dL (p=0.851). The analysis showed that there was no difference between the group before the intervention p=0.921 (p>0.05), but variations were observed after the education with p-value= 0.000 (p<0.05).

Table 2. Hb Levels Before and After Nutrition Education

Group	Before (mg/dL)	After (mg/dL)	Difference (Δ)	p-value
Intervention	11.03 ± 0.60	12.87 ± 0.56	↑1.84 ± 0.70	0.000*
Control	11.05 ± 0.51	11.03 ± 0.45	↓0.02 ± 0.56	0.851*
P-Value	0.921**	0.000***	0.000***	

Source: Primary Data, 2022
* Paired T-Test
**Mann Whitney Test
***Independent T-Test Test

Based on Table 3, there was a significant difference in self-efficacy (p=0.000) after nutrition education in the intervention group with pretest and posttest scores of 36.58 and 52.12, respectively. The self-efficacy level improved from the "less" to the "good"category with an increase of 15.54 points. Furthermore, there was no difference in self-efficacy (p=0.226) after giving leaflets in the control group with pretest and posttest scores of 36.45 and 37.41, respectively, which were both in the "less" category. The analysis showed that there was no significant difference before the intervention with p=0.913 (p>0.05), but variations were observed after the education with p=0.000 (p<0.05).

Table 3. Differences in Respondents' Self-Efficacy Before and After Nutrition Education

Group	Before (Score)	After (Score)	Difference (Δ)	p-value
Intervention	36.58 ± 5,20	52.12 ± 3.13	↑15.54 ± 4.89	0.000*
Control _	36.45 ± 3,94	37.41 ± 5.93	↑0.96 ± 4.35	0.226**
P-Value	0.913***	0.000****	0.000****	

Source: Primary Data, 2022
* Wilcoxon Test
**Paired Sample T-Test
***Independent Sample T-Test
**** Mann-Whitney Test

Table 4 shows a significant difference in motivation (p=0.000) after nutrition education in the intervention

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group with pretest and posttest scores of 46.38 and 65.09, respectively. The motivation improved from the “less” to "good" category with an increase of 18.71 points. In the control group, there was no difference (p=0.871) after the leaflets were given with pretest and posttest scores of 45.77 and 45.64, respectively, which were both in the "less" category with a decrease of 0.13 points. The analysis showed that there was a significant difference before the intervention with p=0.396 (p>0.05), but variations were observed after the education with p=0.000 (p<0.05).

Table 4. Differences in Respondents' Self-Motivation Before and After Nutrition Education

Group	Before (Score)	After (Score)	Difference (Δ)	p-value
Intervention	46.38 ± 4.13	65.09 ± 2.31	↑18.71 ± 4.50	0.000*
Control	45.77 ± 3.38	45.64 ± 4.77	↓0.13 ± 4.37	0.871**
P-Value	0.396***	0.000***	0.000***	

Source: Primary Data, 2022
* WIicoxon Test
**Paired Sample T-Test
*** Mann Whitney Test

Based on Table 5, there was a significant difference in knowledge (p=0.000) after nutrition education in the intervention group with pretest and posttest scores of 5.00 and 8.97, respectively. The knowledge of the participants improved from the “less” to good" category with an increase of 3.96 points. Meanwhile, in the control group, there was no difference knowledge (p=0.883) after providing leaflets with pretest and posttest scores of 5.38 and 5.41, which were both in the "less" category with an increase of 0.03 points. The analysis showed that there was no significant difference between both groups before the intervention with p=0.294 (p>0.05), but variations were observed after the education with p=0.000 (p<0.05).

Table 5. Differences in Respondents' Knowledge Before and After Nutrition Education

Group	Before (Score)	After (Score)	Difference (Δ)	p-value
Intervention	5.00 ± 1.67	8.97 ± 7.52	↑3.96 ± 1.35	0.000*
Control	5.38 ± 14.75	5.41 ± 15.86	↑0.03 ± 1.07	0.883*
P-Value	0.294**	0.000**	0.000**	

Source: Primary Data, 2022
*WIicoxon Test
**Mann Whitney Test

Table 6 shows a significant difference in breakfast practice (p=0.000) after nutrition education in the intervention group with pretest and posttest calorie intake of 281.90 kcal <15% NAR and 592.63 kcal = 15-30% NAR, respectively. The intake improved from the “less” to the “good” category with an increase of 310.73 calories. Furthermore, there was no significant difference (p=0.133) after providing a leaflet to the control group with pretest and posttest scores of education 283.99 kcal <15% NAR and 292.33 kcal <15% NAR, respectively, which were both in the "less" category with an increase of 8.33 calories. The analysis showed that there was no difference (p=0.916) between the groups before the intervention, but variations were observed after the education (p=0.000).

Table 6. Differences in Breakfast Practices Before and After Nutrition Education

Group	Before (Score)	After (Score)	Difference (Δ)	p-value
Intervention	281.90 ± 30.38	592.63± 62.19	↑310.73 ± 67.98	0.000*
Control	283.99 ± 27.70	292.33 ± 32.79	↑8.33 ± 30.03	0.133**
P-Value	0.916***	0.000***	0.000***	

Source: Primary Data, 2022
*WIicoxon Test
**Paired Sample T-test
*** Mann Whitney Test

4. Discussion

4.1 Self-Efficacy

This study shows a significant difference in self-efficacy before (36.58) and after (52.12) 12 weeks of nutrition education based on cognitive-social theory in the intervention group (p=0.000), while there was no significant difference among the control (p=0.226). This is in line with [19] which provided a similar intervention to overweight female adolescents with snacking habits in Junior High Schools in Makassar for 3 months. The program involved parents, and this had a positive effect on increasing self-efficacy to reduce these habits. [18] also found that the application of nutrition education based on cognitive-social theory for 12 weeks caused an increase in this parameter (p=0.000) among undernourished female adolescents on islands in Makassar. This was because respondents received social support from their school and family environment.

The increment in self-efficacy has been reported to have an influence on individual commitment. An observational cohort study among 187 high school students in the USA showed that low physical activity was caused by decrease in self-efficacy. Meanwhile, adolescents with high levels were more likely to act based on the goal of increasing physical activity [20]. Several studies reported that self-efficacy was related to breakfast consumption, and it was a predictor among students in a cross-sectional study in Iran by [21]. [22] concluded that it was the strongest motivator for the transition stage of changing behavior from unreadiness to readiness to change habits among adolescents in elementary school in Iran. A previous study in Turkey revealed that the level of self-efficacy and health literacy of adolescents significantly explained health behavior. This indicated that it necessary to improve the levels of these variables to develop healthy attidude [23].

This study also showed that an increase in self-efficacy was caused by social support from the school in the form of compliance reminders in the continuity of the nutrition education program and school facilities. It is also influenced by the involvement of families, specifically mothers as the closest person to them. These findings are consistent with the theory that self-efficacy is a belief and confidence in one's ability to do something based on expectations. Several studies revealed it was affected by various factors, such as social support [24] and situational awareness [25]. Bandura revealed that self-efficacy was formed by culture, gender, nature, external incentives, individual status, environmental role, and self-ability. Nutrition education based on the cognitive-social theory program was believed to improve the self-efficacy of school-aged girls with macro, micro, and overweight problems.

4.2 Motivation

In this study, there was a significant difference in self-motivation before (46.38) and after (65.09) 12 weeks of nutrition education based on cognitive-social theory in the intervention group (p=0.000), while there was no significant difference (p=0.871) among the control. [18] carried out a study on 92 undernourished female adolescents and reported that educating them significantly increased breakfast motivation (p=0.000). Furthermore, the increase was due to respondents having an interest and ability to change their behavior, after the benefits and negative effects of skipping breakfast were explained. The interactive classroom environment among respondents had a positive effect on emotional attitude and willingness to change.

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These findings are consistent with other studies related to motivation, breakfast behavior, and academic performance. [26] among Tionhoa students showed that self-motivation played an important role in changing breakfast consumption habits, and this affected academic performance (p=0.004). Nutrition education using modules can effectively convey health messages and impressions, and interviews have the ability to increase intrinsic motivation to strengthen health behavior change among obese female students [27].

The cognitive-social theory was closely related to motivation, where goals and self-efficacy became internal processes in creating self-motivation [28]. Some factors influencing this variable include care attitude, ability, interest [29], needs, trust, environment, and knowledge. Furthermore, Bandura revealed that motivation is the fundamental reason for an action, involving biological, emotional, social, cognitive, and hope to stimulate behavior. It was also defined as a force to behave in a specific way to achieve a goal [30]. Each individual has different motivations for achieving their goals.

4.3 Knowledge

Based on the results, there is a significant difference in knowledge before (5.00) and after (8.97) nutrition education based on social cognitive theory for 3 months in the intervention group (p=0.000), but no significant difference was observed (0.883) among the control group. The increase in knowledge of respondents was caused by their interest in listening well to every nutrition education meeting, as evidenced by attendance that was always above 90%. Respondents also had a good understanding of the benefits of breakfast and its effect. Moreover, the involvement of mothers as breakfast providers became a supporting factor from the environment. [18] concluded that the increase in knowledge in changing eating habits was supported by the environment to foster strong self-efficacy for behavioral change. A quasi-experimental study in England evaluated the effect of a 7-minute nutrition education intervention (30 minutes per week) and found a significant increase among adolescent swimmers with a p-value of 0.004 [31]. Empirical studies on 411 faculties at the largest university in Saudi Arabia showed that social-cognitive theory contributed significantly to various educational activities in increasing knowledge [32]. An intervention on healthy breakfast education for 58 Elementary School students in Purwokerto was reported to also cause an increasd (p=0.000) [33]. One of the attractions of nutrition education was the use of audiovisual media by providing pictures and sound, which effectively improvrd knowledge of balanced nutrition, as observed among 44 Elementary School students in Semarang [34].

Knowledge is the result of learning and it occurs after observing an object (Notoatmodjo, 2012) [35]. The ability to understand concepts, principles, and information related to nutrition, food, as well as its relationship to health is known as nutrition knowledge [36]. Providing regular education using modules and leaflets can provide additional insights for adolescents. Furthermore, modules in the form of books provide more information, are durable, easy to store, and read repeatedly.

4.4 Breakfast Practice

This study found a significant difference in breakfast practices before (281.99 kcal) and after (592.63 kcal) 3 months of nutrition education based on cognitive-social theory in the intervention group (p=0.000), but there was no significant difference among the control (p=0.133). The nutritional intake consumed at breakfast contributed to changes in the Hb levels of anemic female adolescents. This is consistent with several studies on malnutrition in female adolescents in Makassar, where increase in breakfast practice after the intervention was influenced by increased self-efficacy, motivation, knowledge, and strong environmental support in changing habits before school [18]. Another study with a sample of 100 medical students living in dormitories in Iran who were given booklets, posters, and reminders through SMS for 4

months supported the assumption that cognitive social theory-based interventions caused a significant increase in breakfast consumption frequency (p=0.001) [37].

These findings are consistent with several studies that nutrition education affected attitudes, and behaviors regarding breakfast and vegetable consumption. Furthermore, nutrition education was reported to be more effective compared to video media [38]. [39] used similar intervention based on cognitive-social theory on overweight and obese female adolescents for 7 months. The results showed that eating habits and psychological factors increased significantly (p=0.001), but there was no difference in body mass index and waist circumference. It was proven that increasing knowledge through nutrition education affected breakfast behavior, and these changes lasted longer. A previous study revealed that the failure of healthy breakfast practices in adolescents was caused by the unavailability of good meals [40], where most of respondents were housewives but active on the farm in the morning.

Breakfast is a crucial activity in starting daily activities, and contributed 15-30% of daily calorie intake. The breakfast practice in this study was the amount of nutrition consumed by respondents in the morning, which was the number of calories needed (15-30%) in a day. Several studies revealed that the habit of skipping breakfast has an impact on nutrition intake. Rohmah stated there was a significant (p=0.000) relationship between breakfast habits and the nutritional status of Junior High School students [41]. Furthermore, the change in these practices among respondents was due to increased knowledge, and understanding of portion sizes, the benefits, and the impact of skipping breakfast. Respondents received motivation from the school and family environment, allowing them to develop strong self-efficacy and motivation for changing healthy eating habits.

5. Conclusion

Self-efficacy, motivation, knowledge, and breakfast practice in the intervention group experienced significant changes after nutritional education based on social-cognitive theory, while there were no changes in the control group. Furthermore, there were significant differences between both groups in these variables after the education was given. Nutrition education is expected to be carried out on an ongoing basis by teachers, parents, the community, and related stakeholders. Female adolescents are also expected to continue to apply a healthy eating pattern to the modules and leaflets given to maintain a healthy lifestyle.

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