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Overview of Adolescent Girls' Knowledge regarding Anemia Prevention at SMKN 2 Denpasar

Ni Luh Putu Risma Yanti¹, Ni Ketut Somoyani², Regina Tedjasulaksana³, Ni Komang Wiary Parmiyati⁴

^{1,2,3}Faculty of Midwifery, Poltekkes Kemenkes Denpasar, Bali, Indonesia

⁴Laura Rural Care, Department for Education, Government of South Australia, Australia

nlprismayanti17@gmail.com

Abstract

Adolescent girls are a high-risk group for anemia due to physiological changes, particularly menstruation, as well as behavioral and nutritional factors. Inadequate knowledge regarding anemia prevention may increase this risk. This study aimed to describe the level of knowledge among adolescent girls regarding anemia prevention at SMK Negeri 2 Denpasar. A descriptive research design with a cross-sectional approach was employed. Data were collected using structured questionnaires administered to 65 tenth-grade female students selected through purposive sampling from a total population of 118 students. The study was conducted on May 22, 2025. Knowledge levels were categorized into good (80–100), sufficient (60–79), and poor (<60) based on respondents' scores. The results showed that most respondents were 16 years old (64.6%), predominantly from the accounting major (67.7%), and 60% had previously received education about anemia. Electronic media was identified as the primary source of information (46.2%), followed by interpersonal sources such as family and peers (30.8%), and print media (23.1%). Overall, the majority of respondents (60%) demonstrated a good level of knowledge regarding anemia prevention, while a smaller proportion had sufficient (32.3%) and poor knowledge (7.7%). Despite generally favorable knowledge levels, gaps remain in specific aspects of anemia prevention, particularly related to menstrual health and comprehensive prevention strategies. Therefore, more structured, continuous, and context-based health education interventions are needed, involving both schools and healthcare professionals, to enhance adolescents' understanding and promote effective anemia prevention behaviors.

Kata kunci: Adolescent Girls; Anemia Prevention; Knowledge Level; Health Education; Information Sources

1. Introduction

Adolescence represents a crucial transitional stage between childhood and adulthood, characterized by rapid and complex changes encompassing physical growth, cognitive development, emotional maturation, and social adaptation (Utami, 2021). This period is marked by significant biological transformations, including puberty and hormonal fluctuations, which influence not only physical health but also psychological and behavioral patterns. According to the Ministry of Health of the Republic of Indonesia (2022), adolescents are individuals aged between 10 and under 18 years. During this phase, individuals begin to develop independence, form identity, and establish lifelong health behaviors. However, these developmental processes also increase vulnerability to various health problems, particularly those related to nutrition and reproductive health. One of the most common health issues affecting adolescents, especially female adolescents, is anemia (Elisa, 2023).

Anemia is defined as a condition in which the concentration of hemoglobin (Hb) in the blood is lower than normal or when the number of red blood cells is insufficient to meet the body's physiological needs (Hapsari, 2019). Hemoglobin plays a vital role in transporting oxygen from the lungs to tissues throughout the body; therefore, a deficiency can lead to reduced oxygen delivery and impaired organ function. Clinically, anemia is diagnosed when hemoglobin levels fall below 13.5 g/dL in males and below 12 g/dL in females. Among adolescents, iron deficiency anemia is the most prevalent type, primarily caused by inadequate dietary intake, increased physiological demands during growth, and, in females, blood loss due to menstruation. The consequences of anemia are not limited to physical symptoms such as fatigue, weakness, and dizziness but also extend to cognitive impairment, decreased academic performance, reduced concentration, and diminished productivity (Aulya et al., 2022).

Globally, anemia remains a major public health concern. Data from the World Health Organization (WHO) reported in the 2023 World Health Statistics indicate that the prevalence of anemia among women of reproductive

age (15–49 years), including adolescents, reached 32.9% worldwide (Aulya et al., 2022). This figure highlights that nearly one in three women is affected by anemia, reflecting a persistent global burden despite ongoing public health interventions. Adolescents, particularly girls, constitute a high-risk group due to their increased nutritional requirements during growth spurts combined with menstrual blood loss. The high prevalence of anemia globally underscores the need for early prevention strategies targeting adolescent populations, as this stage provides a critical window for intervention to prevent long-term health consequences.

In Indonesia, anemia among adolescent girls also remains a significant health issue. Based on the results of the 2023 Indonesian Health Survey (SKI), the prevalence of anemia among adolescent girls aged 15–24 years was reported at 15.5% (Ministry of Health of the Republic of Indonesia, 2023). Although this prevalence is lower than the global average, it still represents a considerable proportion of the population and indicates ongoing nutritional challenges. The persistence of anemia in Indonesia is influenced by multiple factors, including inadequate dietary intake of iron-rich foods, poor adherence to iron supplementation programs, lack of awareness, and limited access to accurate health information. Furthermore, cultural dietary habits and socioeconomic conditions also contribute to the risk of anemia among adolescents.

At the regional level, data further emphasize the seriousness of this issue. In Bali Province, the prevalence of anemia increased from 5.07% in 2019 to 5.78% in 2020 (Varani, 2024). Similarly, in Denpasar City, the prevalence showed a more notable rise, from 4.7% in 2019 to 7.55% in 2020 (Denpasar City Health Office, 2020). These upward trends indicate that anemia among adolescent girls is not only persistent but also increasing in certain areas. Such conditions suggest that existing interventions may not yet be fully effective or adequately targeted. The increasing prevalence at both provincial and city levels highlights the urgency of strengthening preventive strategies, particularly through education and awareness programs tailored to adolescent populations.

Adolescent girls are particularly vulnerable to anemia due to a combination of physiological and behavioral factors. Physiologically, the onset of menstruation results in regular blood loss, which increases iron requirements. During adolescence, rapid growth also demands higher nutrient intake, including iron, to support the development of body tissues and increased blood volume. Behaviorally, adolescents often adopt unhealthy dietary habits, such as skipping meals, consuming low-nutrient foods, or following restrictive diets influenced by body image concerns. These factors collectively contribute to an increased risk of anemia in this population (Elisa, 2023).

Knowledge plays a fundamental role in shaping health behaviors, including those related to anemia prevention. According to Notoatmodjo (2020), knowledge is the result of sensory perception and is influenced by various factors, including education, experience, and access to information. Adequate knowledge enables individuals to understand the causes, symptoms, consequences, and preventive measures of a health condition, thereby promoting positive behavioral changes. In the context of anemia, knowledge about the importance of iron intake, balanced nutrition, consumption of iron supplements, and healthy lifestyle practices is essential for effective prevention. Conversely, limited knowledge can lead to inappropriate behaviors, such as neglecting iron-rich foods or failing to adhere to supplementation programs, ultimately increasing the risk of anemia.

The role of health education is therefore critical in improving adolescents' knowledge and awareness of anemia. Previous studies have demonstrated that structured health education interventions can significantly enhance knowledge and influence attitudes and behaviors related to anemia prevention (Rasdianah et al., 2023). Educational approaches that utilize engaging and interactive methods, such as audiovisual media, social media platforms, and peer education, have been shown to be particularly effective among adolescents. This is because adolescents are more likely to engage with information that is accessible, visually appealing, and relevant to their daily lives (Juwa & Naingalis, 2023; Lestari et al., 2024).

In addition to formal education, access to information through various media channels plays a significant role in shaping adolescents' knowledge. Electronic media, especially social media, has become a primary source of information for adolescents due to its convenience and widespread use. Research indicates that adolescents who receive health information through digital media are more likely to develop better knowledge and adopt preventive behaviors compared to those who rely solely on traditional sources (Lukman et al., 2025; Marfiah et al., 2023). However, the accuracy and reliability of information obtained from these sources must also be considered, as misinformation can lead to misconceptions and ineffective practices.

Despite the availability of information and ongoing health programs, gaps in knowledge among adolescent girls still exist. A preliminary study conducted on February 4, 2025, at State Vocational High School (SMK Negeri) 2 Denpasar through interviews with eight female students revealed that most of them lacked comprehensive knowledge regarding anemia prevention. While some students were aware of the benefits of consuming iron-rich foods, such as green leafy vegetables and chicken liver or gizzard, their understanding remained limited to basic

dietary aspects. They were generally unaware of other important preventive measures, including the regular consumption of iron supplements (blood-added tablets), the importance of a balanced diet, and the role of a healthy lifestyle in preventing anemia. This finding indicates that although some level of awareness exists, it is not yet sufficient to support effective prevention practices.

The existence of these knowledge gaps highlights the need for more comprehensive and targeted educational interventions. Health education programs should not only provide information but also emphasize practical and context-specific aspects of anemia prevention, particularly those related to the daily experiences of adolescent girls, such as menstruation. Furthermore, collaboration between schools, healthcare providers, and communities is essential to ensure that adolescents receive consistent and accurate information. Schools, in particular, serve as strategic settings for implementing health education programs, as they provide direct access to adolescents in a structured environment.

Based on the background described above, it is evident that anemia among adolescent girls remains a significant public health problem, both globally and locally. The increasing prevalence, combined with gaps in knowledge and preventive practices, underscores the importance of understanding adolescents' level of knowledge regarding anemia prevention. Therefore, this study aims to describe the level of knowledge of adolescent girls regarding anemia prevention at SMK Negeri 2 Denpasar. The findings of this study are expected to provide valuable insights for developing more effective health education strategies and interventions to improve adolescent health outcomes, particularly in preventing anemia.

2. Method

The research design employed was descriptive with a cross-sectional approach. The study was conducted at State Vocational High School (SMK Negeri) 2 Denpasar on May 21, 2025, involving 65 tenth-grade female students selected through purposive sampling. The inclusion criteria were students who had reached menarche and agreed to participate as respondents, while students who were ill or absent were excluded from the sample. Variables in this study included age, grade, experience, information sources, and knowledge regarding anemia prevention.

Data were collected using a characteristics questionnaire to identify the respondents' sociodemographic profiles, and a knowledge questionnaire on anemia prevention consisting of 10 items (8 positive and 2 negative questions) using a Guttman scale. The entire questionnaire underwent validity and reliability testing on 30 respondents with similar characteristics and was declared valid ($r = 0.479-0.813$) and reliable (Cronbach's Alpha $0.964 > 0.6$). Data analysis was performed descriptively and presented in the form of frequency distributions. This research obtained ethical clearance under Ethical Approval Number: DP.0402/F.XXXII.25/642/2025 dated May 20, 2025, and a Research Permit from SMK Negeri 2 Denpasar with Number: PP.06.02/F.XXIV.14/1284/2025 dated May 19, 2025.

3. Result

1. Characteristics of Respondents

The characteristics of the female students at State Vocational High School (SMK Negeri) 2 Denpasar, as presented in Table 1, show that the majority of respondents were 16 years old (64.6%), were from the accounting department (67.7%), had prior experience (60%), and had obtained information regarding anemia from electronic media (46.2%).

Table 1. Characteristics of Female Students at State SMK Negeri 2 Denpasar

Characteristic	Characteristics of Female Students at State SMK Negeri 2 Denpasar	
	Frequence	Presentation
	F	%
Age		
15 years old	23	35,4
16 years old	42	64,6
Class		
Accounting	44	67,7
Office administration	21	32,3
Experiences		
Ever	39	60,0
Never	26	40,0

Information source		
Print media	15	24,0
Electronic media	30	46,2
Non media	20	30,8
ammount	65	100

2. Knowledge of Female Students at SMK Negeri 2 Denpasar Regarding Anemia Prevention

The research findings indicate that the majority of female students at State Vocational High School (SMK Negeri) 2 Denpasar possess good knowledge (60.0%), while only 5 students (7.7%) still have poor knowledge. Further details can be found in Table 2 below.

Table 2. Knowledge Of Anemia Prevention Among Female Students at SMK Negeri 2 Denpasar

Knowledge	Frequence	Presentation
	F	%
Good	39	60
Fair	21	32.3
Inadequate	5	7.7
Ammount	65	100

3. Knowledge of Anemia Prevention among Female Students at SMK Negeri 2 Denpasar Based on Respondent Characteristics

The research findings in Table 3 indicate that the majority of respondents with good knowledge were 16 years old (38.5%). However, 7.7% of respondents aged 16 years still possessed poor knowledge. In terms of their major, the majority of respondents with good knowledge were from the Accounting department (44.6%), with only 1.5% having poor knowledge. Based on experience, respondents with good knowledge were predominantly those who had prior experience (46.2%) and obtained information from electronic media (29.2%) compared to those with poor knowledge.

Table 3. Knowledge of Anemia Prevention Based on Respondent Characteristics

Characteristics	Knowledge of Anemia Prevention Based on Respondent Characteristics						<i>p-value*</i>
	Good		Fair		Inadequate		
	f	%	f	%	f	%	
Age							0,000
15 years old	14	21,5	9	13,8	0	0,0	
16 years old	25	38,5	12	18,5	5	7,7	
Class							
Accounting	29	44,6	14	21,5	1	1,5	
Office administration	10	15,4	7	10,8	4	6,2	
Experiences							
Ever	30	46,2	9	13,8	0	0,0	

Never	9	13,8	12	18,5	5	7,7
Information source						
Print media	13	20,0	2	3,1	0	0,0
Electronic media	19	29,2	11	16,9	0	0,0
Non media	7	10,8	8	12,3	5	7,7
Ammount	39	60,0	21	32,3	5	7,7

4. Discussion

1. Knowledge of Anemia Prevention among Female Students at State Vocational High School (SMK Negeri) 2 Denpasar

The results of this study indicate that the majority of respondents (60.0%) possess a good level of knowledge regarding anemia prevention. This is reflected in the high proportion of students (95.4%) who were able to correctly answer questions concerning anemia prevention efforts. This finding is consistent with a study by Sultan Izdihar (2022), which revealed that 63% of adolescents have good knowledge of anemia prevention. Similarly, research by Kurniati (2022) found that the majority (70.1%) of adolescents possess good knowledge about anemia.

This high level of basic knowledge indicates that most adolescent girls already have a general understanding of anemia, particularly regarding its definition and the importance of iron consumption as a preventive measure. According to Notoatmodjo (2020), knowledge is acquired through sensory perception and is influenced by experience, education, and the information received. Nevertheless, this study also found that 35.4% of respondents did not yet understand that menstruation is one of the primary risk factors for anemia in females. This finding suggests that a knowledge gap still exists in more specific and contextual aspects, particularly those related to the physiological conditions of adolescent girls.

In this regard, while high general knowledge demonstrates successful information dissemination, the weak specific understanding indicates a need for more in-depth and contextual educational approaches (Chusniah Rachmawati & Promosi Kesehatan Dan, 2019). Therefore, health education needs to be developed not only in terms of information quantity but also in the quality and relevance of the material. Materials that emphasize anemia risk factors and interactive delivery methods can help foster a more comprehensive understanding of preventing anemia among adolescent girls (Juwa & Naingalis, 2023).

2. Knowledge of Anemia Prevention Based on Respondent Characteristics

The analysis of adolescent girls' knowledge of anemia prevention based on respondent characteristics provides important insights into the multidimensional factors that shape health literacy among adolescents. In this study, knowledge levels were not solely determined by demographic variables such as age or academic major, but were also strongly influenced by exposure to health education, access to information, and the nature of communication channels. These findings reinforce the notion that adolescent health knowledge is a complex construct influenced by both internal and external determinants.

Based on age distribution, the findings reveal that adolescents aged 15 years demonstrated a proportion of good knowledge (21.5%) that was not substantially different from those aged 16 years (38.5%). Although numerically the proportion appears higher in the 16-year-old group, the difference is not statistically striking, indicating that age alone does not serve as a definitive predictor of knowledge level. This is consistent with the concept of adolescent development, where cognitive maturity progresses gradually but is not always directly proportional to chronological age. As stated in the manuscript, adolescence is a transitional phase characterized by significant cognitive and social development. However, such development is highly individualized and influenced by environmental exposure.

The findings align with Maharani (2025), who emphasizes that while cognitive development is age-related, other determinants such as motivation, curiosity, and access to information play equally important roles. In the context of this study, adolescents who are younger may still achieve comparable or even better knowledge if they are more exposed to relevant health information or possess higher intrinsic motivation to learn. Furthermore, the absence of a significant relationship between age and knowledge is supported by Utari and Al Rahmad (2022), suggesting that knowledge acquisition in adolescents is more strongly linked to learning experiences rather than biological

age alone. This indicates that interventions aimed at improving knowledge should not be limited to age-based targeting but should instead focus on enhancing information accessibility and engagement across all adolescent age groups.

When analyzed based on academic major, the study shows that students from the Accounting major (67.7%) tend to have better knowledge compared to those from the Office Administration major (32.3%). However, this difference should be interpreted cautiously. Although the data suggest a higher proportion of good knowledge among Accounting students, there is no strong evidence to conclude that academic specialization directly influences knowledge of anemia prevention. The curriculum in vocational schools may differ across majors, but topics related to health, particularly anemia, are generally not a core component of either Accounting or Office Administration programs.

This observation is supported by Utari and Al Rahmad (2022), who found no significant association between field of study and anemia knowledge. Instead, adolescents are known to actively seek information beyond formal education settings, especially through informal learning channels. As highlighted in the manuscript, adolescents today are exposed to diverse sources of information, including peers, healthcare providers, and digital media. Therefore, differences in knowledge between majors are more likely attributable to variations in individual exposure and engagement with health information rather than academic discipline itself.

Moreover, Munir (2022) explains that knowledge is largely shaped by interaction and experience rather than formal education alone. This suggests that extracurricular factors such as participation in health campaigns, discussions with peers, or exposure to public health messaging may have a greater impact on knowledge levels. Consequently, educational institutions should consider integrating health promotion activities across all majors to ensure equal access to essential health information.

A more significant determinant of knowledge identified in this study is the experience of receiving health education or counseling related to anemia. The data show that 60% of respondents had received such education, and among them, a substantial proportion (46.2%) demonstrated good knowledge. In contrast, only 13.8% of respondents without prior education exhibited good knowledge. This clearly highlights the critical role of structured health education in enhancing adolescent understanding of anemia prevention.

Health education serves as a systematic process of delivering information that can influence knowledge, attitudes, and behaviors. According to Rasdianah (2023), effective health education not only increases awareness but also facilitates behavioral change by providing individuals with the necessary knowledge and skills. In the context of anemia, education may include information about iron-rich foods, the importance of iron supplementation, and the impact of menstruation on iron levels—topics that are essential for adolescent girls. The manuscript also emphasizes that anemia is a significant health issue among adolescent girls, particularly due to physiological factors such as menstruation.

However, it is important to note that knowledge gained through education does not automatically translate into preventive behavior. As highlighted by Adnyana et al. (2021), compliance with anemia prevention practices, such as consuming iron supplements, is influenced by additional factors including family support, cultural norms, and daily habits. This indicates that while education is a necessary component, it must be complemented by supportive environments and reinforcement mechanisms to ensure sustainable behavior change.

Another key finding of this study is the dominant role of electronic media as a source of information. The majority of respondents (46.2%) reported obtaining information about anemia through electronic media, particularly social media platforms. This reflects the growing influence of digital technology in shaping adolescent knowledge and behavior. Electronic media offers several advantages, including ease of access, rapid dissemination of information, and the ability to present content in visually engaging formats.

The effectiveness of digital media in health education is supported by Juwa and Naingalis (2023) and Lestari et al. (2024), who demonstrated that video-based and social media-based interventions significantly improve knowledge and attitudes among adolescents. Digital platforms enable the delivery of interactive and multimedia content, which is more appealing to adolescents compared to traditional methods. This is particularly relevant in the current digital era, where adolescents are highly engaged with online platforms.

Furthermore, Lukman et al. (2025) highlight that electronic media has great potential as a large-scale educational tool for improving health literacy. Information that is tailored to adolescent preferences—such as short videos, infographics, and interactive posts—is more likely to be understood and retained. This is consistent with Marfiah et al. (2023), who found that adolescents exposed to health information through media are significantly more likely to adopt preventive behaviors.

The findings in this study also emphasize the importance of aligning health communication strategies with adolescent lifestyles. Since adolescents frequently access digital platforms, health promotion efforts should leverage these channels to maximize reach and effectiveness. However, it is also essential to ensure the accuracy and credibility of information disseminated through social media, as misinformation can negatively impact health behaviors.

In summary, the analysis of respondent characteristics demonstrates that knowledge of anemia prevention among adolescent girls is influenced by a combination of factors rather than a single determinant. Age and academic major do not show strong associations with knowledge levels, while experience of health education and access to information—particularly through electronic media—play more significant roles. These findings suggest that interventions to improve adolescent knowledge should focus on enhancing the quality and accessibility of health education, utilizing digital media effectively, and creating supportive environments that encourage the application of knowledge in daily life.

5. Conclusion

The findings of this study demonstrate that the majority of female students at State Vocational High School (SMK Negeri) 2 Denpasar have a good level of knowledge regarding anemia prevention, accounting for 60% of respondents, while a smaller proportion (7.7%) still exhibit inadequate knowledge. This indicates that, in general, adolescent girls possess a basic understanding of anemia and its prevention; however, gaps remain in certain groups that require targeted educational interventions. When analyzed based on respondent characteristics, good knowledge is more commonly observed among students aged 16 years, those enrolled in the Accounting major, individuals who have previously received health education, and those who access information through electronic media. These patterns suggest that exposure to structured health education and the availability of accessible, engaging information sources significantly influence adolescents' level of understanding. Furthermore, the study highlights that experience in receiving counseling or health-related education plays a crucial role in strengthening knowledge, as students with such exposure tend to demonstrate better comprehension compared to those without it. Similarly, the dominance of electronic media as a primary information source reflects the shifting trend in how adolescents acquire knowledge, emphasizing the importance of digital platforms in health promotion strategies. Despite these positive findings, the presence of respondents with insufficient knowledge suggests the need for more comprehensive, continuous, and context-specific educational programs. Therefore, it can be concluded that improving adolescent girls' knowledge of anemia prevention requires not only increasing the frequency of health education but also enhancing the quality, relevance, and delivery methods of the information. Collaborative efforts between schools, healthcare providers, and digital media platforms are essential to ensure that educational messages are effectively disseminated and understood, ultimately supporting better preventive behaviors among adolescents.

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