Behavior Modification's Impact on Preventing Iron-Deficiency Anemia among Elementary School Students in Mueang Yasothon District, Yasothon Province, Thailand

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DOI: https://doi.org/10.52939/ijg.v20i10.3651

Abstract

The purpose of this quasi-experimental research was to study the outcomes of a behavior modification program aimed at preventing iron deficiency anemia among primary school students in schools under the jurisdiction of Yasothon Municipality. The sample group consisted of two groups of 50 participants each, comprising an experimental group that received the program and a comparison group that underwent the standard program. Data were collected from both groups twice, before and after the intervention, between October 1, 2023, and February 29, 2024. The data were analyzed using statistical software, with a significance level set at 0.05. The independent t-test was employed to compare mean values between the two independent groups, and the paired t-test was utilized to assess mean differences within the groups. The results indicated that the hemoglobin concentration, knowledge of anemia, attitude towards anemia prevention, participation in anemia prevention, social support for anemia prevention, and iron-deficiency anemia prevention behavior of elementary school students in the intervention group were significantly higher than those in the comparison group at the 0.05 significance level. Therefore, the intervention program on iron-deficiency anemia prevention behavior in elementary school students was deemed effective according to the objectives set.

Keywords: Behavior to Prevent Anemia, Iron Deficiency, Mueng Yasothon, Primary School Students, Srisaket

1. Introduction

Iron Deficiency Anemia is a condition characterized by a lack of iron in the body, posing a significant global public health issue, affecting 2.15 billion individuals, with over 90 percent of cases occurring in developing nations. The study revealed a significant occurrence of anemia in Southeast Asian nations, particularly among pregnant women, young children, school-age children, and individuals of reproductive age [1]. In Thailand, the prevalence of anemia among Thai children aged 6 months to 12 years is 231.63 per 100,000 individuals. Typically, the accepted blood concentration level for individuals aged 6-14 years is 36. Based on the South East Asia Nutrition Survey (SENUTS) project conducted between 2010 and 2012, it was found that there was a significant occurrence of anemia among Thai children in rural areas during early childhood, reaching a prevalence rate of 41.7 percent. Meanwhile, among children in urban areas, the prevalence of anemia was found to be 26 percent [2]. The 6th Thailand Food and Nutrition Survey 2019 - 2020 revealed that there was no significant difference in the average Hemoglobin values between individuals residing in municipal and non-municipal areas, with both groups having an average Hemoglobin value of 13.7. The average Hb levels of men and women in different regions are similar, with the Hb of people in the southern and northern regions having the highest Hb levels (13.8), followed by the central and northeastern regions and Bangkok, respectively. When analyzing the occurrence of anemia based on the area of residence, it was discovered that the highest prevalence of iron deficiency anemia was observed in Bangkok and the Northeast region, with rates ranging from 17.4 to 17.5 percent. This was followed by the Central, Northern, and Southern regions, respectively [3]. Anemia results when the body lacks enough iron to produce red blood cells. Causes of anemia include not consuming enough iron in the diet, malnutrition, acute or chronic blood loss, etc. Anemia often occurs due to iron deficiency, as iron is a crucial element in the Hb of red blood cells, responsible for transporting oxygen to the brain and other body tissues.

Consequently, it fulfills numerous vital functions within the body, such as facilitating growth, enhancing cognitive capabilities, promoting physical performance, and bolstering the immune system to ward off diseases. Anemia can also be caused by genetic abnormalities in the production of Hb, chronic infections, intestinal parasites, chronic blood loss, and other nutritional and mineral deficiencies. Presently, there is compelling evidence suggesting that iron deficiency anemia during the period from birth to 2 years of age has a detrimental impact on development and results in a loss of learning ability, some of which may be irreversible in the long run [4]. The Office of Nutrition has initiated a project to manage and prevent anemia caused by insufficient iron levels. The goal is to ensure that people of all age groups in Thailand receive sufficient iron to enhance their health and prevent anemia. This, in turn, will contribute to the development of the intellectual capacity and productivity of the Thai population, fostering sustainable national progress [5].

Strategies to manage and prevent iron deficiency anemia in young children between the ages of 6 months and 5 years, aiming to have 80% of children in this age group receive iron-fortified liquids by the end of 2021. The prevalence of anemia among children aged 6 - 12 months is below 20%. Parents' schools, such as the Well Child Clinic (WCC), provide information on nutrition and encourage the consumption of age-appropriate foods that are high in iron. Dietary supplements containing iron that are suitable for the individual's age. Iron-fortified liquid medicine (weekly dose) payment is covered by the health promotion and disease prevention benefit package in the National Health Insurance System 2016. Children between the ages of 6 months and 2 years should take a weekly dose of iron-fortified liquid medicine containing 12.5 milligrams. Children between the ages of 2 and 5 years should take a weekly dose of 25 milligrams. The indicator shows that 50% of children aged 6-12 years receive iron supplement tablets. The payment for a weekly dose of iron supplement tablets is required as part of the Health Promotion School program. This payment is specified in the health promotion and disease prevention benefit package of the National Health Security System 2016. The payment supports the iron-rich lunch project [6].

Thetsaban 1 Suk Witthayakon Tang Trong Chit 15 School is a large institution offering expanded opportunities in Yasothon Municipality, catering to students from Grades 1 through 6, with a total enrollment of 1,791. Most students hail from various areas of Mueang District and its surrounding districts. Many students, residing in different parts of Yasothon Municipality, must wake up early to catch buses and rush to school, traveling distances of approximately 40-50 kilometers. This situation is compounded by familial circumstances, such as parents working in other provinces or being divorced, resulting in children living with their elderly grandparents, who may have limited knowledge of nutrition and may indulge the children's eating habits. The previous system distributed iron supplement pills but lacked social support or empowerment. Thus, integrating social support with empowerment is expected to enhance anemia prevention behavior. A survey of 920 primary school students at Thetsaban 1 Suk Witthayakon Tang Trong Chit 15 School revealed that 93 of them had anemia. Iron deficiency anemia manifests in lower intelligence levels, lack of concentration, irritability, drowsiness, dizziness, and decreased muscle ability [7].

Given the aforementioned information, the researchers aimed to investigate the effectiveness of iron supplements and dietary intake in treating anemia. The 2022 blood concentration survey in Yasothon Province revealed that 27.6 percent of children had anemia, with primary school students being the most affected, followed by secondary school students at 6.7%. When focusing on students in Mueang District, Yasothon Province, the most prevalent schools with anemia cases were Thetsaban 1 Suk Witthayakon Tang Trong Chit 15 School, with 10.10 percent affected out of 920 individuals examined, followed by Thesaban 2 Samakkhi Watthana School, with 7.94 percent affected out of 1,133 individuals [8]. Incomplete results from the survey and data collection to screen for anemia in primary school students prompted the researcher to conduct a study to establish reference data and develop a screening system for anemia in this population. The study focused on primary school students at Thetsaban 1 Suk Witthayakon Tang Trong Chit 15 School, Mueang District, Yasothon Province, with the aim of evaluating the efficacy of iron supplements and dietary intake in addressing iron deficiency. The findings would be used to empower iron-deficient elementary school students to take care of themselves and lead normal, joyful lives, ultimately aiming to eradicate anemia in the future.

2. Research Objectives

The research question of this study is whether the behavior modification program implemented in primary schools under Yasothon Municipality is effective in preventing iron deficiency anemia among students.

The main objective of this study is to examine the outcomes of behavior modification aimed at preventing iron deficiency anemia among primary school students in schools under Yasothon Municipality. The specific objectives are as follows:

- To assess the disparity in average blood concentration, anemia awareness, attitude towards anemia prevention, engagement in anemia prevention activities, social support for anemia prevention, and behavior to prevent iron deficiency anemia among primary school students in the experimental group and the comparison group before and after the experiment.
- To evaluate the differences in average blood concentration, understanding of anemia, attitude towards anemia prevention, engagement in anemia prevention activities, social support for anemia prevention, and behavior to prevent iron deficiency anemia among primary school students in both the experimental and comparison groups, both before and after the experiment.

The research hypotheses are listed as follows:

- Following the experiment, there was a noticeable increase in the average blood concentration, understanding of anemia, attitude towards anemia prevention, engagement in anemia prevention activities, social support for anemia prevention, and behavior to prevent iron deficiency anemia among primary school students in both the experimental and comparison groups compared to before the experiment.
- The experimental group of elementary school students exhibited higher mean blood concentration, knowledge about anemia, attitude towards anemia prevention, participation in anemia prevention, social support in anemia prevention, and behavior to prevent iron deficiency anemia compared to the comparison group after the experiment.

3. Research Methods

3.1 Conceptual Framework

This study employs Quasi-Experimental Research. Partition the sample into two distinct groups: the Experimental Group and the Comparison Group. The research design is two groups, measuring twice before and after the experiment (Two Group Pre-test Post-test Design). The experimental group was given a program that combined iron supplements with social support and empowerment to change behavior in order to prevent iron deficiency anemia among primary school students.

According to the researchers, the comparison group did not receive a program that combined the use of iron supplements with social support and empowerment to change behavior in order to prevent iron deficiency anemia among primary school students. The activity was carried out between October 1, 2023 and February 29, 2024. It took 12 weeks to complete the activity. Questionnaires were used before and after the experiment to collect data based on variables in both groups. The conceptual framework of this study illustrates in Figure 1. The program is underway at Thetsaban 1 Suk Witthayakon Tang Trong Chit 15 School, Mueang District, Yasothon Province, to tackle iron deficiency anemia among primary school students. The program integrates iron supplements with social support and empowerment strategies to induce behavioral change. It is developed based on theories of cognition, attitudes, participation, social support, and behavioral theories, which serve as guiding principles for activity planning. The 12-week duration is divided into two distinct phases:

- Phase 1 focuses on enhancing understanding, mindset, engagement, communal assistance, and self-management practices to prevent anemia. The first five weeks involve pre-test evaluations, including workshops, experience sharing, participation, and role-playing to enhance anemia knowledge and social support.
- Phase 2 involves follow-up, blood sample collection, and evaluation of the effectiveness of the iron supplement program combined with social support and empowerment to prevent iron deficiency anemia. Follow-up weeks 8-12 include blood testing to determine blood concentration after program implementation, program effectiveness evaluation, and post-testing.

The data collection instruments are categorized into five sections as follows:

- Section 1: Personal characteristics factors
- Section 2: True-false questions about anemia. Correct answers receive one point, while incorrect answers receive zero points. There are a total of 15 questions and 15 points.
- Section 3: Ten questions representing attitudes toward preventing anemia. Questions are rated on a scale with five options: strongly agree, agree, not sure, disagree, and strongly disagree.
- Section 4: Ten questions about participation in anemia prevention. Questions are structured as a rating scale with five options: the most, a lot, moderate, a little, and the least.

- Section 5: Ten questions about social support for anemia prevention. Questions are rated on a scale with five options: the most, moderate, least.

Instrument Inspection: Content validity is tested by consulting the questionnaire with three experts to check its validity. The research team then reviewed the questionnaire for appropriate language and content clarity before testing. The Index of Item-Objective Congruence (IOC) is checked to ensure content validity and consistency with purpose. The IOC value ranges from 0.67 to 1.00, indicating the tool's reliability. Next, the revised questionnaire is administered to a sample group at Srithamwittaya School, Nai Mueang Subdistrict, Mueang District, Yasothon Province, and analyzed to determine the instrument's reliability using Cronbach's alpha coefficient. The confidence values for knowledge of anemia, attitude toward anemia prevention, participation in anemia prevention, and social support in anemia prevention are 0.87, 0.71, 0.83, and 0.92, respectively. The study area is located in Yasothorn province, Thailand as depicts in Figure 1. The locations of the schools where the anemia data were collected depict in Figure 2.

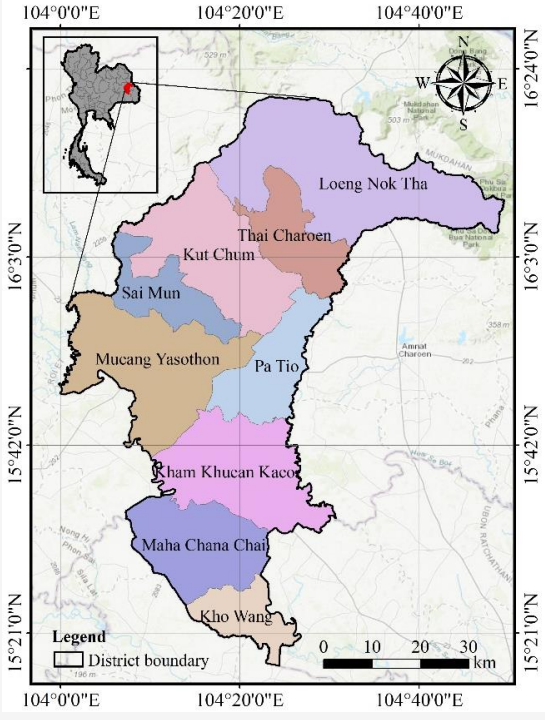

Figure 1: Yasothorn province, Thailand

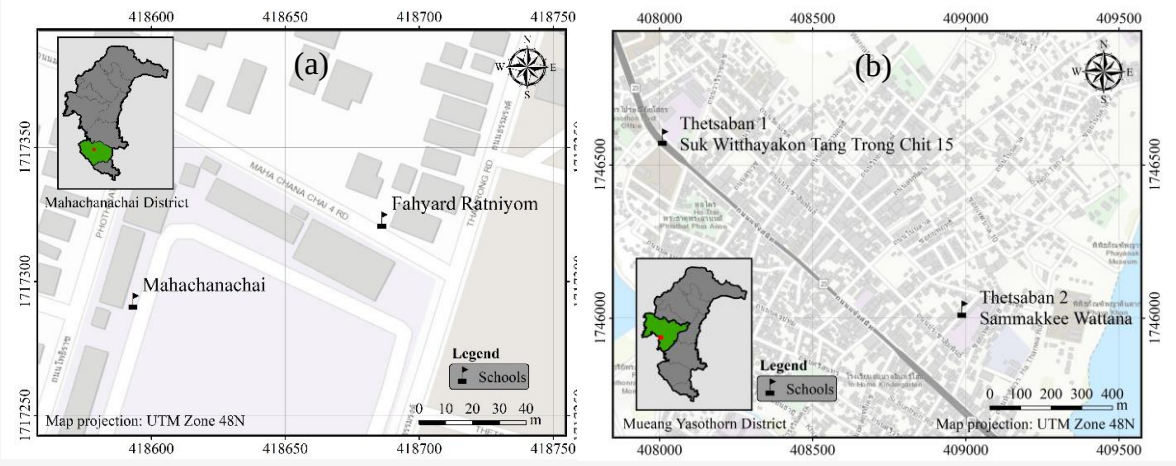

Figure 2: Locations of schools (a) Mahachanachai district (b) Mueang Yasothorn district

3.2 Sample Size

The sample size determination as defined in equation 1 is used to compare the means of two independent populations [9].

$$n / g = \frac{(Z_{\alpha} + Z_{\beta})^2 \sigma_d^2}{\mu_d^2}$$

Equation 1

Where:

- n/g =Sample size per group
- Z_{α} =Statistical values of the standard normal distribution at $\alpha = 0.05$; $Z_{\alpha} = 1.65$
- Z_{β} =Statistical value of standard normal distribution at 0.80 $Z_{0.2} = 0.84$
- σ_d = Covariance of the differences between the experimental and comparison groups.
- μ_d =Difference between results (effective size)

The effectiveness of a group learning program on behavior to prevent iron deficiency anemia in secondary school students in the experimental and comparison groups (27 people per group, total 54 people) was investigated by [10]. After the experiment, it was found that the experimental group had a mean difference in scores on behavior to prevent iron deficiency anemia equal to 1.39, with a standard deviation of the difference equal to 0.27. The comparison group had a mean difference in scores on behavior to prevent iron deficiency anemia equal to 1.35, with a standard deviation of the difference equal to 0.27. From the said study, the covariance values can be calculated as follows. In this study, the sample size was calculated to be 42 people. The researchers expected that 15 percent would be lost to follow-up. This prediction was based on a study by [11], who discovered that 112 people dropped out of the experiment out of a total of 735 participants, accounting for 15.26%. Consequently, this study used a sample size of 50 people per group, for a total of 100 people in both groups.

3.2.1 Inclusion criteria

1. Be a student with a blood concentration (Hematocrit) lower than 36 percent in primary school, Mueang District, Yasothon Province, from 1 August 2023 to 31 October 2023.
2. Be a student with a blood concentration (Hematocrit) lower than 36 percent who has no history of thalassemia or carriers.
3. Never participated in other anemia promotion activities or programs before.
4. Happy to participate in the activity.
5. Able to communicate by speaking, reading, and writing Thai or local languages.

3.2.2 Exclusion criteria

1. Have co-morbidities such as thalassemia or carrier disease.
2. Unable to participate in activities throughout the duration of the activity according to the program.

3.3 Data Analysis

1. Descriptive Statistics: Demographic data were analyzed by frequency distribution, percentage, mean, standard deviation, median, 25th percentile, and 75th percentile.
2. Inferential Statistics: For this research, the research team has set statistical significance at α= 0.05 in order to 2.1 Compare the difference in mean scores before and after the experiment within the experimental and comparison groups using paired t-test statistics on blood concentration, knowledge about anemia, attitude toward anemia prevention, participation in anemia prevention, social support in anemia prevention, and behavior in preventing iron deficiency anemia in primary school students. 2.2 Compare the difference in mean scores before and after the experiment between the experimental and comparison groups using independent t-test statistics for blood concentration, knowledge about anemia, attitude toward anemia prevention, participation in preventing anemia, social support in preventing anemia, and behavior in preventing iron deficiency anemia in primary school students.

3.4 Protecting the Rights of Sample Groups

This research study has been considered by the Human Research Ethics Committee of Ubon Ratchathani University. In order to protect the confidentiality of the sample data, no identifying information was used in the data analysis, and only the information required for the overall study was used. Additionally, the data will be collected by the researcher and destroyed within one year of the study's completion.

4. Results

4.1 Percentage of Students Suffering from Anemia

The data on the number of primary school students suffering from anemia was gathered from four schools located in Mahachanachai and Mueang Yasothorn districts. The total student populations for Fahyard Ratniyom, Mahachanachai, Thetsaban 1, and Thetsaban 2 were 462, 1,210, 921, and 1,357 respectively. Among these schools, Fahyard Ratniyom recorded the highest number of students with anemia, totaling 122, followed by Thetsaban 1, Mahachanachai, and Thetsaban 2. Figure 3 illustrates the percentage of students afflicted with anemia.

Figure 3 display the percentage of students suffering from anemia in different schools. Figure 3(a) shows the percentages for Fahyard Ratniyom and Mahachanachai schools. Fahyard Ratniyom has a significantly higher percentage at around 26.41%, while Mahachanachai's percentage is much lower at 5.54%. Figure 3(b) presents the anemia rates for Thetsaban 1 and Thetsaban 2 schools. Thetsaban 1 has a higher percentage of around 9.12%, whereas Thetsaban 2 has a lower rate of approximately 3.17%. The data reveals varying levels of anemia prevalence among students across these four schools, with Fahyard Ratniyom having the highest percentage and Mahachanachai having the lowest among the schools shown in Figure 3.

4.2 Comparison between Experimental Group and Comparison Group

The experimental group, comprising 52.0% females, had an average age of 9.10 years (SD = 8.93 years). Their median weight was 25.0 kilograms (25th percentile = 22.0 kilograms; 75th percentile = 32.0 kilograms), with a median height of 132.5 centimeters (25th percentile = 124.0 centimeters; 75th percentile = 140.0 centimeters). The median blood concentration value stood at 35.0 percent (25th percentile = 34.0; 75th percentile = 36.0). In comparison, the comparison group comprised 54.0% females, with a mean age of 9.16 years (SD = 1.85 years). They had a median weight of 28.0 kilograms (25th percentile = 23.0 kilograms; 75th percentile = 36.0 kilograms) and a median height of 131.5 centimeters (25th percentile = 121.0 centimeters; 75th percentile = 139.0 centimeters). The median blood concentration was also 35.0 percent (25th percentile = 34.0; 75th percentile = 36.0).

Regarding the difference in mean blood concentration scores between the experimental and comparison groups before and after the experiment, prior to the experiment, there was no statistically significant difference in mean blood concentration scores between the two groups. However, after the experiment, a significant difference emerged at the 0.05 level (p-value <0.001). Specifically, the experimental group exhibited a mean blood concentration score 4.88 points higher than the comparison group, with a 95% confidence interval of 3.95-5.80. Additional details are presented in Table 1. The comparison of knowledge about anemia between the experimental group and the comparison group before and after the experiment revealed no statistically significant difference in mean anemia knowledge scores.

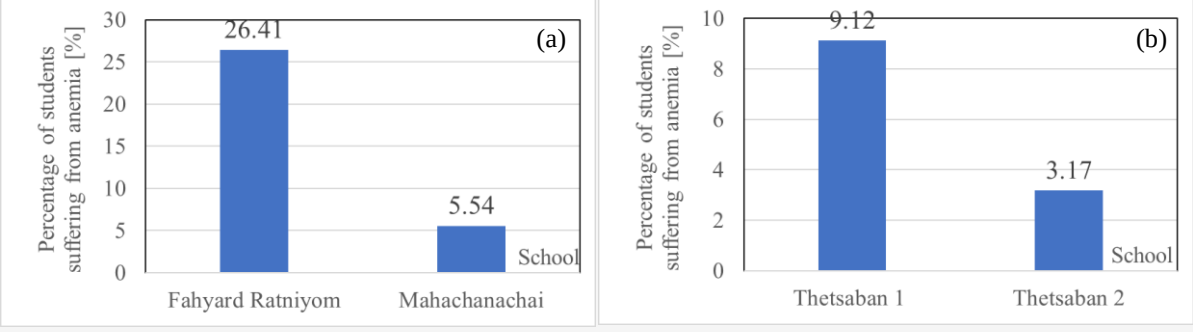

Figure 3: Percentage of students suffering from anemia:
(a) Mahachanachai district and (b) Mueang Yasothorn district

Table 1: Comparison of blood concentration before and after the experiment

Blood Concentration	Mean	SD	Mean Diff.	95%CI	t	p-value
Before the experiment						
Experimental group	34.58	2.28	0.08	-0.71-0.87	0.20	0.841
Comparison group	34.50	1.65				
After the experiment						
Experimental group	39.22	2.97	4.88	3.95-5.80	10.49	<0.001**
Comparison group	34.34	1.39				

***p-value<0.01*

Table 2: Comparison of knowledge about anemia before and after the experiment

Knowledge about Anemia	Mean	SD	Mean Diff.	95%CI	t	p-value
Before the experiment						
Experimental group	8.30	1.01	0.14	-0.62-0.90	0.36	0.717
Comparison group	8.16	1.84				
After the experiment						
Experimental group	14.66	0.62	6.66	6.06-7.25	22.36	<0.001**
Comparison group	8.00	2.01				

***p-value<0.01*

Table 3: Comparison of attitudes towards anemia prevention before and after the experiment

Attitudes towards Anemia Prevention	Mean	SD	Mean Diff.	95%CI	t	p-value
Before the experiment						
Experimental group	28.08	2.15	2.74	1.67-3.80	5.10	<0.001**
Comparison group	25.34	3.12				
After the experiment						
Experimental group	43.34	3.46	22.20	20.73-23.66	30.16	<0.001**
Comparison group	21.14	3.88				

***p-value<0.01*

Table 4: Comparison of participation in anemia prevention before and after the experiment

Participation in Anemia Prevention	Mean	SD	Mean Diff.	95%CI	t	p-value
Before the experiment						
Experimental group	29.10	1.87	4.64	3.34-5.93	7.09	<0.001**
Comparison group	24.46	4.22				
After the experiment						
Experimental group	40.98	3.93	16.70	15.17-18.22	21.77	<0.001**
Comparison group	24.28	3.73				

**p-value<0.01

However, after the experiment, the experimental group demonstrated a significant difference in mean scores of knowledges about anemia at the 0.05 level (p-value<0.001). Specifically, the experimental group had a mean knowledge score of anemia 6.66 points higher than the comparison group (95% CI = 6.06-7.25), as detailed in Table 2.

Regarding attitudes towards anemia prevention, the comparison of mean scores between the experimental group and the comparison group before and after the experiment indicated statistically significant differences in mean attitudes toward preventing anemia before the experiment. Following the experiment, the experimental group exhibited a significantly different mean score in terms of attitude toward preventing anemia, with results being statistically significant at the 0.05 level (p-value <0.001). The experimental group's mean attitude score toward anemia prevention was 22.20 points higher than the comparison group (95% CI = 20.73-23.66), as illustrated in Table 3.

Similarly, the comparison of mean scores for participation in anemia prevention revealed significant differences between the experimental and comparison groups both before and after the experiment. After the experiment, the experimental group displayed a substantial difference in mean scores on anemia prevention at the 0.05 level (p-value<0.001). Specifically, the experimental group had a mean participation score in anemia prevention 16.70 points higher than the comparison group (95% confidence interval = 15.17-18.22), as presented in Table 4. Moreover, the comparison of mean scores of social supports in preventing anemia before and after the experiment unveiled statistically significant differences between the experimental and comparison groups.

Table 5: Comparison of social support in preventing anemia before and after the experiment

Social Support in Preventing Anemia	Mean	SD	Mean Diff	95%CI	t	p-value
Before the experiment						
Experimental group	26.90	2.62	2.06	0.90-3.21	3.52	0.0006**
Comparison group	24.84	3.19				
After the experiment						
Experimental group	41.26	4.44	15.98	14.38-17.57	19.85	<0.001**
Comparison group	25.28	3.55				

***p-value<0.01*

Table 6: Comparison of behavior modification for prevention iron-deficiency anemia deficiency in primary school students before and after the experiment

Behavior Modification for Prevention Iron-Deficiency Anemia Deficiency	Mean	SD	Mean Diff	95%CI	t	p-value
Before the experiment						
Experimental group	25.02	2.95	1.86	0.67-3.04	3.11	0.002**
Comparison group	23.16	3.01				
After the experiment						
Experimental group	42.48	3.78	18.46	17.09-19.82	26.76	<0.001**
Comparison group	24.02	3.07				

***p-value<0.01*

After the experiment, a significant difference in the mean score of social support for preventing anemia was observed at the 0.05 level (p-value<0.001). Notably, the experimental group exhibited a 15.98-point higher average score of social support in preventing anemia than the comparison group (95% CI = 14.38-17.57), as depicted in Table 5.

Finally, regarding behavior to prevent iron deficiency anemia in primary school students, significant differences in mean scores were observed between the experimental and comparison groups before and after the experiment. The experimental group displayed a substantial difference in mean scores of behavior to prevent iron deficiency anemia in primary school students at the 0.05 level (p-value<0.001). Specifically, the experimental group's average score of behavior to prevent iron deficiency anemia in primary school students was 18.46 points higher than the comparison group (95% CI = 17.09-19.82), as outlined in Table 6.

5. Discussion of the Results

The study's findings revealed that the behavioral change program to prevent iron deficiency anemia among primary school students in Yasothon Municipality schools was effective in meeting the objectives. After the experiment, the experimental group had higher mean blood concentration scores, knowledge about anemia, attitude toward anemia prevention, participation in anemia prevention, social support in preventing anemia, and behavior for preventing iron deficiency anemia in primary school students than before the experiment and significantly higher than the control group at the 0.05 level.

This effectiveness stemmed from the researchers developing the program within the study area's context, systematically reviewing literature covering behavior modification, and the program developers being deeply involved in addressing such issues. Consequently, the program was comprehensive and addressed area-specific problems, including promoting knowledge about anemia, fostering positive attitudes toward anemia prevention, encouraging participation in anemia prevention activities, promoting social support, and facilitating preventive behaviors. Furthermore, support from administrators, teachers, parents, and community resources, along with school health policies and practices, contributed to the program's effectiveness according to the set objectives.

These findings align with previous research. For instance, [12] studied the effectiveness of weekly iron supplements in preventing iron deficiency anemia among middle school students, reporting a significant decrease in anemia prevalence from 37.9% to 11.2% after the intervention.

Similarly, [10] investigated a learning program's impact on preventing iron deficiency anemia among secondary school students, revealing improvements in knowledge and eating behavior in the experimental group post-intervention. [13] explored the effect of participatory motivation in taking iron supplement tablets among female lower secondary school students, showing significant improvements in blood concentration levels after the intervention.

Expanding on these findings, [14] developed a model to promote anemia care in pregnant women, demonstrating significant improvements in hematocrit levels and pregnant women's knowledge of self-care. [15] examined the effects of a self-help group program on primary caregivers' caregiving behavior and children's packed red blood cell volume, showing significant improvements in the experimental group compared to the control group. Lastly, [16] studied an operating model for managing anemia in primary school children, indicating improvements in packed red blood cell count and parental food care behavior after implementing the model. Similarly, [17] investigated a nutritional promotion program for teenage pregnant women, showing improvements in nutritional behavior and red blood cell concentration levels in the experimental group compared to the control group. These collective findings underscore the importance of implementing multifaceted interventions and programs tailored to specific contexts to effectively prevent and manage iron deficiency anemia across different population groups.

6. Conclusion

In conclusion, the study's comprehensive behavioral change program effectively addressed iron deficiency anemia among primary school students in Yasothon Municipality. This success was attributed to the program's tailored approach, which encompassed various components such as promoting knowledge, fostering positive attitudes, encouraging participation, enhancing social support, and facilitating preventive behaviors. Additionally, the strong support from administrators, teachers, parents, and community resources, coupled with school health policies, contributed to the program's success in meeting its objectives.

The effectiveness of this program aligns with previous research demonstrating the positive impact of interventions targeting iron deficiency anemia across different population groups. Studies investigating interventions such as weekly iron supplements, learning programs, participatory motivation strategies, self-help group programs, operating models, and nutritional promotion programs have consistently shown significant improvements in knowledge, behaviors, and health outcomes related to anemia prevention and management. Overall, these findings emphasize the importance of multifaceted approaches tailored to specific contexts in effectively addressing iron deficiency anemia. By implementing comprehensive programs and interventions supported by stakeholders and informed by scientific evidence, significant progress can be made in preventing and managing anemia among various demographic groups, ultimately contributing to improved health outcomes and well-being.

7. Suggestions

1. The developed program aims to enhance the effectiveness of behavior change in preventing iron deficiency anemia among primary school students. Expanding the program to include other target groups, such as preschool children, teenagers, and adults, could further promote its effectiveness in preventing iron deficiency anemia in Yasothon Province or serve as a means to test the efficacy of innovations in other regions.
2. Further research endeavors should explore the factors influencing anemia prevention behavior in students. Investigating the causes or predictors of behavior for preventing iron deficiency anemia among students is essential to bolster the effectiveness of anemia prevention efforts.
3. Conducting a comparative study of programs designed to prevent iron deficiency anemia among primary school students in Yasothon Municipality schools alongside other interventions or innovations would enable an assessment of program effectiveness. Additionally, there is a need for studies aimed at determining an appropriate model for preventing iron deficiency anemia in students, integrating the goal of averting anemia onset effectively.

A systematic literature review should be undertaken to identify strategies for developing innovations or new methods to prevent iron deficiency anemia in students that are not only effective but also safe. This would provide valuable insights for devising comprehensive anemia prevention initiatives.

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