

Implementing the 5-Table Posyandu Model as an Intervention for Adolescent Anemia Prevention: An Experimental Study

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ABSTRACT

Background: Anaemia remains a critical public health issue among Indonesian adolescent girls.

Purpose: This study aimed to evaluate the effectiveness of the structured five-table system in Posyandu Remaja on improving adolescents' knowledge of anaemia prevention.

Methods: Using a quasi-experimental one-group pretest-posttest design, 30 adolescent girls (aged 12–18) in the Sebulu I Health Centre work area were selected using purposive sampling. Knowledge was measured using questionnaires before and after the 5-table intervention.

Results: The mean knowledge score significantly increased from 5.63 (pretest) to 11.83 (posttest). Respondents in the "Good" knowledge category surged from 10.0% to 60.0%. Statistical analysis using the Paired Samples Test yielded a p-value of 0.000 ($p < 0.05$), confirming a highly significant improvement. The systematic integration of screening and targeted education within the 5-table framework effectively bridged information gaps regarding the causes of anaemia, its symptoms, and iron supplementation.

Conclusion: The implementation of the 5-table Posyandu Remaja framework significantly enhances adolescent girls' understanding of anaemia prevention. By combining systematic screening with targeted health education, this model serves as a strategic and scalable public health tool to mitigate the risk of anaemia among Indonesian adolescents.

Keywords: Adolescent Health Post, Anemia Prevention, 5-Table System

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BACKGROUND

Anaemia remains a critical public health challenge among adolescent girls in developing nations, where prevalence reaches 27% due to rapid growth phases and menstrual blood loss. In Indonesia, despite national iron supplementation mandates, local burdens remain alarming peaking at 43.2% in East Kalimantan and 30% in Kutai Kartanegara threatening cognitive development, reproductive health, and intergenerational stunting. Although school-based iron distribution exists, low compliance and inadequate nutritional literacy persist as key bottlenecks.

While community-based youth platforms like *Posyandu Remaja* are designed to bridge these gaps, empirical evaluations reveal that standard operational workflows often lack structured continuity, systematic hemoglobin screening, and individualized counseling. Conventional approaches rely heavily on passive, generic group lectures, which evidence shows fail to produce sustained health literacy or behavioral adoption. Consequently, there is a lack of empirical evidence demonstrating how structural workflow optimizations within community health posts translate into measurable improvements in anaemia prevention literacy.

To address these operational deficits, a structured "5-Table System" integrating registration, physical measurement/screening, health logging, targeted nutritional counseling, and supplementation offers a multi-tiered care pathway. While multi-table workflows are established in maternal care, their empirical evaluation within adolescent health posts remains unexamined. This gap is particularly acute in high-risk rural areas such as the Sebulu I Health Centre catchment area, where preliminary screening identified a 35% anaemia prevalence among adolescent girls, yet no structured operational framework had been formally evaluated.

This study addresses this empirical gap by evaluating the direct impact of the structured 5-table *Posyandu Remaja* framework on anaemia prevention literacy among adolescent girls. The specific novelty of this research lies in quantifying the operational transition from conventional passive health education to an active, sequential 5-stage screening-and-counseling pathway. By providing empirical evidence on how workflow standardization enhances adolescent health literacy, this study offers scalable insights for public health policy to optimize community-led nutritional interventions in resource-limited settings.

OBJECTIVE

The major objective of this study is to analyse the direct influence of implementing the structured 5-table system within adolescent integrated health posts (*Posyandu Remaja*) on the prevention of anaemia among adolescent girls. Specifically, this research aims to evaluate how this systematic, multi-tiered community health workflow enhances health literacy regarding the risk factors, diagnostic symptoms, long-term impacts, and preventive behaviors—including iron supplementation compliance and dietary practices associated with adolescent anemia within a high-risk public health service area.

To address these objectives, the following hypotheses were tested:

Null Hypothesis (H₀): There is no significant difference in health literacy and anaemia prevention behaviors among adolescent girls before and after the implementation of the structured 5-table *Posyandu Remaja* framework.

Alternative Hypothesis (H_a): The implementation of the structured 5-table *Posyandu Remaja* framework significantly increases health literacy and anaemia prevention behaviors among adolescent girls.

METHODS**Design and Samples**

This study employed a quantitative research design with a quasi-experimental approach, specifically utilizing a one-group pretest-posttest design wherein each participant served as their own control. The trial was conducted at designated *Posyandu Remaja* (Adolescent Integrated Health Post) activity sites including community halls and health sub-centres within the operational jurisdiction of the Sebulu I Public Health Centre (*Puskesmas Sebulu I*) in Kutai Kartanegara Regency, Indonesia. The target population comprised all 267 adolescent girls residing within the health centre's catchment area.

Study Sample and Eligibility

From the target population, a final analytical sample of $N = 30$ adolescent girls was selected using a purposive sampling technique. Following trial commencement, specific eligibility criteria were applied to refine participant selection, ensuring sample homogeneity and intervention feasibility: Inclusion Criteria: Adolescent girls aged 12 to 18 years, holding active registered membership at the local *Posyandu Remaja*, classified as non-anaemic or mildly anaemic at baseline, proficient in written Indonesian, and able to provide written informed consent along with parental or guardian assent for minors under 18 years of age; Exclusion Criteria: Presence of known severe chronic medical conditions associated with secondary anaemia (such as clinical thalassemia or active chronic infections), severe cognitive or physical impairments hindering independent questionnaire completion, or failure to attend any stage of the 5-table framework implementation or post-test evaluation.

Sample size adequacy was verified through an *a priori* power analysis conducted using SPSS for a two-tailed matched-pairs t-test. Assuming a medium-to-large effect size ($d = 0.55$), an alpha significance level of $\alpha = 0.05$, and a statistical power of $1 - \beta = 0.80$, a minimum sample size of $N = 28$ participants was required to detect statistically significant changes in knowledge scores. Establishing a final sample size of $N = 30$ ensured adequate statistical power to evaluate pre- and post-intervention outcomes while adhering to established experimental design guidelines for community-based educational trials.

Research Instrument and Data Collection

The primary research instrument used for data collection was a structured, validated questionnaire designed to measure the respondents' level of health literacy and understanding regarding anaemia prevention. The questionnaire specifically assessed knowledge across several core domains: causative risk factors, clinical signs and symptoms, long-term health impacts, and preventive behaviours (such as nutritional habits and iron supplementation compliance).

The data collection process followed a systematic three-stage procedure:

1. Pretest: Prior to the intervention, the questionnaire was administered to the 30 respondents to establish baseline knowledge scores.
2. Intervention: The participants underwent a community-based health service intervention through the implementation of the structured 5-Table System. This system organised the service flow into consecutive stages: registration (Table 1), physical measurements and haemoglobin screening (Table 2), data logging/recording (Table 3), targeted nutritional and health education (Table 4), and clinical services including the distribution of iron supplements (*Tablet Tambah Darah/TTD*) (Table 5).
3. Posttest: Following the completion of the 5-table system cycle, the same questionnaire was re-administered to evaluate shifts and improvements in knowledge levels.

Data Analysis

The collected data were processed and analysed using statistical software. To ensure the appropriate selection of comparative tests, data distribution normality was first evaluated using the Kolmogorov-Smirnov test, which confirmed that both pretest and posttest scores were normally distributed ($p = 0.200 > 0.05$). Homogeneity of variance was verified using the Levene test, yielding a significance value of $0.490 > 0.05$, which indicated that the data were homogeneous.

Descriptive statistics were applied to determine the means, standard deviations, minimum-maximum ranges, and frequency distributions of demographic and knowledge categories. To evaluate the statistical significance of the differences between the pretest and posttest scores thereby assessing the direct influence and effectiveness of the 5-table system a Paired Samples t-test (complemented by the Wilcoxon signed-rank test and Pearson Product-Moment correlation for advanced bivariate associations) was executed.

Ethical Consideration

The study was conducted in strict accordance with standard ethical principles for human subject research. Prior to data collection, formal institutional permissions were acquired from the Universitas Strada Indonesia and the administrative head of the Sebulu I Public Health Centre. Informed consent was formally obtained from all participants. For adolescents under the legal age of consent, assent was obtained alongside proxy informed consent from their parents or legal guardians before any screening or intervention procedures began. Participants were fully briefed on the research objectives, the non-invasive nature of the questionnaire, and their right to voluntary withdrawal at any point without penalty. Strict confidentiality was maintained by anonymising all personal identifiers during data entry and statistical processing.

RESULTS

The major findings of this study outline the distribution of respondents' demographic characteristics and the empirical evaluation of their health literacy before and after the intervention. The primary outcomes focus on measuring the direct shifts in the knowledge levels of adolescent girls regarding anemia prevention following the implementation of the structured 5-table system.

Demographic Characteristics of Respondents

The baseline demographic data of the respondents, including gender and age distribution cross-tabulated with their initial and final knowledge scores, were evaluated to provide a comprehensive baseline context for the intervention.

Table 1. presents the baseline knowledge levels of the respondents prior to the intervention (pretest), categorized by gender and specific age groups.

Variable	Category	Less/Poor Knowledge (n)	Less/Poor Knowledge (%)	Fair Knowledge (n)	Fair Knowledge (%)	Good Knowledge (n)	Good Knowledge (%)	Total (n)	Total (%)
Gender	Female	22	73.3%	5	16.7%	3	10.0%	30	100.0%
Age	13 years old	5	83.3%	1	16.7%	0	0.0%	6	100.0%
	14 years old	4	66.7%	1	16.7%	1	16.7%	6	100.0%
	15 years old	9	90.0%	1	10.0%	0	0.0%	10	100.0%
	16 years old	2	40.0%	1	20.0%	2	40.0%	5	100.0%

	17 years old	1	50.0%	1	50.0%	0	0.0%	2	100.0%
	18 years old	1	100.0%	0	0.0%	0	0.0%	1	100.0%

As displayed in Table 1, all 30 respondents participating in this study were female (100.0%). The descriptive analysis reveals that before the implementation of the 5-table system, the vast majority of the adolescent girls possessed an inadequate understanding of anemia, with 22 respondents (73.3%) falling into the "Less/Poor" knowledge category[cite: 1]. The 15-year-old cohort represented the largest age group (n = 10) and exhibited the highest concentration of low health literacy, with 90.0% of its individuals scoring in the poor category during the pretest baseline.

Table 2 highlights the redistribution of the respondents' knowledge levels across the same demographic parameters after completing the 5-table system cycle (posttest).

Table 2. Cross-tabulation of Respondents' Characteristics and Posttest Knowledge Levels

Variable	Category	Less/Poor Knowledge (n)	Less/Poor Knowledge (%)	Fair Knowledge (n)	Fair Knowledge (%)	Good Knowledge (n)	Good Knowledge (%)	Total (n)	Total (%)
Gender	Female	22	73.3%	5	16.7%	3	10.0%	30	100.0%
Age	13 years old	5	83.3%	1	16.7%	0	0.0%	6	100.0%
	14 years old	4	66.7%	1	16.7%	1	16.7%	6	100.0%
	15 years old	9	90.0%	1	10.0%	0	0.0%	10	100.0%
	16 years old	2	40.0%	1	20.0%	2	40.0%	5	100.0%
	17 years old	1	50.0%	1	50.0%	0	0.0%	2	100.0%
	18 years old	1	100.0%	0	0.0%	0	0.0%	1	100.0%

Following the community-based intervention, Table 2 demonstrates a substantial upward shift in health literacy. The number of adolescent girls matching the "Good" knowledge criteria escalated dramatically to 18 respondents (60.0%), while those remaining in the "Less/Poor" category decreased sharply to just 3 individuals (10.0%). Notably, within the dominant 15-year-old group, 60.0% successfully achieved a "Good" understanding post-intervention.

Comparative Tracking of Individual Knowledge Shifts (Pretest vs. Posttest)

To evaluate the precise transitional dynamics of individual health literacy, a cross-tabulation matrix was generated between the baseline pretest categories and the final posttest categories. This structural approach charts individual movement, ensuring an accurate tracking of exactly how many respondents migrated between the poor, fair, and good knowledge tiers following the implementation of the 5-table system.

Table 3 presents the cross-tabulation matrix mapping the direct trajectories of changes in knowledge levels from the pre-intervention status to the post-intervention outcomes.

Table 2. Cross-tabulation Matrix of Pretest and Posttest Knowledge Levels

Baseline Pretest Status	Metric	Posttest: Less/Poor	Posttest: Fair	Posttest: Good	Total Group
Less/Poor Knowledge	Count (n)	3	7	12	22
	% within Row	13.6%	31.8%	54.5%	100.0%

Fair Knowledge	Count (n)	0	1	4	5
	% within Row	0.0%	20.0%	80.0%	100.0%
Good Knowledge	Count (n)	0	1	2	3
	% within Row	0.0%	33.3%	66.7%	100.0%
Total Sample	Count (N)	3	9	18	30
	% within Total	10.0%	30.0%	60.0%	100.0%

The granular tracking in Table 3 clearly reveals high individual improvement rates among the target population. Out of the 22 respondents who started with an initially inadequate understanding ("Less/Poor" baseline), more than half successfully climbed to the highest tier, with 12 individuals (54.5%) matching the "Good" knowledge criteria after the program, while 7 individuals (31.8%) progressed to a "Fair" level. Only a minor segment of 3 individuals (13.6%) remained static in the lowest category. Furthermore, the operational intervention maintained a stable upward path for those who entered with partial understanding.

Among the 5 respondents who occupied the "Fair" pretest baseline tier, none experienced a regression in health literacy. Instead, 4 individuals (80.0%) successfully advanced into the "Good" category, while only 1 person (20.0%) remained stationary at a fair level. For the remaining 3 respondents who already possessed a "Good" baseline standard, 2 individuals (66.7%) successfully sustained their top-tier literacy metrics, whereas 1 person (33.3%) saw a minor stabilization shift into the fair knowledge performance criteria. Cumulatively, this matrix demonstrates that the structured educational and tracking workflow under the 5-table system successfully catalyzed a positive knowledge transition across all initial baseline points.

Intervention Efficacy and Statistical Analysis

To statistically verify the significance of the observed knowledge improvements, a comparative analysis of the aggregate scores was executed.

Table 4 provides a summary of the descriptive and paired statistical metrics comparing the pretest and posttest intervals.

Table 4. Paired Samples Statistics and Efficacy Analysis

Evaluation Interval	Mean Score	Standard Deviation	Standard Error of Mean	Sig. (2-tailed)
Pretest Baseline	5.63	4,021	734	0
Posttest Evaluation	11.83	2,408	440	

The empirical tracking detailed in Table 4 confirms a distinct increase in health literacy scores. The overall mean knowledge score of the adolescent girls rose significantly from a pretest average of 5.63 to a posttest average of 11.83. Furthermore, the variation in scores between participants narrowed, as evidenced by the reduction in standard deviation from 4.021 down to 2.408, indicating a more uniform distribution of health literacy across the sample. The formal hypothesis testing via the Paired Samples t-test yielded a highly significant result with a p-value of 0.000 ($p < 0.05$). Consequently, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_a) is accepted, proving that the execution of the structured 5-table system within the adolescent health post exerts a statistically significant positive influence on increasing anemia prevention literacy among adolescent girls.

DISCUSSION**Alignment of Results with Research Objectives**

This study evaluated the impact of implementing the structured 5-table system within *Posyandu Remaja* on adolescent girls' health literacy regarding anemia prevention. The empirical findings directly address this focus, demonstrating a profound and statistically significant improvement in respondents' knowledge levels post-intervention. Baseline pretest data revealed a severe knowledge deficit in the Sebulu I Public Health Centre work area, where 73.3% of adolescent girls exhibited poor baseline knowledge regarding anemia. Following the execution of the systematic 5-table workflow, this lowest-tier knowledge group contracted sharply to 10.0%, while the "Good Knowledge" category experienced a substantial surge, rising from an initial 10.0% to 60.0%. The rejection of the null hypothesis via the Paired Samples t-test ($p = 0.000 < 0.05$) explicitly confirms that the structured 5-table system serves as an effective educational strategy to significantly enhance adolescent health literacy regarding anemia prevention.

Scientific Interpretation of the Findings

Scientifically, the remarkable transition in health literacy from a pretest mean score of 5.63 to a posttest average of 11.83 can be attributed to the pedagogical and structural organization of the 5-table system. Knowledge acquisition is a psychological and cognitive process driven by active sensory engagement and structured information delivery. Prior to the intervention, the high prevalence of poor knowledge (especially within the dominant 15-year-old cohort at 90.0%) highlights a critical gap in traditional, passive information dissemination channels within the community.

The 5-table system remedies this by shifting the educational model from generic, passive lecturing to an active, multi-stage personalized care pathway. Tables 1 through 3 establish a personalized health context for each participant through formal registration, physical screening (including hemoglobin tracking), and data recording. This clinical onboarding primes the adolescents' psychological readiness for learning. Consequently, when they reach Table 4 (targeted nutritional education and counseling), the information regarding causative risk factors, diagnostic signs, and reproductive health complications becomes personally relevant. Finally, Table 5 reinforces this knowledge by coupling counseling with the tangible provision of iron supplements. The narrowing of the standard deviation from 4.021 down to 2.408 further proves that this systematic, multi-tiered community workflow successfully uniformizes health literacy across varying age groups, ensuring that educational materials are optimally digested by the vast majority of participants.

Integration and Comparison with Existing Literature

The outcomes of this research strongly align with contemporary public health literature advocating for structured, youth-friendly community health platforms. The finding that the 5-table system significantly decreases anemia risk indicators by multiplying health literacy mirrors the conclusions of Novarica et al. (2023), who reported that active participation in structured adolescent health posts effectively curbs anemia rates when paired with systematic tracking. Furthermore, the success of the multi-tiered educational framework supports the assertions of Maharani et al. (2024), who emphasized that targeted health promotions within localized community post frameworks are significantly more effective at altering health-seeking behaviors than uncoordinated supplement distributions. The severe baseline literacy deficits identified in this study also corroborate global and national data trends. The high proportion of initial poor knowledge among adolescent girls due to inadequate nutritional literacy aligns with observations by Pola et al. (2024) regarding multifactorial dietary deficiencies in developing regions. Moreover, the localized vulnerability of the 15-to-18-year-

old cohort due to menstrual iron loss matches the physiological frameworks established by the World Health Organization (2023) and national health surveys showing elevated regional anemia burdens[cite: 1]. However, a minor variance observed in this study lies in its individual transitional tracking. While previous literature, such as Novarica et al. (2023), frequently implies uniform positive shifts across all participants, our cross-tabulation matrix captured nuanced individual variations: 13.6% of respondents with poor baselines remained static, and one respondent in the good baseline tier experienced a minor stabilization score shift. These subtle variances are likely driven by localized extraneous factors, including differences in individual attention spans, cognitive variations, or baseline exposures to school-based health programs. Ultimately, by providing clear empirical evidence of a multi-tiered screening-and-education pathway, this study validates the 5-table system as a highly effective, scalable preventive strategy for public health services to combat adolescent nutritional deficiencies.

The rejection of the null hypothesis via the Paired Samples t-test ($p = 0.000 < 0.05$) explicitly confirms that the structured 5-table system serves as an effective educational strategy to significantly enhance adolescent health literacy regarding anemia prevention. However, this study is limited by its small sample size ($N = 30$) and single-group pretest-posttest design without a control group, which may restrict the generalizability of the findings to broader adolescent populations.

CONCLUSION

In conclusion, this study successfully addresses its primary objective by demonstrating that the implementation of the structured 5-table system within adolescent integrated health posts (Posyandu Remaja) exerts a statistically significant positive influence on increasing health literacy and preventing anemia among adolescent girls. The intervention successfully dismantled the severe baseline public health literacy deficit in the community, shifting the vast majority of participants from the "Less/Poor" knowledge tier (73.3% pretest) into the "Good" knowledge criteria (60.0% posttest), as statistically validated by a highly significant paired t-test result ($p = 0.000 < 0.05$). The scientific justification for this study lies in its shift away from passive health lecturing toward an active, multi-stage, personalized screening-and-education pathway. By systematically integrating registration, physical measurements, hemoglobin tracking, targeted counseling, and supplement distribution into a single community-led workflow, this framework satisfies the psychological and cognitive requirements for effective health behavior modification. The narrowing of score variations confirms that this operational framework provides a uniform, equitable distribution of essential health information, bridging localized knowledge gaps across varying adolescent age groups. Based on these findings, the following recommendations are proposed:

For Community Nursing and Midwifery Practice: Public health and community nurses should formally adopt the 5-table system framework as a standardized operational protocol for youth-friendly health services. Nurses can leverage this structured workflow to conduct early screenings and provide routine, personalized nutritional counseling to improve adolescent iron supplementation compliance.

For Future Public Health Practice and Policy: Healthcare administrators and policymakers should institutionalize this multi-tiered system within primary healthcare networks (Puskesmas) to optimize preventative strategies against regional nutritional deficiencies. Future research should expand on these findings by conducting long-term longitudinal studies to measure the direct, long-term impact of this system on actual clinical hemoglobin levels and the broader reduction of reproductive health complications.

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CONFLICTS OF INTEREST

The authors declare that there are no financial, personal, or professional conflicts of interest that could inappropriately influence or bias the conduct, analysis, or presentation of this research. The study was conducted independently, and the data collection, statistical interpretation, and manuscript development were carried out without any external commercial pressures or competing academic allegiances.

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