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Enhancing Adolescent Health through Anemia Prevention Education and Hemoglobin Testing to Reduce the Risk of Stunting

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ABSTRACT
Stunting can begin as early as adolescence, particularly through anemia in young girls. Anemia occurs due to a lack of hemoglobin, especially during menstruation. If not properly addressed, it can lead to stunting. In Indonesia, the anemia rate among adolescents remains high, reaching 32% in 2018 and declining to 15.5% in 2023. According to the WHO, this figure is still considered high, as it remains above 10%. The purpose of this community service activity is to increase adolescent knowledge and skills regarding anemia prevention. The community outreach activities included pre-test and post-tests, giving health education, and hemoglobin level checks. Results showed that knowledge before the health education was less of knowledge (84.3%), but after the health education increased to 86.8% in good knowledge. Furthermore, hemoglobin level checks revealed that 37% of students had anemia, with half of these having moderate anemia. This community service activity can be a way to prevent anemia through health education and hemoglobin level checks, thereby increasing knowledge about anemia prevention and stunting prevention.

Keywords **:** Adolescents, Anemia, Health Education Stunting

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INTRODUCTION

Anemia is a condition where the morphology of red blood cells is insufficient to meet the body's physiological needs (Anbesu et al., 2022; Anika Niambi Al-Shura, 2020; Wall et al., 2019). In Indonesia, the prevalence rate of anemia in women aged 15-49 years is 28.8% (Mutmainnah et al., 2021). Meanwhile, according to data from the 2023 Indonesian Health Survey, the anemia rate among adolescents aged 15-24 was 15.5%. According to the WHO, this figure is considered high, as it is still above 10% (Kementrian Kesehatan Republik Indonesia, 2023).

Adolescents (15-19 years old) often suffer from malnutrition, which results in substantial growth and developmental delays. This occurs due to insufficient provision of

essential dietary components such as protein, vitamins, minerals, and other essential nutrients (Zhou et al., 2025). If this incident attacks teenagers, it will cause long-term reproductive health problems and will cause stunting cases in the future in children who are born (Taufikurrahman et al., 2023)

Adolescence represents a second window of opportunity after early childhood, influencing developmental trajectories including growth and cognitive development and providing a period during which some adverse childhood experiences can be mitigated (Mastorci et al., 2024; Ross et al., 2020). Adolescents in Indonesia face the triple burden of undernutrition, overnutrition, and micronutrient deficiencies (Deivita et al., 2021). Approximately one-quarter of adolescents aged 13-18 years experience stunting or short stature. 9% of adolescents are underweight or have a low body mass index, while another 16% are overweight or obese. Furthermore, approximately one-quarter of adolescent girls experience anemia.

One of the major impacts of anemia is stunting. Stunting is a condition of failure to grow and develop in the body and brain due to prolonged malnutrition, resulting in a child being shorter than normal children their age and experiencing delays in thinking. Causes of stunting include inadequate nutritional intake, infectious diseases, and maternal factors such as poor nutrition during preconception (Alfika, Irni, 2024). Pregnancy and lactation, genetic factors, exclusive breastfeeding, food availability, socio-economic factors, maternal education level, maternal nutritional knowledge and environmental factors (Anjani et al., 2024).

Although the adolescent cycle seems far from the incidence of stunting, in reality many cases of stunting begin during the teenage phase before becoming a mother, such as: anemia in adolescent girls due to hemoglobin deficiency, especially during menstruation that is not immediately addressed, economic factors, and inappropriate eating patterns and diets. Adolescents are people between the ages of 10 and 19 years old" World Health Organization (WHO). Adolescence is a transition period from childhood to adulthood. This period will experience rapid physical, mental, and emotional growth (Misch & Dunham, 2021). During the physical maturation process, changes in body composition occur, both in height and weight, which will affect a person's health and nutritional status. Therefore, during adolescence, nutritional intake and lifestyle must be considered .

The implementation of anemia prevention in Kediri City has not been running well because it is influenced by several modifying factors, namely the socio-economic conditions of families in choosing food ingredients in the form of breakfast and lunch boxes and the lack of knowledge about the long-term impact of anemia which needs to be prepared for from adolescence (Lutfiasari et al., 2025). Therefore, several strategies need to be developed to address anemia in adolescents, including strengthening health workers in program development, improving program infrastructure, developing community-based health services for adolescents, developing healthy school models, and improving cross-program coordination. One of the things that needs to be done in schools is empowering school health unit (UKS) resources through peer support in program implementation. (Riskesdas, 2018). Systems thinking public health educational campaigns that highlight the consequences of anaemia and at-risk groups are more likely to inspire the adoption of preventive strategies among young adults (Benfo et al., 2023).

METHOD

The methods employed in this community service activity comprised health education on anemia prevention among adolescents, measurement of hemoglobin levels, and capacity building of adolescents as peer educators in health education. Health education was delivered

through lectures and interactive discussions, hemoglobin levels were assessed using a digital hemoglobinometer, and peer group capacity was strengthened through peer simulation. The stages of community service activities can be seen in the following image.

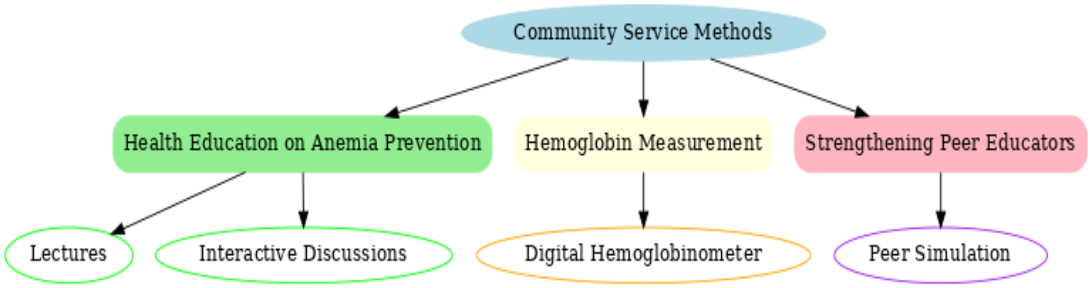

Figure 1. Flowchart of community service activities in the program

This community service activity was conducted in March 2025. Participants in this community service activity were 4 lecturers, 2 university students, and 38 students from SMAN 7 Kota Kediri.

RESULTS

1. Knowledge about anemia prevention

Behavioral change in preventing anemia among adolescents begins with improving their knowledge of anemia and its prevention. Health education serves as an effective intervention to enhance adolescents' understanding and awareness of anemia. The health education session on anemia prevention was conducted at SMAN 7 Kediri City and attended by 38 students from the PMR-UKS extracurricular program. Before the session, students completed a 20-minute pre-test to assess their baseline knowledge.

Table 1. Adolescents' level of knowledge before the delivery of health education on anemia prevention

No	Clasification	Frequency	
		N	%
1	Good knowledge	2	5,3
2	Enough knowledge	4	10,5
3	Less knnowledge	32	84,2
	Total	38	100

Prior to the health education on anemia prevention, the majority of adolescents (84.2%) were found to have insufficient knowledge regarding anemia prevention. Following this assessment, a health education session on preventing anemia in adolescents was delivered.

Figure 2. Health Education about Anemia Prevention

A post-test lasting approximately 20 minutes was administered to assess the adolescents' final knowledge after receiving health education. The health education activity itself consisted of a 20-minute material presentation followed by a 30-minute session of discussion and questions and answers.

Table 2. Adolescents' level of knowledge after the delivery of health education on anemia prevention

No	Clasification	Frequency	
		N	%
1	Good knowledge	33	86,8
2	Enough knowledge	4	10,5
3	Less knnowledge	1	2,7
	Total	38	100

Following the health education on anemia prevention, the majority of adolescents (86.8%) demonstrated good knowledge regarding the prevention of anemia.

2. Hemoglobin Level Examination

Figure 3. Hemoglobin Examination Activity

Hemoglobin level is a key indicator for determining the incidence of anemia in adolescents. In this study, hemoglobin levels were assessed using a digital hemoglobin meter. Adolescents with hemoglobin levels below 12 g/dL were classified as anemic. The measurement was conducted to identify adolescents with anemia and to enable the initiation of early interventions.

The measurement of hemoglobin levels among 38 high school students revealed that 1 student (2.6%) had moderate anemia, 8 students (21.0%) had mild anemia, while the remaining students showed no indication of anemia.

3. Capacity building of peer educators in health education using peer simulation

Figure 4. Capacity building of peer educators in health education using peer simulation

The third community service activity involved strengthening peer educators in health education through simulation exercises on the theme of anemia prevention in adolescents. The activity included simulations on communication skills, delivering information about anemia, promoting preventive efforts, and evaluating adherence to iron tablet consumption. These simulations were carried out in groups.

DISCUSSION

After the implementation of health education and peer educator support, the number of students with good knowledge increased from 2 (5.3%) to 33 (86.8%), reflecting an 81.5% improvement. Adolescence, defined as the period between 10 and 19 years of age, is a transitional stage marked by physical and psychological changes that may give rise to various health problems, one of which is anemia (Madestria et al., 2021). Adolescents are often regarded as the spearhead of national progress, yet adolescent girls remain particularly vulnerable to anemia due to increased nutritional demands associated with rapid growth, menstrual blood loss, malnutrition, and inadequate iron intake (Zuraida et al., 2020). The establishment of youth groups within schools is essential to provide a platform for sharing information on reproductive health (Sari et al., 2022; Singh et al., 2019). Peer education has been recognized as an effective strategy to improve preventive behaviors against anemia among adolescent girls, and it is expected that such programs will continue to be strengthened and integrated into student organization agendas (Permanasari et al., 2021). Sustained and effective peer-to-peer communication facilitates behavior change in preventing anemia (Lutfiasari et al., 2024). Information disseminated through peer education includes strategies for anemia prevention, such as increasing dietary intake of iron and vitamin C. Previous studies have shown that nutrition education enhances iron and vitamin C consumption while reducing the prevalence of anemia (Wiafe et al., 2023).

Anemia is a condition characterized by reduced levels of hemoglobin and red blood cells (Bhagavan et al., 2015). Iron deficiency anemia presents a higher risk for adolescent girls, as it can weaken the immune system and increase vulnerability to various health problems (Abu-Baker et al., 2021). Numerous studies have demonstrated a significant association between knowledge and the incidence of anemia. A study conducted among female students at SMA 05 Pekanbaru on the effects of peer education in anemia prevention revealed significant differences between the intervention and control groups in terms of average knowledge ($p = 0.013$), attitudes ($p = 0.011$), and skills ($p = 0.032$) (Permanasari et al., 2021). Peer education is therefore considered an effective strategy to improve anemia prevention behaviors among adolescent girls. Similarly, (Aisah et al., 2022) found that animated educational videos significantly increased adolescents' knowledge of anemia prevention. These findings suggest that health education serves as a crucial preventive measure, equipping adolescents with information, knowledge, and awareness that form the foundation for positive behavioral and attitudinal changes in anemia prevention. Intensive health education interventions have been shown to improve knowledge, attitudes, practices, and health-seeking behavior among school-aged girls, although additional nutritional intervention studies are needed to reinforce these practices (Singh et al., 2019). Beyond peer education, school-based programs have also proven effective; school-integrated interventions were reported to be more successful than nutritional education alone in improving nutrition-related knowledge and nutritional status among adolescent girls (Patimah et al., 2023). Strengthening peer educators in anemia prevention is crucial for accelerating communication among adolescents. Communication by peer educators with their peers will improve adolescents' knowledge and skills in anemia prevention. Peer support is a key and neglected aspect of education quality (Mitchell, 2023). Well-planned

communication strategy within an integrated health care system is an effective method for encouraging the behavioral changes necessary to reduce anemia in adolescents through dietary/nutrition modifications, such as increased iron and folic acid intake. This occurs through improved knowledge and improved attitudes toward anemia prevention in adolescents (Lutfiasari et al., 2024).

Communication conducted by peer educators is one form of peer support in changing adolescent behavior. The role of peers in adolescents' lives is as agents of socialization and as providers of social and emotional support (Ryan et al., 2019). As agents of socialization, peers can provide information on preventing anemia in adolescents, such as nutrition, iron supplementation, and other efforts to prevent anemia in adolescents. Peer support will make children feel cared for, appreciated, loved, helped, encouraged, and accepted when faced with difficulties (Rochmawati & Rahayu, 2017). The development of educational media for iron tablet intake through the video along packaging modification of iron tablet contributed a significant effect on the knowledge, attitudes, and intentions of young women in the iron supplementation intake (Madestria et al., 2021). Education through peer groups can be more effective in preventing anemia in adolescents if carried out for more than 1 month (Rima Andini & Agestika, 2022).

CONCLUSION

This community service activity successfully increased adolescents' knowledge of anemia prevention through health education, hemoglobin level screening, and peer educator empowerment. Hemoglobin checks enabled students to better understand their own health status, while peer education simulations equipped them with the skills to share information effectively with their peers. Strengthening adolescents as peer educators provides a sustainable strategy for improving anemia prevention behaviors, which may contribute to reducing the risk of stunting in the future.

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