

THE EFFECT OF NUTRITION EDUCATION ABOUT ANEMIA WITH HEALTHY MILLENNIAL CARD MEDIA AND *THINK, PAIR, SHARE* ON THE KNOWLEDGE AND ATTITUDES OF ADOLESCENT GIRLS

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Abstract

Background: A lack of knowledge about anemia condition is a significant factor behind the high prevalence of anemia. Increasing knowledge and attitudes can be achieved through interactive educational media. This study aims to analyze the impact of nutrition education about anemia using the Healthy Millennial Card (KMS) media and the Think, Pair, Share (TPS) method on the knowledge and attitudes of adolescent girls at SMP Muhammadiyah 14 Makassar. **Methods:** This research employed a quasi-experimental design with a two-group pretest-posttest approach without a control group. The study population consisted of 48 female students, with a sample size of 36 students divided into two intervention groups (KMS and TPS), each with 18 students, selected through purposive sampling. Data were collected using pretest-posttest questionnaires and analyzed using paired t-test and independent t-test with a statistical significance level of $p < 0.05$. **Results:** The results showed that both education using KMS media and the TPS method significantly increased the knowledge and attitudes of adolescent girls regarding anemia ($p = 0.001$ for both variables in both groups). However, no statistically significant difference was found in the improvement of knowledge ($p = 0.713$) or attitudes ($p = 0.360$) between the KMS and TPS groups. **Conclusion:** Both educational methods, Healthy Millennial Card (KMS) and Think, Pair, Share (TPS), proved effective and have comparable efficacy in improving the knowledge and attitudes of adolescent girls about anemia. These findings indicate that KMS and TPS are viable and practical intervention options to be implemented in schools or health centers as a strategy for anemia prevention among adolescents.



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Introduction

Anemia is a common health condition characterized by a decrease in blood hemoglobin levels, resulting in decreased oxygen-carrying capacity (1). It affects approximately 25% of the world's population, with women and children bearing the heaviest burden (2). Numerous conditions, such as genetic problems, infections, chronic illnesses, and

nutritional inadequacies, can result in anaemia (2,3). Anemia is a condition characterized by low hemoglobin levels in the blood, typically below 12.5-17.0 g/dL. It can be caused by factors affecting red blood cell morphology, production, replacement, loss, or destruction. Anemia is also characterized by low hemoglobin levels in the blood, typically below 12.5-17.0 g/dL, and can trigger symptoms such as weakness, fatigue, lethargy, and difficulty concentrating. Other symptoms that may arise include dizziness and pallor of the eyelids, lips, tongue, skin, and palms (4).

In Indonesia, anemia remains a major health issue among adolescents, especially adolescent girls. Adolescent girls are particularly vulnerable to anemia due to several factors, such as increased iron needs resulting from rapid growth, blood loss during menstruation, inadequate iron intake, poor nutritional status, and socioeconomic conditions (5). The prevalence of anemia among adolescent girls shows a worrying increase. Data from the Basic Health Research indicate that anemia cases among girls aged 15-24 years from 18.4% in 2013 to 32% in 2018 (6). Moreover, between 2013 and 2018, the overall percentage of adolescent girls with anemia in Indonesia increased from 37.1% to 48.9% (7). Although there was a slight decrease to 16.2% in 2023 according to the Indonesian Health Survey data (8), the previous surge in prevalence highlights the urgency of addressing this issue. The implications of the rising prevalence of anemia among adolescent girls are vast, including negative impacts on learning performance, concentration, productivity, and potentially affecting reproductive health and future pregnancies (9). A lack of awareness of this condition among adolescents significantly contributes to the high prevalence of anemia.

Increasing knowledge and attitudes of adolescent girls regarding anemia can be achieved through the use of interactive and communicative educational media. One promising method is Think, Pair, Share (TPS). A study exploring the impact of incorporating TPS into project-based learning for education students found that it significantly enhanced their creative thinking skills. This combination involves several elements, including project preparation, pair cooperation, project production, evaluation, and conclusion, all of which contribute to improved creativity among students (10). This method has proven effective in increasing classroom participation, especially for shy students (11), as well as in enhancing attitudes and knowledge about anemia prevention among adolescent girls. This is corroborated by earlier studies that found that the think, pair, share game strategy increases attitudes and knowledge about preventing anaemia in teenage females (P-Value of 0.018, $p < 0.05$) (12).

In addition, innovative educational media such as the Healthy Millennial Card (HMC) also shows great potential. HMC is a new educational game that contains questions about anemia and balanced nutrition (13). The game is played individually by matching question cards with selected answer cards. This card game format is considered appealing to adolescents because of its interactive nature, competitive element (with prizes for winners),

and its ability to enable fun information transfer. A study shows that healthy millennial cards are effective in increasing adolescent girls' knowledge about anemia for 30 minutes with a knowledge score before intervention of 78.6 and 92.9 after intervention, but in this study no comparison was made with other educational methods (14). Studies show that HMC is effective in improving adolescent girls' knowledge about anemia.

Based on the above background, the author is interested in examining the effect of nutrition education about anemia using the Healthy Millennial Card (HMC) and the Think, Pair, Share (TPS) method on the knowledge and attitudes of adolescent girls at SMP Muhammadiyah 14 Makassar. It is hoped that this study can provide further insight into the effectiveness of these two educational methods in addressing the issue of anemia among adolescents.

Materials and Methods

This study employed a *quasi-experimental* design with a *two-group pretest-posttest* approach. This design was chosen to analyze the impact of educational intervention on the knowledge and attitudes of respondents. A control group was not used due to ethical and practical considerations, aiming to provide educational benefits to all participants. To address potential bias and maturation effects, the researchers conducted a thorough *pretest* to establish baseline knowledge and attitudes and to ensure group homogeneity. External influences were minimized by conducting the intervention in a controlled school environment without concurrent similar educational programs.

This study was carried out at SMP Muhammadiyah 14 Makassar from June 12 to July 12, 2024. The study population consisted of 48 seventh- and eighth-grade female students at SMP Muhammadiyah 14 Makassar. The sample comprised 36 female students, divided into two groups (18 students each) for the Healthy Millennial Card (HMC) intervention and the Think, Pair, Share (TPS) intervention. The sample was selected using a *non-probability sampling* technique with the *purposive sampling* method, based on inclusion and exclusion criteria (willing to participate, healthy, in seventh/eighth grade, active, punctual; those absent during the study were excluded). Respondent characteristics (age, grade, parents' education and occupation, income) were measured using a questionnaire. Knowledge and attitudes were assessed through *pretest-posttest* questionnaires. The knowledge questionnaire had three categories: high (>75%), moderate (40-75%), and low (<40%). The attitude questionnaire had two categories: good (>50%) and poor (<50%). Data were collected through *pretest* and *posttest*.

- HMC Group: The intervention used a "Healthy Millennial Card" game containing questions about anemia and balanced nutrition, played individually. Each session lasted about 30 minutes and was facilitated by the researcher.
- TPS Group: The intervention implemented the Think, Pair, Share method, starting with the "Think" phase (individual reflection), followed by "Pair" (paired discussion),

and ending with “Share” (sharing with the larger group). Session duration was adjusted for each phase (approximately 45–60 minutes), with the researcher acting as facilitator.

Data were analyzed using SPSS version 25. Univariate analysis was used to describe characteristics, and bivariate analysis to test differences. The *paired t-test* compared changes within groups, while the *independent t-test* compared improvements between the HMC and TPS groups. Statistical significance was set at $p < 0.05$.

Results

This section presents the findings from the conducted research, focusing on descriptive data of respondent characteristics as well as changes in knowledge and attitude before and after the intervention. Table 1 presents the distribution of the general characteristics of the study respondents, including age, class, parents' education (father and mother), parents' occupation (father and mother), and parents' income.

Table 1. Characteristics of Respondent

Variable	n	%
Age		
12	5	13.8
13	7	19.4
14	17	47.2
15	7	19.4
Class		
VII	17	47.2
VIII	19	52.8
Mother's education		
Elementary School	8	22.2
Junior High School	7	19.4
High School	19	52.8
College	2	5.6
Father's education		
Elementary School	4	11.1
Junior High School	5	13.9
High School	20	55.6
College	7	19.5
Mother's Occupation		
Housewife	28	77.8
Self-Employed	3	8.3
Civil Servant	1	2.8
Other	4	11.1
Father's Occupation		
Self-Employed	23	63.9

Retired	2	5.6
Civil Servant	4	11.1
Other	7	19.4
Income		
<Rp.3.650.000	29	80.6
≥Rp.3.650.000	7	19.4
Total	36	100

Based on Table 1, most respondents are in the 14 – 15year age range, and the majority of respondents are from Class VIII. The majority of respondents' parents have SMA (Senior High School) as their highest education level. These demographic characteristics are relevant because they can influence the level of acceptance and understanding of nutritional education information. For instance, the adolescent age range indicates a specific stage of cognitive and social development, while parents' education level can reflect the home learning environment.

Table 2. Distribution of Knowledge and Attitudes about Anemia in the TPS Group

Category	Pretest		Posttest		<i>P value</i>
	n	%	n	%	
Knowledge					
High	0	0	12	66.7	0.001
Moderate	13	72.2	6	33.3	
Poor	5	27.8	0	0	
Attitude					
Good	8	44.4	18	100	0.001
Poor	10	55.6	0	0	
Total	18	100	18	100	

Based on Table 2, in the TPS group, before the intervention, the majority of respondents (72.2%) had moderate knowledge, and 27.8% had poor knowledge. After the intervention, there was a significant increase, with 66.7% of respondents falling into the high knowledge category, and no respondents remaining in the poor knowledge category. This improvement in knowledge was statistically significant ($p=0.001$). Regarding attitude, before the intervention, 55.6% of respondents had a poor attitude, while 44.4% had a good attitude. After the intervention, 100% of respondents demonstrated a good attitude. This improvement in attitude was also statistically significant ($p=0.001$).

Table 3. Distribution of Knowledge and Attitudes about Anemia in the HMC Group

Category	Pretest		Posttest		P value
	n	%	n	%	
Knowledge					
High	0	0	18	100	0.001
Moderate	11	61.1	0	0	
Poor	7	38.9	0	0	
Attitude					
Good	6	33.3	18	100	0.001
Poor	12	66.7	0	0	
Total	18	100	18	100	

Based on Table 3, in the TPS group, before the intervention, the majority of respondents (61.1%) had moderate knowledge, and 38.9% had poor knowledge. After the intervention, there was a significant increase, with 100% of respondents falling into the high knowledge category, and no respondents remaining in the poor knowledge category. This improvement in knowledge was statistically significant (p=0.001). Regarding attitude, before the intervention, 66.7% of respondents had a poor attitude, while 33.3% had a good attitude. After the intervention, 100% of respondents demonstrated a good attitude. This improvement in attitude was also statistically significant (p=0.001).

Table 4. Results of the Analysis on the Differences in Knowledge and Attitudes of Adolescent Girls about Anemia Before and After the Intervention Using HMC and TPS Media

Variable		HMC Group (n=18) Mean ± SD	TPS Group (n=18) Mean ± SD	P
Knowledge	Pretest	41,3±10,8	42,2±9,51	
	Posttest	91,4±5,3	75,1±6,79	
	Δ	50±9,74	32,8±10,4	0,713
	p ^c	0,001	0,001	
Attitude	Pretest	46,8±10,4	51,4±6,27	
	Posttest	79,2±6,44	72,8±6,08	
	Δ	32,3±11,6	21,3±8,7	0,360
	p ^c	0,001	0,001	

*SD: Standar deviasi, Δ: Selisih pretest-posttest, p^c: Paired t-test, p: Independen t-test

Table 4 presents the results of the analysis on the differences in knowledge and attitudes of adolescent girls regarding anemia before and after being given interventions using two types of media, namely HMC (Kartu Menu Sehat or Healthy Menu Card) and TPS (Think Pair Share). For the knowledge variable, the HMC group showed an increase in the

average score from 41.3 ± 10.8 in the pretest to 91.4 ± 5.3 in the posttest, with a mean difference of 50 ± 9.74 points. Meanwhile, the TPS group also showed an improvement from 42.2 ± 9.51 to 75.1 ± 6.79 , with a mean difference of 32.8 ± 10.4 points. Both groups demonstrated statistically significant improvements based on the paired t-test ($p = 0.001$). However, the independent t-test showed that the difference in knowledge improvement between the HMC and TPS groups was not statistically significant ($p = 0.713$), although the absolute increase was higher in the HMC group. For the attitude variable, the HMC group also showed a significant increase from a pretest average score of 46.8 ± 10.4 to 79.2 ± 6.44 in the posttest, with a mean difference of 32.3 ± 11.6 points. The TPS group experienced an increase from 51.4 ± 6.27 to 72.8 ± 6.08 , with a difference of 21.3 ± 8.7 points. These increases were statistically significant ($p = 0.001$) in both groups. However, the comparison between the HMC and TPS groups also did not show a statistically significant difference ($p = 0.360$).

DISCUSSION

A significant increase in knowledge was observed in both intervention groups. In the KMS group, the average knowledge score rose dramatically from 41.3 ± 10.8 on the *pretest* to 91.4 ± 5.3 on the *posttest*. A similar increase was seen in the TPS group, with the average knowledge score increasing from 42.2 ± 9.51 to 75.1 ± 6.79 . This increase was highly significant in both groups ($p = 0.001$). These findings are consistent with various literature supporting the effectiveness of educational interventions in improving health knowledge. The improvement in the KMS group can be attributed to the interactive card game format, which is engaging for adolescents, creating an enjoyable learning environment, reducing boredom, and increasing students' active engagement in the information acquisition process. This is in line with Styaningrum and Metty (2021) research which shows that the mean knowledge score of adolescent girls before the KMS intervention was 78.6 and 92.9 after the intervention. Material presented as card-based questions and answers enables the structured and easily digestible transfer of information, promoting repetition that is essential for the internalization of knowledge.

Meanwhile, the increase in knowledge in the TPS group is in line with constructivist learning theory, in which students actively build their knowledge through social interaction and reflection. The TPS method encourages individual thinking (*Think*), discussion with peers (*Pair*), and sharing ideas publicly (*Share*). This collaborative process enables students to clarify understanding, address misconceptions, and reinforce received information, especially for students who tend to be shy or less active in regular class discussions. These findings are supported by previous studies showing that the *think, pair, share* strategy can increase knowledge about anemia prevention among adolescent girls. These results align with previous research that found that the think, pair, share (TPS) game method significantly

increased knowledge and behavior regarding anemia prevention in adolescents ($P < 0.005$) (16).

In addition to knowledge, the interventions also significantly influenced adolescent girls' attitudes toward anemia. In the KMS group, the average attitude score increased from 46.8 ± 10.4 in the *pretest* to 79.2 ± 6.44 in the *posttest*. In the TPS group, the average attitude score also increased from 51.4 ± 6.27 to 72.8 ± 6.08 . This attitude improvement was also statistically significant in both groups ($p = 0.001$). The increase in attitude indicates that the information delivered through both educational media not only improved cognitive aspects (knowledge) but also influenced affective aspects (attitude). The formation of attitude often follows an emotional response or evaluation of an object or information (17). When adolescents receive information about anemia interactively and in a relevant way, they are more likely to develop a positive view and awareness of the importance of prevention. KMS media, with its fun game format, may make the topic of anemia feel lighter and more interesting, thus fostering a positive attitude. Similarly, discussions in the TPS method allow participants to hear various perspectives and realize the personal relevance of the information, which can strengthen proactive attitudes toward health. Previous studies have also confirmed that cooperative learning models like TPS can positively influence students' social attitude (18).

Although both interventions showed significant individual improvements in knowledge and attitude, results of the *independent t-test* showed that there was no significant difference in the increase of knowledge ($p = 0.713$) or attitude ($p = 0.360$) between the KMS and TPS groups. This indicates that both educational methods are comparably effective in achieving knowledge and attitude improvements. Although the KMS group showed a slightly higher absolute average increase in knowledge (difference $\Delta 50$ vs 32.8) and attitude (difference $\Delta 32.3$ vs 21.3), these differences did not reach statistical significance. This may be due to various factors, including the relatively small sample size or the possibility that both methods are indeed equally suitable for adolescent populations in the context of anemia education. However, these findings contrast with other studies that found certain learning models to be more effective than TPS, such as the *Problem Based Learning* (PBL) model, which showed higher average *posttest* scores than TPS in mathematics lessons (19). Such differences in findings may be explained by factors such as differing subject matter contexts (health education vs. mathematics), specific student characteristics, learning preferences, prior experiences, as well as differences in intervention duration and measurement instruments. For example, the PBL model may require a longer implementation period to demonstrate its full effectiveness compared to the short intervention sessions used in this study.

This study has several limitations that should be considered when interpreting the results. First, the *quasi-experimental* design without a control group limits the ability to

attribute changes exclusively to the intervention. Although a *pretest* was used to measure baseline conditions and homogeneity between groups was assumed, confounding factors (such as maturation effects or uncontrollable external events during the study period) cannot be entirely ruled out as causes for the changes in knowledge and attitude. Second, the relatively short intervention duration may not be sufficient to evaluate the long-term impact of both educational methods. Changes in knowledge and attitude measured in the short term may not persist over a longer period. Based on the identified limitations, several suggestions can be made for future research. Subsequent studies are recommended to include a control group that does not receive the intervention. To evaluate long-term impact, the study duration should be extended, at least 8 weeks, or incorporate *follow-up* studies several months after the intervention. Additionally, future research should add measurements of behavioral variables (such as the frequency of iron tablet consumption, dietary patterns as sources of iron) to provide a more comprehensive understanding of the effectiveness of educational programs.

Conclusion

This study aims to analyze the impact of nutrition education about anemia using the Healthy Millennial Card (KMS) media and the Think, Pair, Share (TPS) method on the knowledge and attitudes of adolescent girls. The main findings show that both intervention methods, KMS and TPS, are significantly effective in improving the knowledge and attitudes of adolescent girls regarding anemia. This indicates that these two interactive learning approaches successfully enhance health literacy in the target population. Specifically, no significant differences were found in the improvement of knowledge or attitudes between the group receiving education with KMS and the group receiving education with TPS. The practical implications of these findings are highly important: both KMS and TPS are viable and effective intervention options for various institutions seeking to improve adolescent girls' health literacy related to anemia. These methods can be concretely implemented in schools as part of health curricula or extracurricular programs, in community health centers (puskesmas) as part of adolescent health promotion programs, or in community-based programs targeting adolescent health. For example, teachers or health workers can use the KMS game in brief educational sessions to engage students' attention, or adapt the TPS method for in-depth group discussions in class or during community meetings.

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