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The role of community-based organizations in improving rural female adolescents' knowledge, attitude, and haemoglobin level

Apriningsih Apriningsih[1], Rita Ismail[2], Ratri Ciptaningtyas[3], Tri Astuti Sugiyatmi[4], Dudung Angkasa[5], Fathimath Ana Nadheem[6]

[1]Department of Public Health, Faculty of Health Sciences, Universitas Pembangunan Nasional Veteran Jakarta, Jakarta, Indonesia
[2]Department of Nursing, Faculty of Health Sciences, Universitas Pembangunan Nasional Veteran Jakarta, Jakarta, Indonesia
[3]Department of Public Health, Faculty of Health Sciences, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Jakarta, Indonesia
[4]Department of Public Health, Faculty of Medicine, Universitas Borneo, Tarakan, Indonesia
[5]Department of Paediatrics, Dr.von haunter Children's Hospital, Ludwig-Maximilians-Universität, Munich, Germany
[6]Public Health Preparedness and Surveillance and Epidemiology Division, Male City, Maldives

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ABSTRACT

Addressing the prevalence of anemia in female adolescents requires the active engagement of multiple sectors. The COVID-19 pandemic has hampered the school-based weekly iron folate supplementation (WIFAS) program which may lead to an increased anemia prevalence in female adolescents. The role of community-based organizations in assisting preexisting programs is supposed to alleviate the prevalence effectively. This study aimed to analyze the role of a community-based organization (CBO) consisting of youth organizations and integrated services post cadres in a program to improve hemoglobin level in Sirnagalih Village, Bogor, West Java, Indonesia. This pre-experimental study involved 89 female adolescents. After the intervention conducted by the CBO, significant differences were identified in the level of knowledge, attitudes, and hemoglobin (Hb) levels of female adolescents ($p<0.05$). The linear regression test obtained a statistical model equation related to female adolescents' Hb levels after being assisted by the CBO ($R = 0.821$, $p = 0.000$). The variable role of CBO, understanding media information, initial Hb level, adherence to consuming WIFAS, and habits to consume iron enhancer food of female adolescents can explain the Hb levels as much as 82%.

Corresponding Author:

Apriningsih Apriningsih
Department of Public Health, Faculty of Health Sciences,
Universitas Pembangunan Nasional Veteran Jakarta
Jakarta, Indonesia
Email: apriningsih@upnvj.ac.id

1. INTRODUCTION

According to the 2021 Global Nutrition Report, 571 million female adolescents and women of reproductive age worldwide suffer from anemia, which may influence maternal mortality and infant nutritional status [1]. The World Health Assembly (WHA) aims to reduce the prevalence of anemia by fifty percent by 2025 [2], [3]. Through a program to improve diet, food diversification, food fortification, and administration of iron folic acid supplement (IFAS) to female adolescents, women at reproductive age, and pregnant and lactating mothers, the World Health Organization (WHO) implements a strategy to reduce anemia in female adolescent and women of reproductive age globally [4]. For the supplied interventions to be effective, particularly for marginalized communities, implementing this strategy must consider the context and involvement of local stakeholders [5].

Based on Indonesia National Basic Health Research 2018, there was an increase in the prevalence of anemia among adolescent girls from 23.9% in 2013 to 27.2% in 2018 [6]. Along with the WHA and WHO agreement, the Ministry of the Health Republic of Indonesia aims to reduce the prevalence of anemia to below 20% among female adolescents and 30% of them get IFAS [7], [8]. However, ironically, the iron tablet supplementation program for adolescent females is hampered by adherence to taking the tablets. This is due to several factors: knowledge, motivation, self-efficacy, and aid from parents, teachers, and peers. School teachers and peers who give encouragement and information for weekly iron folate supplementation (WIFAS) consumption at school play a significant role in WIFAS consumption adherence [9], [10].

The COVID-19 pandemic has reduced the effectiveness of the WIFAS program in the schools. The regulation of social distance has resulted in a lack of closed interactions. Teachers and classmates found it challenging to motivate female teenagers to consume WIFAS. As a result, a few school districts have maximized social media and WhatsApp applications as communication and instructional channels to motivate folate supplementation. However, such internet connectivity was unavailable in several rural areas [10]. With a decrease in the influence of teachers and peers, limited information from social media, and rural adolescent girls experiencing a higher prevalence of anemia compared to the adolescent girls living in urban areas, as reported in the Indonesia Basic Health Research 2018, there is a pressing need to explore innovative initiatives in rural areas to mitigate the prevalence of anemia among female adolescents [6]. One of the innovative efforts is a collaboration between academicians and rural community-based organizations (CBO), namely youth organization (*karang taruna*) and integrated health services (*pos pelayanan terpadu/posyandu*) cadres, to motivate female adolescents to consume iron-folic acid regularly. Likewise, research carried out in Bangladesh revealed that the implementation of community-based health and nutrition education tailored for adolescents, along with accessible services, and economic growth, could enhance the overall health and nutritional awareness and status of rural adolescents [11].

While previous articles have discussed the engagement of specific social groups, such as youth organizations or cadres, in the WIFAS program and various small workshops aimed at enhancing participants' knowledge of anemia, this study represents the first to address their role in mitigating anemia rates among female adolescents during the pandemic. This study sought to examine the role of CBOs comprised of *karang taruna* and *posyandu* cadres who were trained in capacity building to increase WIFAS consumption and minimize anemia among female adolescents in Sirnagalih village, Bogor, West Java, Indonesia amidst the challenges posed by the COVID-19 pandemic [12].

Several articles have mentioned the involvement of one type of social group, namely youth organizations or cadres, in the WIFAS program and several small workshops targeting the participants' knowledge of anemia, to date, this is the first study that wrote about their role in reducing anemia rate in girl adolescents in the pandemic setting [12], [13]. During the COVID-19 pandemic, this study intends to examine the role of CBOs comprised of *karang taruna* and *posyandu* cadres who were trained in capacity building to increase WIFAS consumption and minimize anemia among female adolescents in Sirnagalih village, Bogor, West Java, Indonesia.

2. METHOD

2.1. Study design, site, and sample

This study utilized a pre-experimental design with a single-group design strategy. This is the simplest group research design for assessing the functions of people receiving social work services [14]. The study population consisted of Sirnagalih Village, Bogor, West Java, Indonesia, female adolescents. The inclusion criteria for the study involved selecting 89 respondents, namely female adolescents residing in Sirnagalih Village who experience menstruation and express willingness to participate. Using the Lemmeshow formula to calculate sample size in a pre-experimental study design with $\sigma^2 = 9.85$ and a pre-post-test difference (D) of 8.1, a minimum sample size of 62 was determined. Considering this, the minimum sample size requirements for this study have been met. The following are the stages of the research carried out which are reflected in Figure 1.

2.2. Intervention

The intervention was carried out by applying a community engagement approach, in this case, which was involving CBOs consisting of 6 youth organizations and 10 *posyandu* cadres. The 16 CBOs members were given face-to-face training for 5 hours for 2 consecutive days with a trainer consisting of 3 trainers who were lecturers from the nutrition study program, public health study program, and medical study program at Universitas Pembangunan Nasional Veteran Jakarta (UPNVJ). The training method used lectures, discussions, questions and answers, and role-play utilizing virtual book media, videos, and materials related to adolescent

health and nutrition. To measure the effectiveness of the training, a pre-post study was conducted on the level of knowledge and attitude of CBOs related to anemia prevention programs in adolescent girls.

Youth organizations and cadres consisted of young women in their respective domicile areas and managed to gather as many as 89 young women. Then the CBOs formed mentoring groups consisting of 7 to 20 adolescent girls. Each group was accompanied by one CBO and one academic from UPNVJ. CBOs provided education, and counseling, and held WIFAS consumptions together once a week for 3 months. The intervention activities spanned from January 2022 to March 2022. Prior to the commencement of assistance by CBOs, an assessment was carried out to measure the level of knowledge about anemia, attitudes towards anemia prevention programs among adolescent girls, and their hemoglobin levels. The Measurements were conducted using a validated questionnaire from the previous, which reported r values for the questionnaire being >0.361 and Cronbach's alpha ≥0.60 [15]. The knowledge scores ranged from a minimum of 0 to a maximum of 18. For the attitude variable, the scores ranged from a minimum of 12 to a maximum of 48.

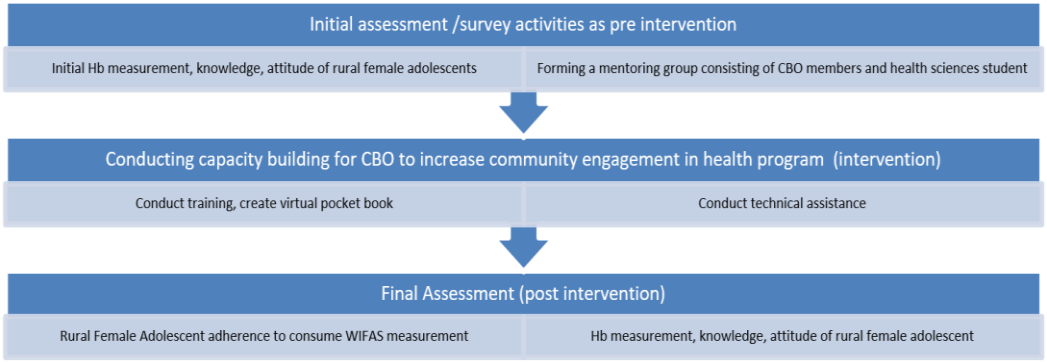

Figure 1. Study flow chart

2.3. Research variables

The dependent variable is adolescent girls' hemoglobin (Hb) level, which indicates their nutritional status. Hb levels were measured both before and after the intervention using the EasyTouch GcHb type ET-321 manufactured in Taiwan, MG 206-3E, Pev A.03/10, P/N 201198. Kemenkes RI AKL N0. 20101710009. The independent variables encompassed the respondent's characteristics including age, education, knowledge, attitude, perception, media information comprehension, adherence to taking WIFAS, and supervision of a member from a CBO. Data collection was facilitated through a Google Form. Questions were adopted from previous research which had reliability and validity score >0.361 and Cronbach alpha ≥0.60 [7].

The knowledge score variable was calculated by summing the correct responses to 12 questions. These questions encompassed various areas including a definition of female adolescents and the definition of anemia in female adolescents, the diagnosis of anemia in female adolescents, the benefits and content of WIFAS, the classification of WIFAS as a drug or a supplement, the rule to consume the WIFAS, side effects of WIFAS, the prevention of WIFAS side effects, foods that prevent anemia, prevention of anemia and identify some foods that inhibit iron absorption. The attitude variables were assessed using a Likert Scale which added responses to 12 statement items. This variable was measured using the sum of 6 questions including the number of WIFAS taken during the intervention, behaviors when receiving WIFAS, and consistency of remembering to take the WIFAS.

The adherence variable was determined using the sum of 6 questions including the number of WIFAS taken during the intervention, behaviors when getting the WIFAS, and consistency of remembering to take WIFAS. The variable of supervision for CBO was measured by using 3 questions. These questions asked whether the participants consumed WIFAS together, whether they recorded their adherence to IFAS consumption, and whether WIFAS was distributed to the homes of those who were absent from group WIFAS consumption sessions. These questions already have validity and reliability tests in previous research [16].

Data on the measurement of eating habits that can increase iron absorption (iron enhancer food) was measured using 3 questions. These questions pertained to habits of eating red meat, poultry, fish, and shrimp in the past month. The data on the food or drink that can inhibit the absorption of iron were collected using 4 questions. These questions asked about the consumption habits of tea, coffee, milk, and peptic ulcer medicine close to the time of WIFAS consumption in the last month. The data for these two variables of eating habits were collected using a food frequency questionnaire (FFQ) [17].

The descriptive analysis of univariate data consisted of displaying the frequency distribution, and percentage for categorical data, and the mean, standard deviation (SD), minimum, and maximum for numerical data. Using linear regression, the T-test, and the McNemar test, the bivariate test was conducted to examine the relationship between the dependent and independent variables. A multivariate analysis was conducted to obtain a statistical model equation that fits the Hb levels of female adolescents after following a 3-month intervention by CBO.

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3. RESULTS AND DISCUSSION

3.1. Characteristics of adolescent girls in Sirnagalih Village, Bogor, West Java

Most of the respondents' last education level was junior high school education (42.7%) with a mean of age was 16.05 years old. This finding is reinforced by a study on the determinants of school enrolment rates in West Java in 2014 which stated that the average length of schooling for the population of 15 years and over in West Java was only 7.9 years and the school enrolment rate in West Java was the lowest of all provinces [18].

In the baseline measurement, the mean knowledge score was 11.34 (SD±6.23), and the initial attitude score was 38.56 (SD±7.31). Before the intervention, most of the respondents (60.7%) reported that they used to eat foods that facilitate the absorption of iron (enhancer food), while 67.4% admitted that they used to consume iron-inhibiting foods or drinks. The average Hb level before the intervention was 11.88 as shown in Table 1.

Table 1. Baseline measurement (n = 89)

Variable	Mean±SD	n	%
Age	16.05±2.08		
- 10-14 years old		23	25.8
- 15-20 years old		66	74.2
Education			
- Primary school		16	18
- Junior high School		38	42.7
- Senior high school		25	28
- Academy		10	11.3
Hemoglobin level	11.88±1.52		
- <12gr/dl		24	23
- >12gr/dl		65	73
Knowledge	11.34±6.23		
- Poor knowledge		42	47.2
- Good knowledge		47	52.8
Attitude	38.56±7.31		
- Poor attitude		43	48.3
- Good attitude		46	51.7
Consume iron enhancer food habit			
- Not frequent		35	39.3
- Frequent		54	60.7
Consume iron inhibiting food habit			
- Not frequent		29	32.6
- Frequent		60	67.4

The mean score of initial knowledge was 11.34 (SD±6.23), and initial attitude was 38.56 (SD±7.31). This is in line with a study conducted in Sirnagalih Village in 2022 [19]. Before the intervention, most of them (60.7%) admitted that they used to consume iron absorption enhancer foods but 67.4% stated they used to consume food or drinks that inhibit iron absorption. The average Hb level of the respondents before intervention was 11.88 gr/dl (SD±1.52) considered as mild iron anemia. Initial hemoglobin levels can affect hemoglobin levels after intervention with WIFAS and mentoring in the form of education and assistance.

CBOs provide education using different kinds of media including posters, virtual handbooks, and videos. Following the mentoring sessions, the level of understanding of adolescent girls regarding the educational media used was measured and CBO supervision in adherence of adolescent girls taking iron folate tablets was measured. Table 2 presents the proportion of adolescent girls who were supervised by CBOs in consuming iron folic acid tablets consumption. A significant majority of the respondents were supervised by CBO members while consuming WIFAS (79.8%), and 84.3% understood the media messages about anemia and WIFAS.

The mean value of knowledge and attitude scores after intervention are 17.9±3.4, and 46.70±5.91 respectively. The test of differences between knowledge and attitudes scores about anemia and WIFAS showed a significant difference ($p<0.05$), and similar results were indicated between Hb level and their habit of consuming iron enhancer foods before and after the intervention. The score of attitudes is 38.56±7.31 and the Hb level is 13.7gr/dl ±2.08 as shown in Table 3. These findings align with studies conducted in Depok City, the Philippines, and in Yogyakarta, the female adolescent who received assistance from teachers, peers, and youth organizations experienced an increase in Hb levels as an indicator of improving anemia status [20].

Table 2. Female adolescents' ability to understand the media about anemia and CBO supervise while consuming WIFAS (n = 89)

Variable	n	%
CBO supervises while consuming WIFAS		
- Yes	71	79.8
- No	18	20.2
Ability to understand the media about anemia		
- Good understanding	75	84.3
- Poor understanding	14	15.7

Table 3. The differences between scores of respondents 'knowledge, attitude, and Hb level before and after the CBO's assistance

Variable	Baseline (Mean±SD)	Post line (Mean±SD)	Delta Mean	p-value
Knowledge	11.34±6.23	17.9 ±3.4	6.56	0.000
Attitude	38.56±7.31	46.70±5.91	8.14	0.000
Hb level	11.89±1.52	13.7±2.08	1.81	0.000
Adherence score	-	5.6±9.4	-	-

Table 4 shows the factors that correlate with Hb levels after the intervention. The correlation test showed that the factors that correlated with Hb levels after intervention were initial Hb levels, adherence to consuming WIFAS, and age ($p<0.05$). While other factors such as knowledge and attitudes towards anemia and WIFAS did not correlate significantly ($p>0.05$). Adherence to consuming WIFAS is an important factor in the anemia prevention program among female adolescents. The results of Indonesia Basic Health Research 2018 and previous studies in Bogor and Bekasi show that the low adherence to consuming WIFAS regularly is a factor inhibiting the success of reducing the prevalence of anemia in female adolescents [6], [20]-[22]. Our study found a significant association between adherence to IFAS consumption with post-Hb. This is in line with the systematic review result from Silitonga which revealed peer educator intervention studies increase adherence to IFAS consumption by as much as 80% [23]. Peer educators in our study are included in CBO namely *karang taruna*. This study has been supported by another finding that youth attitudes towards *karang taruna* have a significant impact on their participation in *karang taruna* activities [24]. However, the role of CBOs needs to be supported by their readiness to provide assistance to motivate and educate adolescent girls to consume iron folate and eat balanced nutrition.

Table 4. Factors correlated to Hb level after intervention (n = 89)

Factors	R	R2	p-value
Adherence to consuming WIFAS	0.662	0.438	0.000
Age	0.256	0.066	0.008
Initial Hb level	0.765	0.585	0.000
Knowledge	0.000	0.000	0.999
Attitude	0.028	0.001	0.793

Although in the model the adherence factor is found to be an insignificant factor, it must still be present in the model of increasing Hb levels, together with the factor of female adolescents' habits to consume iron enhancer food and supervision from *karang taruna* and *posyandu* cadres. This study in line with Risonar *et al.* [18] study in Bandar Lampung and Lutfiasari *et al.* [25].

A multivariate test with multiple linear regression was carried out to determine a fit statistical model related to the Hb levels of adolescent girls in Sirnagalih Village, Bogor, West Java after intervention. Table 5 shows that the variables included in the regression model are age, supervision from CBO, adherence to consuming WIFAS, being able to comprehend media messages about anemia, pre haemoglobin level, and habits of consuming iron enhancers food. The coefficient of determination (R square) shows a value of 0.674 which means that the regression model can explain 82% dependent variable of Hb level among adolescent girls after intervention. In other words, the five independent variables can explain the Hb levels as much as 67%. The results of the F test show a p-value = 0.000, meaning that at 5% alpha the regression model fits the existing data, and the four variables can significantly predict the Hb level after the intervention.

Table 5. Linear regression on the role of CBO member in increasing the Hb level among female adolescent in Sirnagalih Village, Jonggol, Bogor, West Java

Model parameters	R	R2	Beta coefficient	p-value
Constant	0.821	0.674	3.837	0.000
Understanding media message of anemia			1.615	0.029
Supervision of CBO			0.992	0.052
Adherence to consume IFAS			0.071	0.851
Pre Hb-Level			0.644	0.000
Habits of consuming iron enhancers foods			1.495	0.299

Hb post= 3.837+1.615 understanding the media messages about anemia + 0.992 supervision from CBO member +0.071 adherence to consume IFAS + 0.644 pre Hb Level + 1.495 Habits of consuming iron enhancers foods.

Although our study found supervision of CBO is not significantly associated with the increasing Hb level, the role of CBO as a peer group in creating awareness of anemia had contributed to adolescents' understanding. Community-based interventions, combined with population-wide interventions (e.g. social marketing campaigns) and structural changes (e.g. Building networks and partnerships), are recognized by WHO as an effective and durable way to prevent health issues in adolescents [26], [27]. Another advantage of engaging CBO as a health intervention in our study compared to other anemia interventions among adolescents can be seen in Utami *et al.* [28] which their knowledge improved after education but with no significant improvement in post-Hb. Adolescents' understanding is a skill of literacy. This study highlighted the opportunity to provide intervention at this stage of life which has proven beneficial as adolescents' characters are indicated by the development of positive values and skills [29].

The limitation of our study is the measurement of adherence to consumption IFAS did not reveal its determinant. It is different from Kamau *et al.* [30] where nutrition education can elevate the compliance of IFAS in the intervention group rather than the IFAS-only group. In addition to that, our study did not assess the adherence to IFAS consumption before intervention.

4. CONCLUSION

The improvement of iron nutritional anemia among female adolescents is highly needed to improve the current and future nutritional status of female adolescents to prepare for their motherhood. The improvement could be carried out through an iron supplementation program that requires regular and complete adherence to iron-folic acid supplements. Adherence requires the role of the assistant as an educator and motivator. The CBO consisting of youth organizations and *posyandu* cadres can be involved as assistants to groups of adolescent girls in rural areas, particularly when teachers cannot play a direct role due to circumstances like the COVID-19 pandemic. This study proves that CBO plays a role in increasing the Hb level of adolescent girls, besides understanding media information, initial Hb level, adherence to consume IFAS, and habits to consume iron enhancer food of female adolescents in Sirnagalih Village, Bogor, West Java.

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AUTHOR CONTRIBUTIONS STATEMENT

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Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Apriningsih Apriningsih	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓
Rita Ismail		✓								✓	✓	✓		
Ratri Ciptaningtyas			✓	✓	✓		✓			✓	✓			
Tri Astuti Sugiyatmi				✓	✓					✓				
Dudung Angkasa				✓	✓					✓				
Fathimath Ana Nadheem				✓	✓					✓				

C : **C**onceptualization
M : **M**ethodology
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I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state no conflict of interest.

ETHICAL APPROVAL

This research has received ethical approval from the Health Research Ethics Committee, Universitas Pembangunan Nasional Veteran Jakarta Number. 499/XII/2021/KEPK.

DATA AVAILABILITY

Other researchers who need the data can contact the author [AA].

REFERENCES

[1] M. M. Hasan *et al.*, "Anemia in women of reproductive age in low- and middle-income countries: progress towards the 2025 global nutrition target," *Bulletin of the World Health Organization*, vol. 100, no. 03, pp. 196–204, Mar. 2022, doi: 10.2471/BLT.20.280180.

[2] WHO, "Global Nutrition Targets 2025 Anemia Policy Brief," WHO Library. [Online]. Available: http://www.who.int//iris/bitstream/10665/148556/1/WHO_NMH_NHD_14.4_eng.pdf (Accessed: September 5, 2022).

[3] A. Al-Jawaldeh *et al.*, "Are countries of the eastern mediterranean region on track towards meeting the world health assembly target for anemia? A review of evidence," *International Journal of Environmental Research and Public Health*, vol. 18, no. 5, pp. 1–26, 2021, doi: 10.3390/ijerph18052449.

[4] G. A. Stevens *et al.*, "National, regional, and global estimates of anemia by severity in women and children for 2000–19: a pooled analysis of population-representative data," *The Lancet Global Health*, vol. 10, no. 5, pp. e627–e639, May 2022, doi: 10.1016/S2214-109X(22)00084-5.

[5] A. Apriningsih, C. Dwiriani, S. Madanijah, and R. Kolopaking, "High school female students'adherence to iron folic acid supplement consumption and hemoglobin improvement," *Seameo-Recfon.Org*, vol. 52, no. Suplement 1, pp. 60–73, 2021.

[6] Ministry of Health RI, "RISKESDAS National Report 2018," 2018. [Online]. Available: https://repository.badankebijakan.kemkes.go.id/id/eprint/3514/1/Laporan Riskesdas 2018 Nasional.pdf (Accessed: August 7, 2021)

[7] Apriningsih, S. Madanijah, C. M. Dwiriani, and R. Kolopaking, "Determinant of highschool girl adolescent'adherence to consume iron folic acid supplementation in Kota Depok," *Journal of Nutritional Science and Vitaminology*, vol. 66, pp. S369–S375, 2020, doi: 10.3177/jnsv.66.S369.

[8] Ministry of Health RI, "Ministry of Health Strategic Plan 2105-2019. No: HK.02.02/MENKES/52/2015," 2014. [Online]. Available: https://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/indonesia/renstra-2015.pdf (Accessed: April 2, 2020).

[9] S. Kheirouri and M. Alizadeh, "Process evaluation of a national school-based iron supplementation program for adolescent girls in Iran," *BMC Public Health*, vol. 14, no. 1, p. 959, Dec. 2014, doi: 10.1186/1471-2458-14-959.

[10] Y. R. Upreti, B. Devkota, S. Bastien, and B. C. Luitel, "Developing a school-based nutrition education programme to transform the nutritional behaviours of basic-level schoolchildren: a case from participatory action research in Nepal," *Educational Action Research*, vol. 32, no. 3, pp. 528–547, 2024, doi: 10.1080/09650792.2023.2206580.

[11] N. Alam, K. Roy S., T. Ahmed, and A. M. Ahmed, "Nutritional status, dietary intake, and relevant knowledge of adolescent girls in rural Bangladesh.," *Journal of Health, Population, and Nutrition*, vol. 28, no. 1, pp. 86–94, 2010.

[12] S. Kataria, S. Kataria, D. Chougule, B. Bharti, and A. Rastogi, "Evaluating the impact of an iron supplementation program for combating anemia in school-age and adolescent females by a grassroots organization in India," *Cureus*, vol. 16, no. 12, p. e75608, 2024, doi: 10.7759/cureus.75608.

[13] E. K. Mugish, "Enhancing malaria and anemia management through community engagement and health education: assessing the impact of local health programs on enhancing malaria and anemia management through community engagement and health education: assessing the impact," *Eurasian Experiment Journal of Scientific And Applied Research* (EEJSAR), vol. 6, no. 3, 2024.

[14] B. A. Thyer, "Pre-experimental research designs," *Quasi-Experimental Research Designs*, pp. 29–76, 2012, doi: 10.1093/acprof:oso/9780195387384.003.0002.

[15] R. Agustina *et al*., "Associations of knowledge, attitude, and practices toward anemia with anemia prevalence and height-for-age Z-score among Indonesian adolescent girls," *Food and Nutrition Bulletin*, vol. 42, no. 1_suppl, pp. S92–S108, Jun. 2021, doi: 10.1177/03795721211011136.
[16] N. W. Suarniti, N. K. E. Astiti, N. M. D. Purnamayanti, I. G. A. A. Novya Dewi, and I. N. Wirata, "Implementation of youth integrated healthcare center in the prevention of stunting incidents in the Kekeran Village of Badung Regency, Indonesia," *Journal of Midwifery and Health Sciences*, vol. 7, no. 3, pp. 434–444, 2024, doi: 10.62425/esbder.1417380.
[17] N. T. Milman, "A review of nutrients and compounds, which promote or inhibit intestinal iron absorption: making a platform for dietary measures that can reduce Iron Uptake in patients with genetic haemochromatosis," *Journal of Nutrition and Metabolism*, vol. 2020, 2020, doi: 10.1155/2020/7373498.
[18] M. G. D. Risonar, L. W. Tengco, P. Rayco-Solon, and F. S. Solon, "The effect of a school-based weekly iron supplementation delivery system among anemic schoolchildren in the Philippines," *European Journal of Clinical Nutrition*, vol. 62, no. 8, pp. 991–996, 2008, doi: 10.1038/sj.ejcn.1602809.
[19] B. K. Shah and P. Gupta, "Weekly vs daily iron and folic acid supplementation in adolescent Nepalese girls," *Archives of Pediatrics and Adolescent Medicine*, vol. 156, no. 2, pp. 131–135, 2002, doi: 10.1001/archpedi.156.2.131.
[20] R. Zuraida, N. I. Lipoeto, M. Masrul, and J. Fesshartanty, "The effect of anemia free club interventions to improve adolescent dietary intakes in Bandar Lampung city, Indonesia," *Open Access Macedonian Journal of Medical Sciences*, vol. 8, pp. 145–149, 2020, doi: 10.3889/OAMJMS.2020.4168.
[21] S. D. Dubik, K. E. Amegah, A. Alhassan, L. N. Mornah, and L. Fiagbe, "Compliance with weekly iron and folic acid supplementation and its associated factors among adolescent girls in Tamale Metropolis of Ghana," *Journal of Nutrition and Metabolism*, vol. 2019, 2019, doi: 10.1155/2019/8242896.
[22] J. A. Kavle and M. Landry, "Community-based distribution of iron–folic acid supplementation in low- and middle-income countries: a review of evidence and programme implications," *Public Health Nutrition*, vol. 21, no. 2, pp. 346–354, Feb. 2018, doi: 10.1017/S1368980017002828.
[23] H. T. H. Silitonga, L. A. Salim, I. Nurmala, and M. Wartiningsih, "Compliance of iron supplementation and determinants among adolescent girls: a systematic review," *Iranian Journal of Public Health*, vol. 52, no. 1, pp. 37–48, 2023, doi: 10.18502/ijph.v52i1.11664.
[24] S. Suharma, R. A. Rahman, E. L. Syaodih, Y. Sundayani, P. Sutarsih, and Y. E. Tungga, "The effect of adolescent attitudes on *karang taruna* in handling problems toward adolescents in the development period," *Indonesian Journal of Social Work*, vol. 3, no. 2, 2020, doi: 10.31595/ijsw.v3i2.230.
[25] D. Lutfiasari, S. Martini, and S. Widati, "The effectiveness of peer group on adolescent anemia prevention behavior: a systematic review," *Journal of Public Health in Africa*, vol. 14, no. S2, 2023, doi: 10.4081/jphia.2023.2542.
[26] A. Grüters, S. Wiegand, and H. Krude, "Population-based approaches to childhood obesity prevention," *World Health Organization*, vol. 144, no. 9, pp. 34–36, 2002.
[27] P. Attree, B. French, B. Milton, S. Povall, M. Whitehead, and J. Popay, "The experience of community engagement for individuals: A rapid review of evidence," *Health and Social Care in the Community*, vol. 19, no. 3, pp. 250–260, 2011, doi: 10.1111/j.1365-2524.2010.00976.x.
[28] A. Utami, A. Margawati, D. Pramono, H.-P. Julianti, D.-A. Adespin, and D.-R. Wulandari, "The effectiveness of iron-folic acid supplementation and education intervention to hemoglobin level, knowledge, and compliance among adolescent girls in islamic boarding school," *Open Access Macedonian Journal of Medical Sciences*, vol. 10, no. E, pp. 1141–1146, 2022, doi: 10.3889/oamjms.2022.9688.
[29] D. Exner-Cortens, D. Wolfe, C. V. Crooks, and D. Chiodo, "A preliminary randomized controlled evaluation of a universal healthy relationships promotion program for youth," *Canadian Journal of School Psychology*, vol. 35, no. 1, pp. 3–22, 2020, doi: 10.1177/0829573518821508.
[30] M. Kamau, S. Kimani, and W. Mirie, "Counselling and knowledge on iron and folic acid supplementation (IFAS) among pregnant women in Kiambu County, Kenya: a cross-sectional study," *AAS Open Research*, vol. 1, p. 21, 2019, doi: 10.12688/aasopenres.12891.3.

BIOGRAPHIES OF AUTHORS

Apriningsih Apriningsih is an Assistant Professor at the Faculty of Health Sciences, Universitas Pembangunan Nasional Veteran Jakarta. She earned a bachelor's and master's degree in public health from Universitas Indonesia, respectively in 1998 and 2010. She earned her doctoral degree from IPB University in 2016. She has published peer-reviewed scientific articles in major journals about female adolescent nutrition status, breastfeeding, and children's nutrition and health status research. She is interested in exploring social-ecological determinants of public health nutrition of society. She can be contacted at email: apriningsih@upnvj.ac.id.

Rita Ismail is an Assistant Professor at the Faculty of Health Sciences, Universitas Pembangunan Nasional Veteran Jakarta. She earned a bachelor's in nursing and a master's degree in public health from Universitas Indonesia, respectively in 2000 and 2003. She earned her second master's degree in nursing (health and environment) from Ewha Womans University, Seoul, South Korea in 2009. She continued her education with a doctoral degree in nursing at the University of Washington, Seattle, USA, and graduated in 2014. She has published peer-reviewed scientific articles in major journals about HIV and maternity nursing. She has written books about maternity nursing and research. She can be contacted at email: ismailr@upnvj.ac.id.

Ratri Ciptaningtyas is a public health nutrition scholar. Her research interests focus on adolescent nutrition, digital nutrition education, and health behavior. She also works for community empowerment in urban areas to improve nutrition and health status among women. She can be contacted at email: ratri.ciptaningtyas@uinjkt.ac.id.

Tri Astuti Sugiyatmi is a public health researcher. Her research interests focus health care and policy management, quality health care, mental health, and maternal and child health. She can be contacted at email: triastuti@borneo.ac.id.

Dudung Angkasa is a registered dietitian and maternal–child nutrition researcher. He is an associate professor and has published several peer-reviewed original articles. He has served as a reviewer for more than seven national journals, a member of the editorial board in several national journals, and an invited reviewer for several international peer-reviewed journals. He was actively involved in the Erry Project and Gisel Project, which emphasize the important role of nutrition in pregnancy and child development. He can be contacted at email: angkasa.dudung@med.uni-muenchen.de.

Fathimath Ana Nadheem is an emergency preparedness and response section officer of the Maldives Public Health Preparedness Surveillance and Epidemiology divisions. She can be contacted at email: ana@health.gov.mv.