

ORIGINAL ARTICLE

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# Empowerment of CEMPAKA Cadres to Improve Compliance with Iron Tablet Consumption among Female Students at X Islamic Boarding School, Banyuwangi

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#### **ABSTRACT**

**Background:** Anemia remains a serious problem among adolescent girls in Indonesia, with the prevalence rate of 32%. Low adherence to iron tablet consumption, especially in Islamic boarding schools, contributes to this problem, as evidenced by 11 cases identified at the target school. Adolescent girls have a significantly high risk of anemia due to low access to health information, lack of nutrition education, and limited support from health workers. Hence, involving peers as health cadres is an effective way to increase iron tablet intake and health-promoting behavior among the students.

**Objectives:** To improve compliance with iron tablet consumption among female students by strengthening the role of cadres, creating a supportive school environment, and contributing to anemia free boarding schools in Banyuwangi Regency.

**Methods:** The activities were conducted through socialization and training under the CEMPAKA (*Cermat Pantau Kondisi Anemia*) program. The final participants were 50 female students and 15 health cadres. Pre- and post-test questionnaires were used to determine the level of knowledge. Mean differences were calculated using a two-sample t-test with equal variances assumed to test for pre- and post-differences.

**Results:** There was a statistically significant increase in student's knowledge about anemia and iron tablet consumption (p=0.009, p<0.05). Similarly, cadre's knowledge improved significantly (p=0.003, p<0.05). However, improvements in communication skills were not statistically significant (p=0.162, p>0.05), though a positive trend was observed, indicating better communication performance after training.

**Conclusion:** The empowerment of cadres through the CEMPAKA program demonstrated improvements in knowledge about anemia, the importance of consuming iron supplements, and communication skills. A participative intervention such as this will further establish peer cadres as agents of healthy behavioral change in Islamic boarding schools and represents an initial step toward achieving a healthy, anemia-free Islamic boarding school in Banyuwangi Regency.

**Keywords:** Anemia, Adolescent Girls, Boarding School, Cadres, CEMPAKA, Good Health and Well-Being, Iron Tablet

#### INTRODUCTION

Anemia is still a nutritional problem and remains a public health challenge in various developing countries, including Indonesia. According to data from the World Health Organization (WHO), approximately 30.7% of women aged 15-49 years worldwide were reported to have anemia in 2023 (World Health Organization, 2023). In Indonesia, based on the 2018 Basic Health Research (RISKESDAS), the prevalence of anemia among adolescent girls was 32% (Kementerian Kesehatan, 2018). This situation indicates that anemia remains a public health problem that requires serious attention, especially among adolescent girls who are at high risk of iron deficiency due to the blood loss that occurs during menstruation (Nasruddin et al., 2021).

Anemia in adolescent girls can have serious short- and long-term impacts. In the short term, anemia causes fatigue, reduced concentration in learning, impaired immunity, and reduced productivity in daily activities. In the long term, anemia in adolescent girls may impair cognitive development and increase the risk of complications during pregnancy and childbirth (Maigoda, 2025). Recognizing these impacts, the Indonesian Ministry of Health implemented a program that provides iron tablets (TTD) on a weekly basis, one tablet per week, for adolescent girls at the junior and senior high school levels as an effort to reduce anemia prevalence (Kementerian Kesehatan, 2022).

However, the implementation of this program still faces significant challenges in terms of iron supplement compliance. Various studies have shown that many adolescent girls do not take iron supplements regularly due to factors such as discomfort after taking the tablets, perceived side effects, and a lack of understanding of the importance of anemia prevention (Damayanti *et al.*, 2025). This condition of non-compliance is increasingly complex in Islamic boarding school environments, where female students have busy activity schedules, limited access to health information, and minimal support from health workers (Alfianti, Dieny and Wijayanti, 2024).

One Islamic boarding school facing this situation is the X Islamic Boarding School, located in Wongsorejo District, Banyuwangi Regency, East Java. This area is considered to have a high stunting prevalence of 6.4% in 2023. This contributes significantly to the total cases in Banyuwangi Regency, which has a prevalence of 3.5% and remains above the Banyuwangi zero target of 0% by 2030. X Islamic Boarding School accommodates over 300 students, the majority of whom come from lower-middle income families and limited parental education (Pemerintah Kecamatan Wongsorejo, 2024). The boarding school system is packed with a busy schedule of activities, both academic and

religious, leaving the female students with demanding routines and limited time to manage their personal health, including adherence to iron consumption (Puskesmas Wongsorejo, 2025).

Initial observations show that most students at Islamic Boarding School X do not consume iron tablets regularly as recommended by health workers. Although the boarding school has a program for drinking iron tablets together every Friday, its implementation has not been optimal due to inconsistent supervision, limited assistance, side effects such as nausea and vomiting, and a lack of mechanisms to ensure that all students actually take the tablets according to schedule. Therefore, a community-based approach is needed that can encourage the active participation of students in monitoring and motivating each other to adopt healthy behaviors, particularly in taking TTD to prevent anemia (Puskesmas Wongsorejo, 2025).

The CEMPAKA (Cermat Pantau Kondisi Anemia) cadre empowerment program is an innovative intervention focused on enhancing the capacity of female Islamic boarding school students as peer health cadres. Through this program, female Islamic boarding school students are equipped with knowledge and skills in nutrition education, peer mentoring, and routine monitoring of iron tablet consumption. The goal of this program is to improve adherence to iron tablet consumption among female Islamic boarding school students by strengthening the role of peer cadres, building a boarding school environment that supports adolescent girl's health, and supporting the achievement of a healthy, boarding anemia-free Islamic schools Banyuwangi Regency.

# **METHODS**

Community service was conducted at the X Islamic Boarding School in Banyuwangi Regency from October to December 2025 in collaboration with the students, health cadres, and management of the boarding school using participatory methods. A health education session on anemia and the importance of taking TTD was provided on the first day to 50 female students at the MTs level. The total number of participants was representative of MTslevel female students who stayed in the boarding school. Participants were selected using inclusion criteria, who were actively pursuing studies at the MTs level and staying full-time in the dormitory, while students who were sick or absent at the time of data collection were excluded from the study. The session was delivered interactively through lectures, question-and-answer. discussions, and educational materials had been prepared according to the guidelines set by the Ministry of Health and supported by visual media in the form of posters, modules, educational videos, and the CEMPAKA health diary.

The second day was allocated to health cadre training for 15 students who were selected based on their roles as santri husada, who had previously undergone basic health training from the local community health center. Material presentation, group discussions, case simulations, and role-play exercises were included in this one-day training to enable cadres to provide persuasive and supportive health messages to their peers. Training effectiveness was measured by pre- and post-tests and through performance evaluation in role-play sessions. This program received ethical approval from the Health Research Ethics Committee of the Faculty of Public Health, Universitas Airlangga, with ethical clearance number 267/EA/KEPK/2025.

#### **Program Activity Stages**

The implementation of the program was carried out in four main stages. Each stage was systematically structured to ensure effectiveness and achievement of program objectives. These stages are shown in Figure 1 and include:

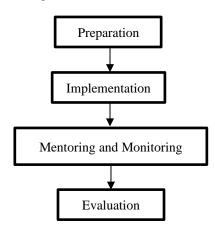


Figure 1. Workflow Diagram

#### 1. Preparation Stage

The preparation phase included coordination with the Islamic boarding school and the local village primary health services (*Puskesmas Wongsorejo*), as well as a site survey and preliminary study to identify context-specific needs. This stage also covered the development of educational materials in the form of logbooks, modules, and iron tablet consumption diaries, which were designed to support the weekly monitoring and evaluation plan from October to December.

### 2. Implementation Stage

This phase included outreach activities related to anemia and iron tablet consumption for 50 MTs-level female students in a 2–3 hour session, using interactive lectures, discussions, and a question-and-answer sessions. Next, a one-day CEMPAKA cadre training was conducted for 15 *santri husada* on knowledge

about anemia, effective communication skills, and skills in monitoring adherence to iron tablets consumption. The training, was conducted for approximately 5–6 hours, consisted of material delivery, group discussions, case simulations, and role-play exercises. The role-play performance assessment was used to assess how capable the cadres were in applying these skills in real situations, along with pre- and post-tests.

## 3. Mentoring and Monitoring Stage

Trained cadres mentored their peers to remind them to consume iron tablets regularly and recorded adherence in the provided diary. Reminders were delivered through direct peer-to-peer communication, either in person or via simple messages, providing interpersonal support that differs from automated medication reminder programs. The cadres then summarized their peers adherence in a logbook and reported progress to the caretaker, with mentoring and monitoring conducted weekly from October to December.

# 4. Evaluation Stage

The evaluation involved administering a pre-test before the training and a post-test after the completion of the mentoring and monitoring period to ensure an appropriate interval and avoid immediate recall bias. The data obtained from the pre-test and post-test were analyzed using the paired t-test to determine the significance of differences before and after the training intervention (Hedberg and Ayers, 2015).

### **Activity Documentation**



**Figure 2.** Presentation of material on the socialization by the Wongsorejo Public Health Center



**Figure 3.** Presentation of material using poster media at the Socialization by FIKKIA Lecturers at Airlangga University



**Figure 4.** Screening of anemia education video at socialization



**Figure 5.** Introduction of CEMPAKA diary book in socialization activities



**Figure 6.** Action of consumption iron tablet together after the socialization activity



Figure 7. CEMPAKA cadre training



**Figure 8.** Simulation of monitoring the consumption of iron-boosting tablets



**Figure 9.** Presentation of material in cadre training activities

#### RESULTS AND DISCUSSION

# Improvement of Female Students Knowledge about Anemia and Iron Tablet Consumption

The socialization of anemia and the importance of consuming iron tablets was attended by fifty (50) female students at X Islamic Boarding School. This activity is part of the CEMPAKA (Cermat Pantau Kondisi Anemia) program, which aims to increase the knowledge of adolescent girls, promote anemia prevention, and emphasize the importance of iron tablet consumption. The socialization was carried out using interactive lectures, discussions, and questions and answers to encourage active participant involvement. Various techniques were used to attract the attention of the adolescent girls, such as provocative questions, simple language, and linking the material to everyday life. This was reinforced by the use of educational media such as posters, modules, educational videos, and CEMPAKA diaries.

All materials presented were prepared by the facilitators, with reference to official Ministry of guidelines and supplemented with Health educational materials from the local public health center (Puskesmas) to ensure the information provided remains accurate and meets health standards. A pre- and post-test using a ten (10) multiple-choice questionnaire on anemia and iron deficiency was administered to assess the effectiveness of the outreach activities in increasing participants knowledge. The multiple-choice format was chosen because it provides an objective assessment, is easy for participants to understand, and is efficient for large groups. The ten-question set was chosen to cover basic knowledge indicators without overwhelming participants.

Data analysis using the paired t-test indicated an increase in the mean knowledge scores between the pre-test and post-test. This difference shows that socialization had a positive impact on participants knowledge. The average pre-test and post-test scores are presented in Table 1 below.

Based on Table 1, the mean knowledge score of female students increased from 71.8 before the socialization to 80.4 after the activity. The analysis showed a positive correlation (r=0.452) between the pre-test and post-test scores, with a pvalue=0.009 (p<0.05), indicating a statistically significant improvement in knowledge after the socialization (Andrade, 2019). This suggest that the socialization activity was effective in improving students knowledge about anemia and the importance of iron tablet (TTD) consumption. This improvement in knowledge demonstrates that the delivery methods used, such as interactive lectures, discussions, and Q&A sessions, were effective in significantly enhancing participants understanding. Furthermore, the use of educational media such as posters, modules, iron tablet consumption diaries,

and educational videos helped participants understand the importance of anemia prevention in

everyday life within the Islamic boarding school environment. (Fitraniar, Anita and Yusnaini, 2025).

**Table 1.** Results of the Paired t-Test for Pre-test and Post-test Knowledge of Female Students about Anemia (n=50)

Group	Mean	N	Std. Deviation	Correlation	P-Value
Pre-test	71.8	50	16.49	0.452	0.009
Post-test	80.4	50	16.03		

<sup>\*</sup>p-value  $\alpha$ =0.05

The results of this study align with the findings of Dinur et al. (2025), who stated that health education using an interactive approach can improve adolescent girls knowledge about anemia (Dinur, Sunartono and Dewi, 2025). Similarly, Taryzafitri et al. (2025) found that counseling sessions using visual and audiovisual educational media significantly improved participants knowledge levels (Taryzafitri, Meihartati and Astutik, 2025). Furthermore, Palungan (2025) found that the increase in knowledge about iron tablets was higher in the group receiving direct assistance compared to the group receiving one-way counseling (Palungan, 2025). This result is also supported by Xaveria et al. (2025), who stated that participatory counseling methods that actively involve participants are more effective in improving knowledge and attitudes about anemia prevention (Xaveria et al., 2025).

The CEMPAKA program not only provides information but also fosters a sense of responsibility and reminds female students to consume iron tablets regularly. Overall, the results of this activity demonstrate that the anemia awareness program within the CEMPAKA program was effective in increasing the knowledge of female students. This increased understanding provides a crucial foundation for developing positive behaviors, such as adherence to regular iron supplement consumption. This success is expected to be the first step towards creating healthy, anemia-free Islamic boarding schools.

# Improvement of Knowledge among CEMPAKA Cadres

CEMPAKA cadre training was conducted to improve the knowledge and skills of cadres in

assisting female students in preventing anemia at X Islamic Boarding School. Fifteen cadres participated in the training, which covered two main topics: anemia and effective communication. The cadres came from the Islamic boarding school, where the cadre selection process had already been determined and the boarding school health post was already in place. The cadres were students from the Husada unit of the Islamic boarding school who had previously received basic training and mentoring. The training was delivered through a combination of interactive lectures, group discussions, case simulations, and role-playing exercises to ensure that cadres not only understood the material but also applied it in real-life situations. The role-playing exercises emphasized the communication module, allowing cadres to practice delivering persuasive messages and providing supportive mentoring. All training sessions were conducted by an organizing committee from Airlangga University, whose members had backgrounds in public health and experience in adolescent health education. Trainers were selected based on their qualifications and experience in community service activities.

Cadre training also included a pre-test to assess initial knowledge before receiving the training. After all training sessions were completed, cadres were given a post-test to assess their knowledge gains after receiving the materials. Statistical testing of the pre-post result using the two-sample t-test, assuming equal variances, was conducted to compare the mean scores between the groups. This analysis was performed to determine whether there were any significant differences in the measured variables. The results of the analysis are presented in Tables 2 and 3.

**Table 2.** Results of the t-Test for Cadres Knowledge about Anemia (n=15)

Group	Mean	N	Std. Deviation	Correlation	P-Value
Pre-test	74.67	15	16.42	0.531	0.003
Post-test	90.67	15	10.33		

<sup>\*</sup>p value  $\alpha$ =0.05

Based on Table 2, the average knowledge score of the cadres increased from 74.67 before the training to 90.67 after the training. The analysis showed a positive correlation (r=0.531) between the pre-test and post-test scores, with a p-value=0.003 (p<0.05), indicating a statistically significant difference in knowledge levels before and after the

training (Andrade, 2019). These results confirm that the training was effective in improving the cadre knowledge about anemia. This improvement demonstrates that the training method, which combined interactive lectures, simulations, and discussions, successfully enhanced the cadres capacity. The cadres became more knowledgeable

about the concept of anemia, the importance of iron tablets (TTD) consumption, and effective communication techniques for assisting students.

These findings align with research by Dewi et al. (2022), which reported that cadre training on anemia could improve cadre knowledge and ability to provide nutritional education for adolescent girls (Dewi, Gusti and Junita, 2022). Furthermore, Emilyani and Kurnia (2023) found that practice-based training improved cadres confidence and skills in educating communities about adolescent health (Emilyani and Kurnia, 2023). Another study by Prasetyo and Safitri (2024) also supports these

findings, where effective communication training has been shown to improve cadres skills in delivering health messages in a more persuasive and empathetic manner (Prasetyo and Safitri, 2024).

In addition to knowledge about anemia, the cadres effective communication skills were also assessed to observe changes in their ability to convey health messages to their intended audience. The assessment aimed to evaluate whether the training contributed to improvements in their communication performance. The results of the t-test on communication skills are presented in Table 3.

**Table 3.** Results of the t-Test for Cadres Effective Communication Skills (n=15)

Group	Mean	N	Std. Deviation	Correlation	P Value
Pre-test	82.67	15	9.61	0.411	0.162
Post-test	86.67	15	4.88		

<sup>\*</sup>p value  $\alpha$ =0.05

Based on Table 3, the average communication skill score of the cadres increased from 82.67 before the training to 86.67 after the training. However, the p-value=0.162 (p>0.05) indicates that the difference between the pre-test and post-test scores was not statistically significant (Supriyono, 2021). Despite this, the improvement in the mean score suggests a positive trend in enhancing cadres communication skills following the training.

The lack of statistical significance in the effective communication outcomes may be attributed to the relatively short duration of the training, which may not have been sufficient for optimal development of communication skills. According to Ghofar and Endaryono (2024), improving communication skills requires repeated practice and ongoing feedback to hone interpersonal skills (Ghofar and Endaryono, 2024). These findings are also in line with R. Dewi et al. (2018), who found that a single training session was insufficient to produce significant changes in the communication skills of health cadres (Dewi, Dida and Anisa, 2018).

In general, the results of cadre training in the CEMPAKA (Cermat Pantau Kondisi Anemia) program showed improvements in both knowledge and communication skills. This significant increase in knowledge strengthens the cadres role as agents of change in supporting healthy behaviors among female students, while the improvement in communication skills, although not yet significant, remains a potential area for development through further training and regular mentoring. Therefore, the CEMPAKA cadre training is a strategic step in achieving the sustainability of anemia prevention programs in Islamic boarding schools.

This community service program has several strengths. First, the activities applied the participatory approach, which involved active participation by both the cadres and the boarding

school community. It promoted collaboration efforts and gave a sense of mutual responsibility in implementing health promotion activities, especially on improving adherence to iron supplement tablets consumption. Interactive learning media (posters, modules, educational videos, and the CEMPAKA diary) were also prepared to further engage participants and support a deeper understanding of the subjects during activities. However, there are some limitations to the program. Participation was still limited in number, as was the implementation period; thus, it potentially shortened the cadres skill development process. Moreover, sustainability will always depend on the commitment of the boarding school and the cadres after the activities are over.

The potential for sustainability with the program is considerable because the cadres have already been equipped with basic knowledge and various educational media that can be used independently. The boarding school also responded very well during the implementation. However, there are also threats from the students busy schedules, changes in the leadership of the boarding school, and the possibility of dwindling cadre motivation if not constantly guided. Therefore, it is necessary to perform periodic monitoring and continued support from the community health center and educational institutions so that the activities of the program can continue to be implemented effectively and provide a long-term impact.

#### **CONCLUSION**

The socialization and training activities conducted under the CEMPAKA (Cermat Pantau Kondisi Anemia) program have proven to have a positive impact on improving participants knowledge at Miftahul Ulum Islamic Boarding School, Bengkak. In the socialization activity for female students, showed a significant increase in

knowledge regarding anemia and the importance of iron tablet consumption. This indicates that educational methods through interactive lectures, discussions, and the use of educational media such as posters, modules, and videos are effective in increasing adolescent girls understanding of anemia prevention. Meanwhile, the CEMPAKA cadre training also produced positive results. Cadres knowledge about anemia increased significantly, confirming that the practice-based and simulationbased training effectively increased the cadres capacity to provide health education to female students. Although the increase in effective communication skills among cadres did not show a significant difference, the average increase indicates a positive trend towards improved communication skills.

Overall, the CEMPAKA program activities have successfully increased the individual capacity of both female students and Islamic boarding school health cadres. Female students have gained a better understanding of the importance of preventing anemia through regular iron supplementation. Meanwhile, cadres have gained the knowledge and skills to become persuasive and supportive mentors. This success is expected to be the first step towards establishing a healthy, independent, and sustainable Islamic boarding school environment in anemia prevention efforts.

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## **Conflict of Interest and Funding Disclosure**

None

# **Author Contributions**

SIP: Conceptualization, project administration, leading the study, review, writing and revise the article. FNA, JRH: Conceptualization, training, methodology, writing—original draft and revise the article. FHA, DYM, MR, DP: Conceptualization, training, and revise the article. MH: Revise the article. SNAK: Conceptualization, revise the article. SKS: Supervision.

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