Anaemia and adherence to weekly iron-folic acid supplementation among female senior high school students in stunting-risk areas of Ambon city, Indonesia: Findings from a 2023 cross-sectional survey in Poka and Laha villages

Running title: Anaemia and iron supplementation in female students

Christiana Rialine Titaley PhD[1,2], Maxwell Landri Vers Malakauseya MD[2], Ressita Fannia Iwan MD[2], Elpira Asmin MKes[1,2], Ritha Tahitu MKes[1,2], Sixtintia Aprilla Irene Dea SKed[2], Yudhie Djuhastidar Tando MD[2], Liyani Sartika Sara SKom[2], Ina Kusrini MKM[3], Dwi Hapsari Tjandrarini Dr[3]

[1]Department of Public Health, Faculty of Medicine, Universitas Pattimura, Ambon, Indonesia
[2]Faculty of Medicine, Universitas Pattimura, Ambon, Indonesia
[3]Research Organization for Health, National Research and Innovation Agency, Bogor, Indonesia

Authors' email addresses and contributions:
CRT: christiana.titaley@lecturer.unpatti.ac.id
Orcid: https://orcid.org/0000-0002-3023-003X
Contribution: contributed to the conceptualisation and study methodology, data curation, formal analysis, prepared the original draft of the manuscript, reviewed and edited the final manuscript.

MLVM: maxwell.malakauseya@lecturer.unpatti.ac.id
Orcid: https://orcid.org/0000-0003-1388-6798
Contribution: contributed to data curation, prepared the original draft of the manuscript, reviewed and edited the final manuscript.

RFI: ressitafannia1@gmail.com
Orcid: https://orcid.org/0009-0002-4461-0073
Contribution: contributed to data curation, performed the literature search, reviewed and edited the final manuscript.

EA: elpira.asmin@lecturer.unpatti.ac.id
Contribution: conceptualisation and study methodology, provided advice on data analysis, reviewed and edited the final manuscript.

RT: ritha.tahitu@lecturer.unpatti.ac.id
Contribution: conceptualisation and study methodology, provided advice on data analysis, reviewed and edited the final manuscript.

SAID: sixtintiaaprilla@gmail.com
Orcid: https://orcid.org/0009-0000-2375-8082

Contribution: performed the literature search, reviewed and edited the final manuscript.

YDT: yudhiedjuhastidar22@gmail.com
Orcid: https://orcid.org/0000-0003-2260-0739
Contribution: performed the literature search, reviewed and edited the final manuscript.

LSS: liyani2303@gmail.com
Orcid: https://orcid.org/0009-0007-9154-4554
Contribution: performed the literature search, reviewed and edited the final manuscript.

IK: inak001@brin.go.id
Orcid: https://orcid.org/0000-0001-6997-4821
Contribution: contributed to data curation, formal analysis, reviewed and edited the final manuscript.

DHT: dwih011@brin.go.id
Orcid: https://orcid.org/0000-0001-8313-4722
Contribution: provided advice on data analysis, reviewed and edited the final manuscript.

Corresponding Author: Dr Christiana Rialine Titaley, Department of Public Health, Faculty of Medicine, Universitas Pattimura, Ambon, Indonesia, 97233. Tel:. Email: christiana_rialine@gmail.com

ABSTRACT

Background and Objectives: Weekly iron-folic acid (IFA) supplementation has been implemented in Indonesia to reduce the prevalence of anaemia in adolescent girls. This study aimed to assess the prevalence of anaemia and adherence to weekly IFA supplementation and their associated factors among adolescent girls in senior high schools in two high-stunting-prone areas of Ambon City, Indonesia. **Methods and Study Design:** This cross-sectional study was conducted in August–September 2023, involving 645 adolescent girls enrolled at five senior high schools in two high-stunting-prone areas of Ambon City, namely Poka-Rumah Tiga and Laha Village. The dependent variables were anaemia (i.e., haemoglobin level <12 g/dL) and adherence to weekly IFA supplementation (i.e., consumption of one IFA tablet per week). Factors associated with anaemia and adherence to weekly IFA supplementation were examined using logistic regression. **Results:** Of 645 adolescent girls surveyed, 19.7% had anaemia, and 19.5% consumed weekly IFA tablets. The likelihood of developing anaemia was associated with respondents with a high level of awareness of anaemia (adjusted odds ratio [aOR] = 1.73, 95% confidence interval [CI]: 1.16-2.57). Adherence to taking weekly IFA tablets increased in those with a high level of awareness of IFA supplementation (aOR = 3.88, 95%CI: 2.46-6.10). **Conclusions:** Our study showed that anaemia among adolescent girls represents a moderate to high public health problem, accompanied by low adherence to weekly IFA supplementation among adolescent girls in these areas. Strengthening school-based supplementation, parental engagement, and supply monitoring could enhance programme effectiveness and inform local health policies in Ambon City and other similar settings in Indonesia.

Key Words: low haemoglobin level, teenage, weekly iron-folic acid supplementation, supplementation compliance

INTRODUCTION

Anaemia is a major global public health concern, particularly affecting adolescent girls, women of reproductive age (15–49 years), pregnant women, and children in low- and middle-income countries.[1] Among adolescents, anaemia is primarily caused by rapid physical growth, menstrual blood loss, and inadequate dietary iron intake. Several types of anaemia could affect adolescents, including iron deficiency anaemia (IDA), which is the most common and results from insufficient iron intake or chronic blood loss during menstruation. Other forms include anaemia of infection or inflammation, folate, or vitamin B12 deficiency anaemia, and,

less commonly, haemolytic anaemia or anaemia related to chronic diseases. Studies in Indonesia and similar settings have also shown that IDA remains highly prevalent among adolescent girls, especially in rural and resource-limited areas.[2]

These factors contribute to a range of health problems, including fatigue, weakness, and impaired cognitive development.[3] Evidence also highlights the long-term consequences of anaemia in women, such as an increased risk of delivering low-birthweight infants and poor growth outcomes in their children, including stunting.[4–6]

In 2020, the World Health Organization (WHO) reported that anaemia affected 24.8% of the global population, with prevalence rates reaching 27% among adolescent girls in low-income countries and 6% in high-income countries.[7] In Indonesia, the 2018 Basic Health Research recorded a high prevalence of anaemia, at 23.7%, with notably higher rates among pregnant women (48.9%) and adolescent girls (32%).[8] Although the 2023 Indonesia Health Survey indicated a sharp decline in anaemia prevalence among adolescent girls to 15.5%,[9] regional disparities across the country remain.

One effective strategy recommended to address anaemia in adolescent girls is weekly iron and folic acid (IFA) supplementation.[10] In 2014, the Indonesian government launched a national weekly IFA supplementation programme targeting junior and senior high school adolescent girls.[11] However, efforts to monitor compliance with IFA consumption should be strengthened, as adherence among adolescent girls has often been suboptimal.[12,13]

In 2022, a research team from the Faculty of Medicine at Pattimura University, Ambon, Indonesia, surveyed three senior high schools located in Poka–Rumah Tiga Village, a stunting-prone area in Ambon City. The 2022 survey aimed to assess the prevalence of anaemia and adherence to IFA supplementation among female students. The findings revealed a high prevalence of anaemia (49.2%) and low adherence to weekly IFA supplementation (15%).[14] These outcomes were likely influenced by the disruption in IFA tablet distribution during the coronavirus disease 2019 pandemic, as the survey was conducted shortly after students resumed in-person learning. That situation was exacerbated by the absence of an effective monitoring system to ensure student compliance with supplementation.[15]

Following one year of regular IFA tablet distribution by the local community health centre, a follow-up survey was conducted in 2023 across three senior high schools in Poka–Rumah Tiga Village and two additional schools in Laha Village—adjacent areas in Ambon City known to be prone to stunting. Notably, Laha Village is also one of the community development areas fostered by the Faculty of Medicine at Pattimura University. Ambon City provides a particularly interesting context. As the capital of Maluku Province, it represents a

coastal-island urban setting with communities that vary widely in socioeconomic status, food security, and accessibility to health and nutrition services. This mixed setting of urbanised and semi-rural zones reflects the broader challenges faced by many small islands in eastern Indonesia, where distance and limited logistics could hinder consistent programme implementation and health outreach.[16] Using data from the 2023 survey, the present analysis aimed to assess the prevalence of anaemia, adherence to weekly IFA supplementation, and associated factors among adolescent girls attending these five senior high schools in Poka–Rumah Tiga and Laha Village, Indonesia.

MATERIALS AND METHODS

Design and sampling

This study employed an analytical observational approach with a cross-sectional design. Data collection was conducted from August to September 2023. It included structured interviews, anthropometric measurements, and haemoglobin (Hb) level assessments among female students from five senior high schools in Poka–Rumah Tiga and Laha Village, Ambon City, Indonesia. A total sampling method was used, involving all female students who were enrolled in the selected schools and consented to participate in the survey. The final sample size consisted of 645 adolescent girls, representing the entire population of female students attending the five schools during the study period.

Study sites

Poka-Rumah Tiga and Laha Village are in the Teluk Ambon Sub-District of Ambon City (Figure 1). All senior high schools in these villages were included in this survey. The schools in Poka-Rumah Tiga Village were: (1) Al-Mabrur Islamic Senior High School, (2) Vocational High School 5 Ambon, and (3) State Senior High School 3 Ambon, while the schools in Laha Village were (1) Private Senior High School of Lembaga Ketahanan Masyarakat Desa (LKMD), and (2) Private Senior High School of Angkasa.

Study instrument

A structured questionnaire was employed to collect data on sociodemographic characteristics, history of infections, dietary patterns, awareness of anaemia, and IFA supplementation. The questionnaire was adapted from two previous national surveys conducted in Indonesia[17,18] and was also used in the 2022 survey involving three senior high schools in Poka–Rumah Tiga Village.[14]

Anthropometric measurements (body weight and height) were used to calculate Body Mass Index (BMI)-for-age and height-for-age as proxies for nutritional status and growth among adolescent girls. Body weight was measured using a non-digital weighing scale, with participants barefoot and wearing light clothing. To ensure accuracy, the scale was checked for a zero reading prior to each measurement. Height was measured using a SECA 213 portable stadiometer and recorded to the nearest 0.1 cm. The stadiometer was placed with its backboard supported against a wall. During measurement, participants stood upright with their heads, backs, buttocks, and heels aligned against the backboard, with their heels together, knees extended, and heads positioned in the Frankfort horizontal plane. Hairstyles or accessories that could interfere with the measurement were adjusted or removed. The Z-scores for BMI-for-age (BAZ) and height-for-age (HAZ) were calculated using the WHO AnthroPlus software,[19] based on the WHO 2007 growth reference for school-aged children and adolescents.[20]

The blood Haemoglobin (Hb) level was assessed using a Hemometer/HbChecker (HemoCue® Hb 301 Analyser). All medical instruments were calibrated prior to data collection to ensure the accuracy of measurements.

Field workers

A total of 17 fieldworkers were assigned to collect data across the selected high schools. The team consisted of two supervisors, ten interviewers, two anthropometric assessors, and three personnel responsible for collecting blood samples. The supervisors were medical doctors on the research team, while the remaining 15 fieldworkers were final-year medical students from Pattimura University, Ambon. All team members underwent a comprehensive training session, including a trial run, to ensure a clear understanding of the questionnaire and competency in conducting anthropometric assessments, blood sample collection, and Hb measurements.

Data collection procedure

Prior to data collection, the research team visited each school to obtain permission from school administrators. A list of all adolescent girls enrolled in each school was compiled with their assistance. Before the interviews, each participant was informed about the study and asked for their willingness to participate.

Data collection was conducted in designated classrooms at each school under the supervision of medical doctors and local schoolteachers. Each interview lasted approximately 15 minutes, followed by another five minutes for anthropometric measurements and blood

sample collection. Upon completion of the survey, all participants were offered snacks as a token of appreciation for their participation. The results of the anthropometric and haemoglobin assessments were recorded and individually provided to each participant. Students identified as anaemic were advised to seek further consultation with a medical professional at the local health centre.

Dependent and independent variables

This analysis relied on two dependent variables: (1) anaemia and (2) adherence to weekly IFA supplementation (Figure 2). A respondent was categorised as having anaemia if her Hb level was <12 g/dL.[21] Adherence to weekly IFA supplementation was defined as the consumption of one IFA tablet per week. Although the type of anaemia was not identified in this study due to the absence of biochemical tests, it is most likely that the majority of the cases represent IDA, which is the predominant form of anaemia among adolescent girls.

Various potential predictors of anaemia and adherence to weekly IFA supplementation were included in the analysis, such as school characteristics, respondents' sociodemographic factors, suspected pulmonary Tuberculosis and worm infections, dietary habits, nutritional status, and awareness of anaemia and IFA supplementation (Table 1).

The nutritional status of the respondents was assessed using BAZ and HAZ, based on the WHO 2007 growth reference.[20] BAZ was categorised into three groups: normal (-2 SD to $\leq$ $+2$ SD), thinness (≤ -2 SD), and obesity ($> +2$ SD). HAZ was classified into two categories: normal (-2 SD to $\leq +2$ SD) and stunting (≤ -2 SD). Anaemia status was included as a potential predictor in the proposed model to examine factors associated with adherence to IFA supplementation.

Awareness of anaemia was assessed using ten questions that covered various aspects, including whether participants had heard of anaemia, its causes, symptoms, individuals at risk, normal Hb levels, prevention strategies, iron-rich foods, reasons for iron loss in women, available treatments, and the health impacts. A favourable response to each question was awarded a score of "1," while unfavourable responses received a score of "0." For multi-response questions on causes, prevention, treatment, and impact, scores ranged from 0 to 2 ("0" for no favourable answers and "2" for two favourable answers). The score ranged from 0 to 3 for symptom-related questions, based on the number of correct symptoms identified. The total awareness score was calculated by summing the scores across all components. Respondents scoring above the median were classified as having a high level of awareness of

anaemia, while those scoring at or below the median were considered to have a low level of awareness.

Awareness of IFA supplementation was assessed through three questions: whether participants had heard of IFA tablets (yes/no), whether they knew the benefits of IFA supplementation, and whether they knew how to properly consume IFA tablets (yes/no). As with the awareness of anaemia questions, each favourable response was awarded a score of "1," while unfavourable responses received a score of "0." For the question on the benefits of IFA supplementation, scores ranged from 0 to 2, with "0" indicating no favourable answers and "2" indicating two favourable responses.

Data analysis

The data analysis was conducted in three phases. First, a descriptive analysis was carried out to present the frequency distribution of each variable. Second, bivariate logistic regression was used to explore the association between each independent variable and the study outcomes, without adjusting for other variables. Third, multivariate logistic regression was performed to identify factors independently associated with the study outcomes, adjusting for potential confounders. Variables with a p-value of less than 0.25 in the bivariate analysis were included in the multivariate model. Regardless of its statistical significance, the school variable was included in the multivariate analysis a priori. A *p*-value of less than 0.05 was considered statistically significant. All analyses were conducted using STATA MP version 17.

Ethics approval

This study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Pattimura, Ambon, Indonesia (Approval No: 141/FK-KOM.ETIK/VIII/2022). Permission to conduct data collection was also obtained from the authorities of each participating senior high school. Prior to data collection, interviewers provided a detailed explanation of the study to all potential participants. Informed consent was obtained through signed consent forms, indicating the respondents' voluntary participation. Throughout the data collection process, teachers were present to monitor activities but did not influence or pressure students to participate in the study.

RESULTS

Our analysis found that of the 645 adolescent girls aged 13 to 19 years interviewed in this survey, 19.7% had anaemia and 19.5% consumed IFA tablets weekly. The characteristics of all adolescent girls interviewed are shown in Table 2. A high percentage of students had a low awareness of anaemia (53.8%) and IFA supplementation (75.0%). Although 57.2% ever took the IFA tablet, only 19.5% took it every week. The rate of anaemia was higher among respondents with a high level of awareness of anaemia (24.2%) compared to those with a low level of awareness (15.9%). The percentage of students who adhered to consuming IFA tablets weekly was higher among those with a high level of awareness of IFA supplementation (39.1%) than among those with a low level of awareness.

The frequency distribution of favourable answers for each component of awareness of anaemia and IFA supplementation is presented in Figure 3. More than 20% of the respondents had never heard of anaemia, and less than 5% were aware of the normal Hb level. Regarding the awareness components of IFA supplementation, only 24.5% of respondents knew how to consume IFA tablets.

Table 3 shows factors associated with anaemia among adolescent girls. The only factor significantly associated with anaemia was awareness of anaemia. It is interesting to note that the likelihood of developing anaemia was 75% higher in respondents with a high level of awareness than those with a low level of awareness (adjusted odds ratio [aOR] = 1.75, 95% confidence interval [CI]: 1.18-2.61, p = 0.006), after controlling for school, BMI-for-age, and knowledge about anaemia.

Table 4 shows factors associated with adherence to weekly IFA supplementation. The odds of adherence were higher in those with a high level of knowledge than in those with a low level of awareness (aOR = 3.75, 95% CI: 2.38-5.90, p <0.001), after controlling for school, grade in school, type of residential area, suspected worm infection, height-for-age and awareness of anaemia.

DISCUSSION

This analysis demonstrated that anaemia among adolescent girls in these stunting-prone areas of Ambon City constitutes a moderate to high public health problem, based on the WHO classification.[22] An increased likelihood of developing anaemia was associated with a high level of awareness of anaemia. Remarkably low adherence to weekly IFA supplementation was also observed. Factors associated with an increased likelihood of adherence were student grades and awareness of IFA supplementation. The second-grade students were more likely to

adhere to weekly IFA supplementation than the first-grade students. As expected, adolescent girls with a high level of awareness of IFA supplementation were more likely to adhere than those with a low level of awareness. Policymakers could use these findings to design effective and targeted interventions to improve awareness, reduce anaemia, and improve adherence to weekly IFA supplementation among adolescent girls in the two high-stunting-prone areas of Ambon City.

Our study found a higher rate of anaemia in these areas compared to the national rate in Indonesia (15.5%).[9] However, this rate is lower than that found in our survey in 2022 (49.2%).[14] This progress may be attributed to the consistent distribution of IFA tablets in schools, alongside health promotion activities carried out by local health authorities. These activities included education on the importance of nutrition-specific and nutrition-sensitive interventions to reduce anaemia among adolescent girls. Studies have shown that various factors contribute to susceptibility to stunting, including economic constraints, cultural dietary habits, lack of awareness among adolescents and the general community, limited access to diverse food sources, and even infections.[13,23–27] Consequently, even when IFA supplementation programmes are available, the prevalence of anaemia may still be high.

Interestingly, respondents with a high level of awareness of anaemia had an increased likelihood of developing anaemia. A possible inverse causation is that those who were anaemic were more aware and knowledgeable about their condition, instead of the other way around. Individuals who have experienced anaemia or are currently managing anaemia might seek more information, and thus have a high awareness of anaemia. This pattern also indicates that awareness alone does not necessarily lead to preventive behaviour. Adolescents might recognise anaemia symptoms or understand its consequences but still face multiple barriers to adopting effective prevention measures. Future longitudinal or qualitative studies are needed to better understand the temporal and contextual dynamics of this relationship among adolescents in similar settings.

It is widely acknowledged that nutritional status is a key determinant of haemoglobin concentration. However, in this study, neither BMI-for-age nor height-for-age showed a significant association with anaemia, as also reported in previous studies.[28] This evidence suggested that anaemia can occur across various nutritional categories and may not always align with anthropometric indicators.[29] Although no significant association between stunting and anaemia was found in our study, the potential association between these two variables remains important to consider. Anaemia could impair growth through reduced oxygen transport and metabolic efficiency, while stunting-related inflammation and micronutrient

deficiencies could, in turn, increase anaemia risk. This underscores the importance of integrated adolescent nutrition programmes addressing both growth and micronutrient adequacy.

Very low adherence to weekly IFA supplementation was observed in adolescent girls. Our study confirmed the importance of awareness regarding adherence to weekly IFA supplementation. Adolescent girls with a high level of awareness of IFA supplementation were more likely to adhere to taking supplements than those with a low level of awareness, as previously reported.[23,30] This information will improve our understanding of the benefits and necessity of these supplements. Thus, educated individuals could be more aware of their susceptibility to anaemia and its impact and, as a result, be more motivated to comply with weekly IFA supplementation.

Multiple approaches should be considered to improve adherence to weekly IFA supplementation. Previous studies have also indicated that a lack of access to educational materials has hindered adolescent girls from consistently consuming IFA tablets.[31,32] Therefore, leveraging digital platforms to disseminate educational content regarding the benefits and use of IFA tablets could improve adherence.[23] A study from Ambon showed that multiple forms of health promotion media could significantly improve community awareness of health issues.[33] Programme managers could consider using social media and other digital-based interventions that younger people prefer.

The implications of these findings are also significant for local health policy and school-based interventions. The persistently low adherence to weekly IFA supplementation among adolescent girls highlights the need to strengthen coordination between schools and community health centres. While awareness of IFA supplementation was associated with better adherence, awareness alone is not sufficient to ensure behavioural change. Schools should become a key platform for promoting IFA supplementation. It is essential to create a supportive environment involving school headmasters, committees, teachers, parents, and students to foster a sense of ownership and commitment, which is critical to a programme's long-term success.[34] Peer education programmes, in which trained students share information and experiences with classmates, could enhance awareness, address misconceptions, and empower girls to prioritise their health.[35] Integrating health education, including information on anaemia, into the school curriculum could provide students with a deeper understanding and encourage adherence to anaemia prevention measures. Schools could organise weekly events for collective IFA tablet consumption, which might boost female student participation. Studies suggest that scheduling a specific day each week for collectively consuming IFA

tablets could address some barriers, as the fixed-day approach helps prevent forgetfulness and simplifies programme monitoring and reporting.[34,36] The involvement of parents in health education sessions is also crucial. Parents can help reinforce health messages and motivate their children to take IFA tablets at home. These coordinated, school-based approaches could serve as a model for improving adolescent nutrition programmes in other islands and rural districts across eastern Indonesia.

Local health authorities are undeniably vital in the fight against anaemia. They provide crucial information regarding anaemia and its prevention and ensure a steady supply of IFA supplements. However, maintaining a continuous supply of these supplements remains challenging. Supply chain interruptions have been frequently reported, particularly in the eastern regions of Indonesia.[9] Addressing these supply chain issues is critical to ensure anaemia prevention efforts' success and improve health outcomes in affected regions.

Strengths and limitations

Our study is one of the few to examine the prevalence of anaemia and adherence to IFA supplementation among adolescent girls in Ambon, encompassing all three senior high schools in the Poka-Rumah Tiga Health Centre area, a known locus of stunting. This analysis allowed us to identify the specific barriers to and facilitators of adherence to weekly IFA supplementation in this population. However, despite its contributions, this study has some limitations. The cross-sectional design relies heavily on respondents' memories and, therefore, may introduce a recall bias. The design also limits cause-and-effect conclusions. The survey excluded non-enrolled girls and junior high school students, who were also key targets for IFA supplementation. Additionally, several potentially influential factors were not considered, such as the number of IFA tablets received, any adverse effects experienced, home environment conditions, the availability of tablets at health centres, and details of worm infections, menstrual status, or deficiencies of other micronutrients, as these data were unavailable in the dataset. Some student absences during data collection highlight the requirement for improved scheduling in future studies.

Conclusions

Our study highlights the high prevalence of anaemia among adolescent girls and the notably low adherence to weekly IFA supplementation in two stunting-prone areas of Ambon. Our findings underscore the need for targeted, context-specific interventions to enhance awareness and adherence to weekly IFA supplementation among adolescent girls. Strengthening school-

based programmes through regular supplementation days, curriculum-integrated health education, and parental engagement can improve programme sustainability. Collaboration between schools, families, and community health centres, supported by consistent IFA supply and monitoring systems, should be prioritised by local health authorities. These measures could inform Ambon City's health policy and provide a replicable framework for other island regions in eastern Indonesia to reduce anaemia and improve adolescent health outcomes. Lastly, we recommend that future studies include non-enrolled adolescent girls and consider additional influencing factors—such as menstrual patterns, dietary diversity, infection status, and household food security—to provide a more comprehensive understanding of the determinants of anaemia and adherence behaviours among adolescents in island settings.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

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Table 1. Questions administered in the questionnaire for variables used in this study

No	Variable	Question
1	Suspected pulmonary tuberculosis infection	Do you often experience coughing and night sweats?
2	Suspected worm infection	Have you had a worm infection in the past month?
3	Eating frequency per day	What is your average daily meal frequency?
4	Food restriction	Do you have any dietary restrictions against certain foods?
5	Consumption of meat-based food	Do you consume animal-based protein (e.g., meat, eggs, fish) every day?
6	Consumption of green vegetables	Do you eat green leafy vegetables every day?
7	Awareness of anaemia	Have you ever heard of anaemia?
8	Awareness of IFA supplementation	Have you ever heard of iron and folic acid (IFA) tablets?
9	Ever taken IFA tables	Have you ever received IFA tablets?
10	Took weekly IFA tablets	Do you consume IFA tablets weekly?

Table 2. Frequency distribution of variables analysed in the study and by anaemia and adherence to weekly iron/folic acid (IFA) supplements in Poka-Rumah Tiga and Laha Village, Ambon City, 2023 (n=645)

Variable	n	%	Anaemia		Consumed weekly IFA supplements	
			n	%	n	%
School characteristics						
School						
SMAN 3	383	59.4	73	19.1	73	19.1
SMAK 5	140	21.7	32	22.9	30	21.4
MA Al-Mabrur	13	2.0	3	23.1	1	7.7
SMAS Angkasa	89	13.8	12	13.5	17	19.1
SMAS LKMD	20	3.1	7	35.0	5	25.0
Sociodemographic factors						
Grade in school						
Grade 10	274	42.5	52	19.0	39	14.2
Grade 11	183	28.4	41	22.4	50	27.3
Grade 12	188	29.2	34	18.1	37	19.7
Type of residential area						
Coastal	198	30.7	35	17.7	45	22.7
Lowland non-coastal	308	47.8	65	21.1	55	17.9
Highland	139	21.6	27	19.4	26	18.7
Maternal occupation						
Housewife/retired	388	60.2	74	19.1	76	19.6
Formal	126	19.5	22	17.5	27	21.4
Nonformal	106	16.4	24	22.6	17	16.0
Passed away	25	3.9	7	28.0	6	24.0
Paternal occupation						
Not working/retired	29	4.5	5	17.2	4	13.8
Formal	190	29.5	45	23.7	39	20.5
Nonformal	366	56.7	66	18.0	70	19.1
Passed away	60	9.3	11	18.3	13	21.7
Maternal education						
University/academy	134	20.8	23	17.2	24	17.9
Junior/Senior high school	330	51.2	67	20.3	63	19.1
Primary school	60	9.3	13	21.7	15	25.0
None/don't know	121	18.8	24	19.8	24	19.8
Suspected infections						
Suspected Pulmonary Tuberculosis infection						
Yes	28	4.3	6	21.4	6	21.4
No	617	95.7	121	19.6	120	19.5
Suspected worm infection						
Yes	15	2.3	4	26.7	5	33.3
No	630	97.7	123	19.5	121	19.2
Dietary habits						
Eating frequency per day						
<3 times a day	380	58.9	75	19.7	77	20.3
≥ 3 times a day	265	41.1	52	19.6	49	18.5
Food restriction						
Yes	196	30.4	36	18.4	43	21.9
No	449	69.6	91	20.3	83	18.5
Consumed meat-based food						
Yes	561	87.0	110	19.6	113	20.1
No	85	13.0	17	20.2	13	15.5
Consumed green vegetables						
Yes	429	66.5	87	20.3	87	20.3
No	216	33.5	40	18.5	39	18.1
Nutritional status						
Body-mass-index-for-age						
Normal (–2 SD to ≤ +2 SD)	571	88.9	120	21.0	110	19.3
Thinness (≤ –2 SD)	52	8.1	6	11.5	11	21.2
Obesity (> +2 SD)	19	3.0	1	5.3	4	21.1

SMAN = State Senior High School; SMAK = Vocational High School; MA = Islamic Senior High; SMAS = Private Senior High School.

Table 2. Frequency distribution of variables analysed in the study and by anaemia and adherence to weekly iron/folic acid (IFA) supplements in Poka-Rumah Tiga and Laha Village, Ambon City, 2023 (n=645) (cont.)

Variable	n	%	Anaemia		Consumed weekly IFA supplements	
			n	%	n	%
Nutritional status						
Height-for-age						
Normal (–2 SD to ≤ +2 SD)	512	79.75	101	19.7	95	18.6
Stunting (≤ –2 SD)	130	20.25	26	20.0	30	23.1
Awareness of anaemia and iron/folic acid (IFA) supplementation						
Awareness of anaemia						
Low	347	53.8	55	15.9	51	14.7
High	298	46.2	72	24.2	75	25.2
Awareness of IFA supplements						
Low	484	75.0	97	20.0	63	13.0
High	161	25.0	30	18.6	63	39.1
Consumption of IFA tablets						
Ever taken an IFA tablet						
Never	276	42.8	51	18.5	0	0.0
Yes	369	57.2	76	20.6	126	34.2
Took weekly IFA tablet						
Never	519	80.5	101	19.5	0	0.0
Yes	126	19.5	26	20.6	126	100.0

SMAN = State Senior High School; SMAK = Vocational High School; MA = Islamic Senior High; SMAS = Private Senior High School.

Table 3. Factors associated with anaemia among adolescent girls in Poka-Rumah Tiga and Laha Village, Ambon City, 2023 (n=645)

Characteristics	Univariable				Multivariable			
	OR	95% CI		*p-value*	OR	95% CI		*p-value*
School characteristics								
School								
SMAN 3	1.00				1.00			
SMAK 5	1.26	0.79	2.01	0.338	1.33	0.82	2.14	0.244
MA Al-Mabrur	1.27	0.34	4.75	0.718	1.44	0.38	5.47	0.589
SMAS Angkasa	0.66	0.34	1.28	0.220	0.67	0.35	1.31	0.243
SMAS LKMD	2.29	0.88	5.93	0.089	2.31	0.88	6.08	0.091
Sociodemographic factors								
Grade in school								
Grade 10	1.00							
Grade 11	1.23	0.78	1.95	0.373				
Grade 12	0.94	0.58	1.52	0.809				
Type of residential area								
Coastal	1.00							
Lowland non-coastal	1.25	0.79	1.97	0.345				
Highland	1.12	0.64	1.96	0.648				
Maternal occupation								
Housewife/retired	1.00							
Formal	0.90	0.53	1.52	0.687				
Nonformal	1.24	0.74	2.09	0.415				
Passed away	1.65	0.66	4.10	0.280				
Paternal occupation								
Not working/retired	1.00							
Formal	1.49	0.54	4.13	0.444				
Nonformal	1.06	0.39	2.87	0.915				
Passed away	1.08	0.34	3.45	0.900				
Maternal education								
University/academy	1.00							
Junior/Senior high school	1.23	0.73	2.07	0.439				
Primary school	1.33	0.62	2.86	0.457				
None/don't know	1.19	0.63	2.25	0.583				
Suspected infectious								
Suspected Pulmonary Tuberculosis infection								
Yes	1.00							
No	0.89	0.35	2.25	0.813				
Suspected worm infection								
Yes	1.00							
No	0.67	0.21	2.13	0.495				
Dietary habits								
Eating frequency per day								
< 3 times a day	1.00							
≥ 3 times a day	0.99	0.67	1.47	0.971				
Food restriction								
Yes	1.00							
No	1.13	0.74	1.73	0.577				
Consumed meat-based food								
Yes	1.00							
No	1.04	0.59	1.84	0.892				
Consumed green vegetables								
Yes	1.00							
No	0.89	0.59	1.35	0.596				
Nutritional status								
Body-mass-index-for-age								
Normal (–2 SD to ≤ +2 SD)	1.00				1.00			
Thinness (≤ –2 SD)	0.49	0.20	1.18	0.110	0.49	0.20	1.18	0.112
Obesity (> +2 SD)	0.21	0.03	1.58	0.129	0.21	0.03	1.60	0.132

SMAN = State Senior High School; SMAK = Vocational High School; MA = Islamic Senior High; SMAS = Private Senior High School.

Table 3. Factors associated with anaemia among adolescent girls in Poka-Rumah Tiga and Laha Village, Ambon City, 2023 (n=645) (cont.)

Characteristics	Univariable				Multivariable			
	OR	95% CI		*p-value*	OR	95% CI		*p-value*
Nutritional status								
Height-for-age								
Normal (–2 SD to ≤ +2 SD)	1.00							
Stunting (≤ –2 SD)	1.02	0.63	1.65	0.944				
Awareness of anaemia and iron/folic acid (IFA) supplementation								
Awareness of anaemia								
Low	1.00				1.00			
High	1.69	1.14	2.50	0.009	1.75	1.18	2.61	0.006
Awareness of IFA supplements								
Low	1.00							
High	0.91	0.58	1.44	0.697				
Consumption of IFA tablets								
Ever taken an IFA tablet								
Never	1.00							
Yes	1.14	0.77	1.70	0.504				
Took weekly IFA tablet								
Never	1.00							
Yes	1.08	0.66	1.74	0.766				

SMAN = State Senior High School; SMAK = Vocational High School; MA = Islamic Senior High; SMAS = Private Senior High School.

Table 4. Factors associated with anaemia among adolescent girls in Poka-Rumah Tiga and Laha Village, Ambon City, 2023 (n=645)

Characteristics	Univariable				Multivariable			
	OR	95% CI		*p-value*	OR	95% CI		*p-value*
School characteristics								
School								
SMAN 3	1.00				1.00			
SMAK 5	1.16	0.72	1.87	0.547	1.26	0.75	2.14	0.385
Al-Mabrur	0.35	0.05	2.77	0.322	0.42	0.05	3.46	0.422
Angkasa	1.00	0.56	1.80	0.993	0.81	0.43	1.52	0.510
LKMD	1.42	0.50	4.02	0.514	1.04	0.34	3.16	0.945
Sociodemographic factors								
Grade in school								
Grade 10	1.00				1.00			
Grade 11	2.27	1.42	3.62	0.001	1.65	0.98	2.77	0.060
Grade 12	1.48	0.90	2.42	0.122	1.14	0.66	1.99	0.635
Type of residential area								
Coastal	1.00				1.00			
Lowland non-coastal	0.74	0.48	1.15	0.180	0.83	0.52	1.33	0.431
Highland	0.78	0.46	1.34	0.373	0.73	0.41	1.31	0.288
Maternal occupation								
Housewife/retired	1.00							
Formal	1.12	0.68	1.83	0.654				
Nonformal	0.78	0.44	1.40	0.408				
Passed away	1.30	0.50	3.36	0.593				
Paternal occupation								
Not working/retired	1.00							
Formal	1.61	0.53	4.91	0.399				
Nonformal	1.48	0.50	4.38	0.481				
Passed away	1.73	0.51	5.86	0.380				
Maternal education								
University/academy	1.00							
Junior/Senior high school	1.08	0.64	1.82	0.768				
Primary school	1.53	0.73	3.18	0.257				
None/don't know	1.13	0.61	2.13	0.695				
Suspected infectious								
Suspected Pulmonary Tuberculosis infection								
Yes	1.00							
No	0.89	0.35	2.23	0.796				
Suspected worm infection								
Yes	1.00				1.00			
No	0.48	0.16	1.42	0.182	0.33	0.10	1.08	0.066
Dietary habits								
Eating frequency per day								
< 3 times a day	1.00							
≥ 3 times a day	0.89	0.60	1.33	0.577				
Food restriction								
Yes	1.00							
No	0.81	0.53	1.22	0.310				
Consumed meat-based food								
Yes	1.00							
No	0.73	0.39	1.36	0.316				
Consumed green vegetables								
Yes	1.00							
No	0.87	0.57	1.32	0.502				
Nutritional status								
Body-mass-index-for-age								
Normal (−2 SD to ≤ +2 SD)	1.00							
Thinness (≤ −2 SD)	1.12	0.56	2.26	0.742				
Obesity (> +2 SD)	1.12	0.36	3.43	0.846				

SMAN = State Senior High School; SMAK = Vocational High School; MA = Islamic Senior High; SMAS = Private Senior High School.

Table 4. Factors associated with adherence to weekly IFA supplementation among adolescent girls in Poka-Rumah Tiga and Laha Village, Ambon City, 2023 (n=645) (cont.)

Characteristics	Univariable				Multivariable			
	OR	95% CI		*p-value*	OR	95% CI		*p-value*
Nutritional status								
Height-for-age								
Normal (–2 SD to ≤ +2 SD)	1.00				1.00			
Stunting (≤ –2 SD)	1.32	0.83	2.10	0.246	1.30	0.79	2.15	0.306
Anaemia								
No (Haemoglobin level <12 g/dL)	1.00							
Yes (Haemoglobin level ≥12 g/dL)	1.08	0.66	1.74	0.77				
Awareness of anaemia and iron/folic acid (IFA) supplementation								
Awareness of anaemia								
Low	1.00				1.00			
High	1.95	1.31	2.90	0.001	1.32	0.84	2.07	0.225
Awareness of IFA supplements								
Low	1.00				1.00			
High	4.30	2.85	6.49	<0.001	3.75	2.38	5.90	<0.001

SMAN = State Senior High School; SMAK = Vocational High School; MA = Islamic Senior High; SMAS = Private Senior High School.
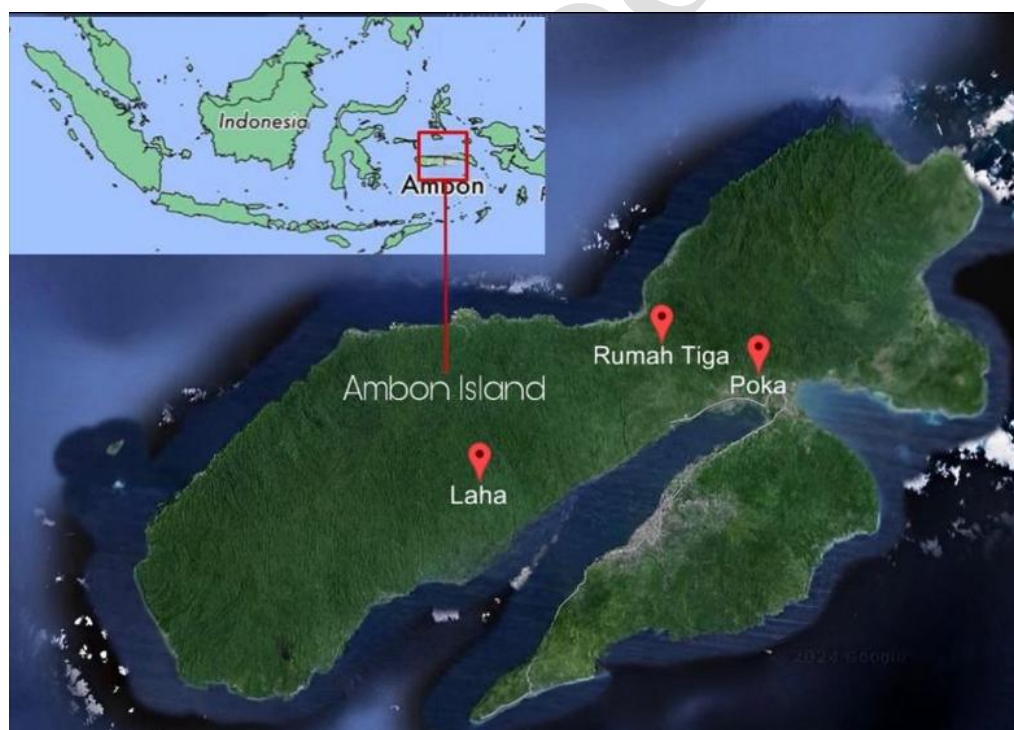
Figure 1. Study location of Poka-Rumah Tiga and Laha Village in Ambon City, Maluku Province, Indonesia
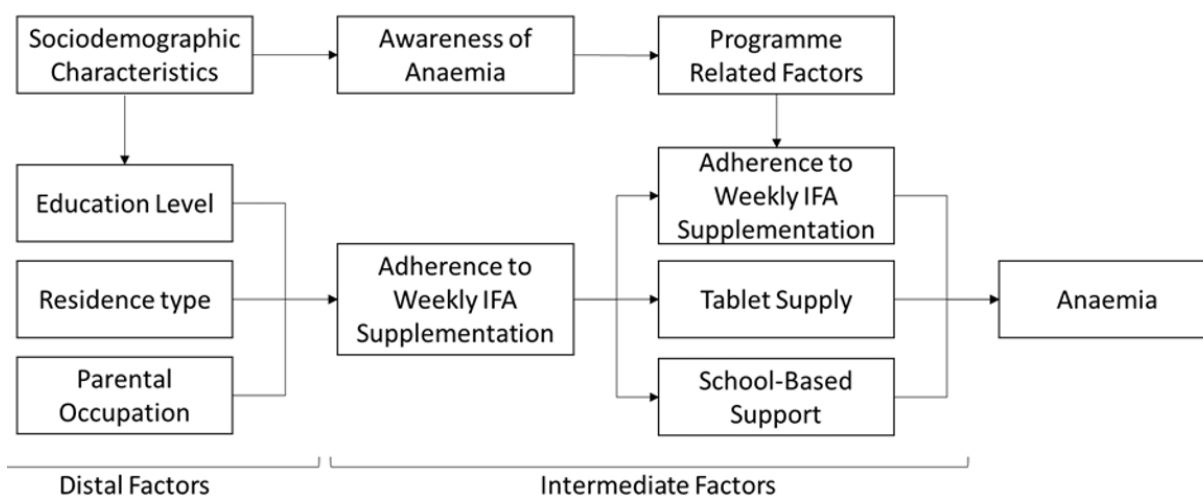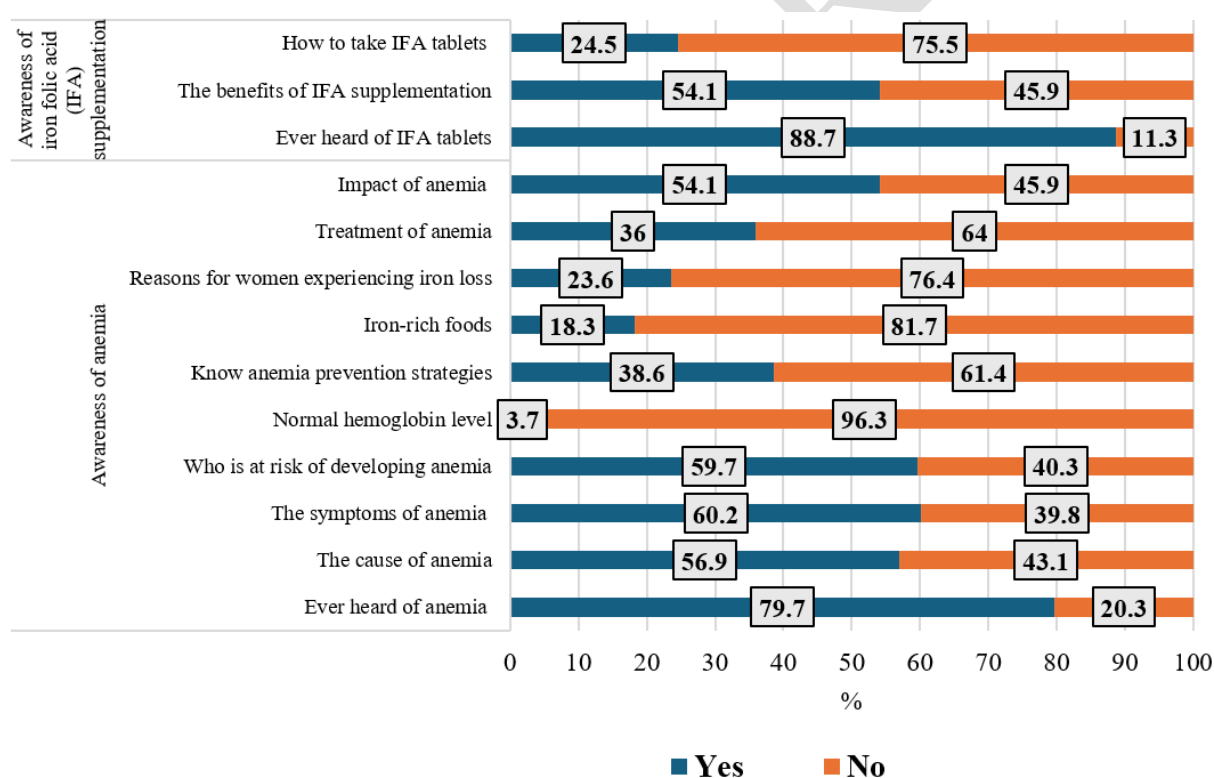
Figure 2. Conceptual framework

Figure 3. Frequency distribution of respondents' answers about the awareness of anaemia and iron-acid supplementation among adolescent girls in Poka-Rumah Tiga and Laha Village, Ambon City, 2023