Acta Biomed 2025; Vol. 96, N. 2: 16231 DOI: 10.23750/abm.v96i2.16231

Original article

Impact of community-based programs on anemia and stunting prevention: A multicenter randomized controlled trial

Darmawati[1], Herlina Dimiati[2], Sufriani[3], Mira Rizkia[1], Aida Fitri[1], Mariatul Kiftia[1], Elka Halifah[1], Fithria[4], Dara Ardhia[1]

[1]Maternity of Nursing Department, Faculty of Nursing, Universitas Syiah Kuala, Banda Aceh, Indonesia; [2]Department of Pediatrics, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia; [3]Pediatrics of Nursing Department, Faculty of Nursing, Universitas Syiah Kuala, Banda Aceh, Indonesia; [4]Family of Nursing Department, Faculty of Nursing, Universitas Syiah Kuala, Banda Aceh, Indonesia

Abstract. *Background and aim of the work:* The urgency of the health problems of anemia and stunting has a long-term impact on the future of children, and the nation's intelligence, so appropriate intervention is required. This study aims to assess the effectiveness of Community-based interventions in preventing anemia and stunting. *Research Design and Methods:* The study used a Randomized Controlled Trial design. The population was pregnant women in Aceh Besar Regency; the sample was 86, but 6 people dropped out; therefore, the total was 80. Tools for data collection include knowledge, attitudes, and behavior questionnaires. This study measured the mother's weight, upper arm circumference, and Hemoglobin (Hb) levels, as well as the baby's weight and body length at the post-test. *Results:* The results showed that there were differences in the mean rank on the post-test knowledge (U = 587,500, P-value = 0.002), attitudes (U = 363,000, P-value = 0.000), behavior (U = 469,500, P-value = 0.001) which were significantly higher in the intervention group compared with the control group. However, the control and intervention groups did not differ in the mean ranking of Hb levels at the post-test (U = 688,000, P-value = 0.130). Control group newborns showed abnormality rates of 5.1% of body weight and 12.8% of body length. *Conclusions*: Good knowledge, attitudes, and behavior in the intervention group show that the community as an intervention partner has proven to be effective in preventing anemia and stunting in pregnant women, so routine education by nurses is needed to maintain the effectiveness of this intervention. (www.actabiomedica.it)

Key words: community-based participatory research, anemia, child nutrition disorders, growth disorders, randomized controlled trial, intervention studies, public health, community health services

Introduction

Anemia in pregnancy is a significant public health problem. Globally, Southeast Asia has a high percentage of women who experience anemia during pregnancy, approximately 48.2%. This condition will increase the risk of hemorrhage and sepsis during labor, low birth weight, and weak immune system; in some cases, the condition can cause death if the treatment of anemia does not produce a significant effect (1). In addition, anemia is one of the factors causing stunting, which can be prevented so that mothers and babies remain healthy and free from stunting starting from the first thousand days of life (2). *Stunting* is a condition of failure to thrive in children under five years old caused by a lack of nutritional intake for a long time

and recurrent infections. These two causal factors are influenced by inadequate parenting patterns and psychosocial simulation, especially in the first 1,000 days of life. Children are classified as stunted if their length or height according to their age is lower than the applicable national standards (3). Several countries, including Indonesia, are currently experiencing problems related to stunting (1,4). The Ministry of Health's Basic Health Research (Riskesdas) 2018 found that 30.8% experienced stunting. Even though stunting has decreased from 37.2% in 2013, the stunting rate remains high in 2 (two) provinces with a prevalence above 40%. Aceh is currently the third province in Indonesia for stunting cases. Based on the Aceh health profile, the Aceh Besar district's stunting rate shows fluctuations from 2019 to 2021. The Kutabaro Community Health Centre is under the working area of Kuta Baro District Aceh Besar Regency and is trying to make several breakthroughs to reduce the stunting rate. Currently, based on the results of interviews with the midwife in charge, it was found that there were several villages where anemia was detected, 7 out of 21 pregnant women, or around 35%, had mild to severe anemia, and 8 out of 156 toddlers with poor nutritional status who needed special attention, in addition to toddlers who were at risk of stunting. Stunting and anemia in pregnant women are two interrelated phenomena (5) and are problems that still occur frequently in Indonesia (6). Therefore, prevention of anemia and stunting are two things that are interconnected and cannot be separated, so they require appropriate intervention to overcome this problem. One intervention that can be carried out is by application of the Community as a Partner model as partners in carrying out this intervention. This model can reduce stressors, which include system balance, maintaining healthy community health, and promoting community health (7). Improving the health status of mothers, babies, and toddlers is one of the focuses of the MDGs by reducing morbidity and mortality rates and preventing diseases, including anemia and stunting. This condition can be done by increasing access to prenatal services and using a community-based approach (8). The results of a literature study in Indonesia show that controlling and preventing stunting can be done through integrated nutritional interventions. Specific nutritional intervention strategies such as providing supplementation and additional food plus sensitive nutritional interventions include non-health interventions, improving family economics, access and use of clean water, and sanitation (9). The results of other research using the community as a partner model in South Africa, which was carried out using qualitative methods, showed that an in-depth analysis found the root of the problems underlying the phenomenon in community groups related to teenage pregnancy. This event becomes a sensitive issue, such as teenage pregnancy (10). The results of research using this model can be helpful as a starting point for developing interventions, especially in communities, to prevent various situations, including pregnant women with anemia and stunting.

Based on this phenomenon, it is crucial to carry out this research as an effort to prevent anemia in pregnant women and stunting by implementing the Community as Partner Based Integrated Approach Model through qualitative and quantitative approaches which are deemed capable of identifying actual problems and providing sustainable guidance so that the structure of the Community Based Integrated Approach Model as Partner is capable of being implemented and can be implemented optimally.

Participants and Method

This research used a Randomized Control Trial (RCT) approach *control group design*, and it was developed using a flow chart of parallel randomized trials of two groups from the CONSORT model, including enrollment, allocation, follow-up, and analysis. The study population was all third-trimester pregnant women and newborns in 6 Community Health Centers in the working area of Aceh Besar Regency. The sample was selected using a simple random sampling technique (using a lottery). The six community health centers were divided into two groups: 3 community health centers as the intervention group and 3 community health centers as the control group. The recruitment process for potential respondents uses a purposive sampling technique. The sample size is based on Cohen's (1988) (11) table for the t-test with power

(p) = 0.80, significance level (α) = 0.05, and effect size (d) = 0.40 under the provisions in nursing research with a range of 0, 20-0.40 (12). The results showed that the required sample size was 78 people, which was increased by 10% (to avoid dropping out during the research), so the total was 85.8 or 86 respondents. The 86 respondents were divided into 43 in the control group and 43 in the intervention group. During the intervention process, some respondents dropped out, totaling four in the control group and two in the intervention group. The final total of respondents was 80 people, with 39 in the control group and 41 in the intervention group (Figure 1). The data collection tool in this study used a questionnaire developed by researchers, where the knowledge questionnaire consisted of 20 questions, attitudes 20 questions and behavior 15 questions. This study also measured body weight, LILA (in the pre-test), and Hb levels (pre-test and post-test) in the mother and measured the baby's weight and body length during the post-test. The research intervention process was based on the community as a partner stage. Firstly, the assessment stage is to obtain initial data regarding pregnant women with anemia and data related to stunting. Then, the researcher analyzed the problem related to anemia and stunting. The next stage included intervention and program development for anemia and stunting, consisting of modules preparation for village health cadres, conducting cadre training, and health education preparation for pregnant women. The next stage was implementation, including six weeks (5 sessions). The first week of training is carried out for village cadres (2 sessions meeting/2 hours per session) on preventing anemia in pregnant women and stunting in babies. After cadre training, the team gave informed consent and a pre-test on respondents by filling out a questionnaire measuring knowledge, attitudes, and behavior to prevent anemia, stunting, and a Hb examination. Then, in the second week, the intervention was given by a trained cadre, supervised by the researcher (1 session/2 hours). The topic is related to the dangers of pregnancy complications. The third week was educating pregnant women on anemia prevention and nutrition (1 session/2 hours). In the fourth week, we included health education on stunting prevention. The fifth week was about family support for pregnant women in preventing anemia and stunting (1 session/2 hours). In the sixth week, the final community as partner stage was performed, namely an evaluation in the form of a post-test. Then, after the respondents gave birth, the cadre reported the weight and height values of the newborn on the first day. Moreover, the Hb value was measured in the second week post-partum (10 to 14 days) (detail can be observed in Figure 2).

Results

Demographic data

This research was carried out from May to November, starting from the initial data collection process, data collection, and the entire series of interventions on 80 pregnant women selected as respondents. Data on the respondents' characteristics in this research's results can be seen in the Table 1.

Table 1 shows that most respondents in the control and intervention groups were 20-35 years old. The

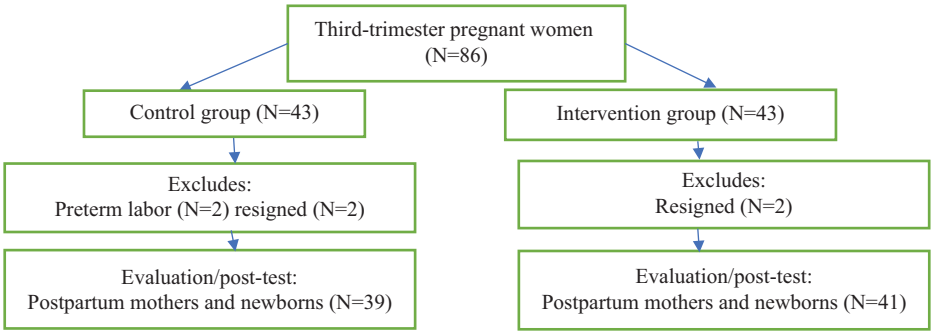

Figure 1. Flow charts of the respondent selection process.

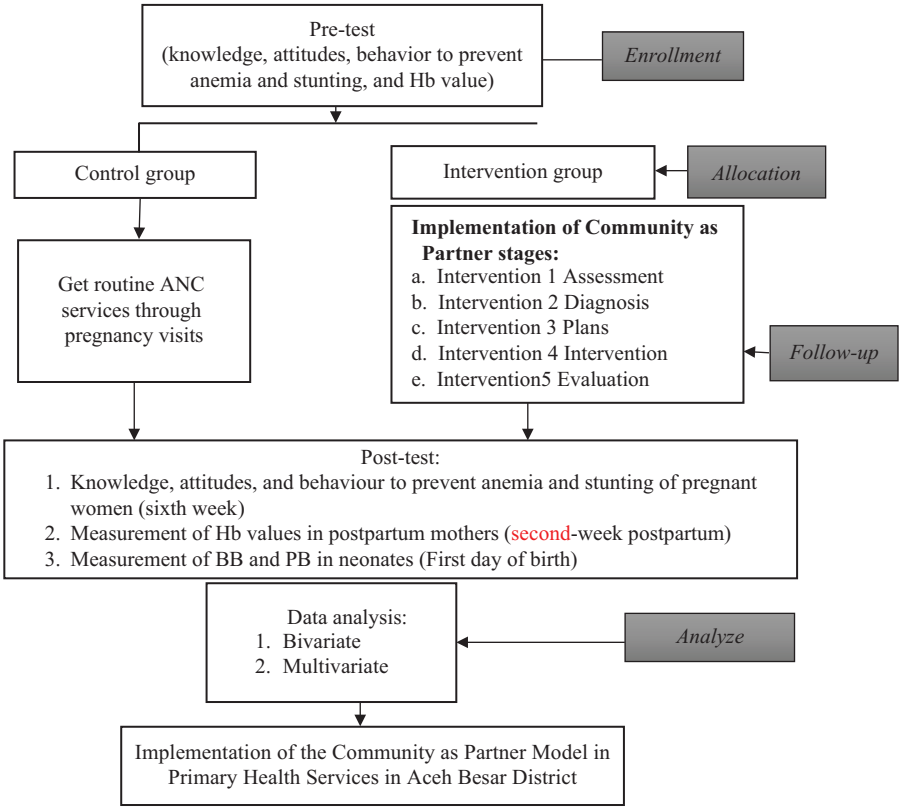

Figure 2. Research Flow.

majority of respondents in both groups are housewives. Respondents in both groups had incomes less than the minimum wage with secondary-level education. The majority of respondents had a pregnancy distance of > 2 years from their previous child, namely 56.4% in the control group and 68.3% in the intervention group. The majority of respondents in both groups had primiparous parity status (43.6% and 36.6%) and had one living child (43.6% and 43.9%). When measuring body mass index, it was found that the average respondents from the two groups were classified as obese (43.6% and 56.1%) with typical LILA measurement results (82.1% and 70.7%). Records of the weight and length of the baby at birth from respondents showed that all respondents in the intervention group had average baby weight and baby length (100%). Meanwhile, in the control group, 5.1% of babies had a body weight of < 2500 grams, and 12.8% had a body length of < 48 cm.

Effectiveness of community-based interventions in preventing anemia and stunting

Frequency distribution data on Hb levels and knowledge, attitudes, and behavior regarding anemia and stunting in the control group and intervention group in the pre-test and post-test can be seen in the Table 2.

The results of data analysis of differences in the mean rank of Hb levels, knowledge, attitudes, and behavior regarding the prevention of anemia and stunting in pregnant women in the control group and intervention group in the pre-test and post-test can be seen in the Table 3.

Table 3 shows the test results for the Hb level variable using the Wilcoxon Rank Sign Test. The results of the hypothesis test show that there is a change in the mean rank for the Hb level variable in the control group between the pre-test and post-test (Z = -0.584,

Table 1. Socio-demographic Characteristics of Respondents (n = 80).

Characteristics	Group		*P-value*
	Control f %	Intervention F %	
Age (Years)			
20-35	34 (87.2)	34 (82.9)	0.597
<20 / >35	5 (12.8)	7 (17.1)	
Work			
Housewife	34 (87.2)	38 (92.7)	0.415
Work	5 (12.8)	3 (7.3)	
Income			
< Minimum wage	34 (87.2)	34 (82.9)	0.597
> UMR	5 (12.8)	7 (17.1)	
Education			
Base	4 (10.3)	5 (12.2)	0.990
Intermediate	29 (74.4)	29 (70.7)	
Tall	6 (15.4)	7 (17.1)	
Pregnancy Spacing			
> 2 Years	22 (56.4)	28 (68.3)	0.193
< 2 Years	7 (17.9)	1 (2.4)	
0 Years (First Child)	10 (25.6)	12 (29.3)	
Parity			
Nulliparous	8 (20.5)	12 (29.3)	0.565
Primipara	17 (43.6)	15 (36.6)	
Multiparous	14 (35.9)	14 (34.1)	
Number of Living Children			
There is not any	9 (23.1)	13 (31.7)	0.308
One	17 (43.6)	18 (43.9)	
Two	6 (15.4)	5 (12.2)	
Three	7 (17.9)	4 (9.8)	
Four	0 (0.0)	1 (2.4)	
BMI			
Thin	1 (2.6)	0 (0.0)	0.524
Normal	14 (35.9)	16 (39.0)	
Fat	17 (43.6)	23 (56.1)	
Obesity	7 (17.9)	2 (4.9)	
LILA			
Normal (> 23.5 cm)	32 (82.1)	29 (70.7)	0.237
Abnormal (< 23.5 cm)	7 (17.9)	12 (29.3)	
BB Baby			
Normal	37 (94.9)	41 (100.0)	0.144
Abnormal	2 (5.1)	0 (0.0)	
PB Baby			
Normal	34 (87.2)	41 (100.0)	0.019
Abnormal	5 (12.8)	0 (0.0)	
Total	39 (100)	100)	

Table 2. Frequency Distribution of Hb Levels of Pregnant Women, Mothers' Knowledge Levels, Mother's Attitude Values, and Maternal Behaviour Levels in the Control Group and Intervention Group in pre-test and post-test (n = 80).

	Control Group (n = 39)		Intervention Group (n = 41)		Total %
	f	%	f	%	
Hb level					
Pre Test					
Not Anemic	32	82.1	18	43.9	50 (62.5)
Anemia	7	17.9	23	56.1	30 (37.5)
Post Test					
Not Anemic	28	71.8	35	85.4	63 (78.8)
Anemia	11	28.22	6	14.6	17 (21.2)
Knowledge					
Pre Test					
Good	23	59.0	19	46.3	42 (52.5)
Enough	12	30.8	15	36.6	27 (33.8)
Low	4	10.3	7	17.1	11 (13.8)
Post Test					
Good	27	69.2	39	95.1	66 (82.5)
Enough	7	17.9	2	4.9	9 (11.3)
Low	5	12.8	0	0.0	5 (6.3)
Attitude					
Pre Test					
Positive	19	48.7	21	51.2	40 (50.0)
Negative	20	51.3	20	48.8	40 (50.0)
Post Test					
Positive	12	30.8	35	85.4	47 (58.8)
Negative	27	69.2	6	14.6	32 (41.3)
Behavior					
Pre Test					
Good	4	10.3	6	14.6	10 (12.5)
Enough	14	35.9	21	51.2	35 (43.8)
Not enough	21	53.8	14	34.1	35 (43.8)
Post Test					
Good	8	20.5	16	39.0	24 (30.0)
Enough	21	53.8	20	48.8	41 (51.2)
Not enough	10	25.6	5	12.2	(18.8)

P-value = 0.559) so it can be concluded that H_0 is accepted, which means there is no increase in mean rank for the Hb level variable in the control group between pre-test and posttest. Furthermore, it was discovered that there was an increase in the mean rank value of Hb levels during the post-test (Z = -3.837, P-value = 0.000). This result shows that the mean rank

Table 3. Differences in Mean Rank of Hb Levels, Knowledge, Attitudes, and Behavior Regarding Prevention of Anemia and Stunting in Pregnant Women in the Control Group and Intervention Group at Pre-test and Post-Test (n = 80).

Variable	Control Group (n = 39)			Intervention Group (n = 41)		
	MR	Z	*P-value*	MR	Z	*P-value**
Hb level						
Pre-Test	4.71	-0.584	0.559	8.50	-3,837	0,000
Post-Test	7.33			12.33		
Knowledge						
Pre-Test	10.00	-0.431	0.666	0.00	-4,354	0,000
Post-Test	7.60			11.50		
Attitude						
Pre-Test	8.00	-1,807	0.071	8.50	-4,032	0,000
Post-Test	8.00			21.83		
Behavior						
Pre-Test	6.50	-1,355	0.175	12.67	-3,046	0.002
Post-Test	8.06			11.31		

*P-value <0.05, MR (Mean Rank), Z (Wicoxon Rank Sign Test).

value of the Hb level post-test was more significant than the mean rank pre-test in the intervention group, so it can be concluded that H_0 was rejected, which means there was an increase significant mean rank in the Hb level value between the pre-test and post-test in the intervention group. In the knowledge variable, the results of the hypothesis test resulted in a change in the mean rank in the control group (Z = -0.431, P-value = 0.666), so it can be concluded that H_0 was accepted, which means there is no difference in the knowledge variable between the pre-test and post-test in the control group. Furthermore, it was discovered that there was an increase in the mean knowledge rank value during the post-test in the intervention group (Z = -4.354, P-value = 0.000), this shows that the mean post-test knowledge rank was more significant than the mean pre-test rank in the intervention group, so it can be concluded that H_0 was rejected which means there was an increase significant mean rank on the knowledge variable between pre-test and post-test in the intervention group. Regarding the attitude variable, the results of the hypothesis test did not change the mean rank in the control group (Z = -1.807, P-value = 0.071), so it can be concluded that H_0 was accepted, which means there is no difference in the attitude variable between the pre-test and post-test in the control group. Furthermore, it was discovered that there was no change in the mean rank value in the intervention group (Z = -4.032, P-value = 0.000); this shows that the mean rank of attitude during the post-test was more significant than the mean rank of the pre-test in the intervention group, so it can be concluded that H_0 was rejected which means there was an increase in the mean significant rank on the attitude variable between pre-test and posttest in the intervention group. In the behavioral variables, the results of the hypothesis test resulted in a change in the mean rank of the control group (Z = -1355, P-value = 0.175), so it can be concluded that H_0 was accepted, which means there is no difference in the behavioral variables between the pre-test and post-test in a behavioral group. Furthermore, it was discovered that there was a change in the mean in the intervention group (Z = -3046, P-value = 0.002), this shows that the mean rank of behavior during the post-test was more significant than the mean rank of the pre-test in the intervention group, so it can be concluded that H_0 was rejected which means there was a significant increase in mean rank on behavioral variables between pre-test and post-test in the intervention group.

The results of data analysis on differences in mean Hb levels, knowledge, attitudes, and behavior regarding the prevention of anemia and stunting in pregnant women between the control group and the

Table 4. Differences in Mean Rank of Hb Levels, Knowledge, Attitudes, and Behavior Regarding Prevention of Anemia and Stunting in Pregnant Women Between the Control Group and the Intervention Group in the PreTest and post-test (n = 80).

Variables and Measurement	Control (n = 39)		Intervention (n = 41)		Mann Whitney U Test	*P-value*
	MR	SR	MR	SR		
Hb level						
Pre Test	32.38	1263.00	48.22	1977.00	483,000	0,000
Post Test	43.36	1691.00	37.78	1549.00	688,000	0.130
Knowledge						
Pre Test	37.60	1466.50	43.26	1773.50	686,500	0.228
Post Test	45.94	1791.50	35.33	1448.50	587,500	0.002
Attitude						
Pre Test	41.01	1599.50	40.01	1640.50	779,500	0.824
Post Test	51.69	2016.00	29.85	1224.00	363,000	0,000
Behavior						
Pre Test	44.54	1737.00	36.66	1503.00	642,000	0.096
Post Test	48.96	19.09.50	32.45	1330.50	469,500	0.001

intervention group in the pre-test and post-test can be seen in the Table 4.

Based on Table 4 shows the test results to prove the variables of Hb levels, knowledge, attitudes, and behavior using the Mann-Whitney U Test. Hypothesis test results show that there is a difference in the mean rank of Hb levels in the pre-test (U = 483,000, P-value = 0.000), and there was no difference in the mean rank of Hb levels at the post-test (U = 688,000, P-value = 0.130) between the control and intervention groups. In the knowledge variable, the results of the hypothesis test show that there is no difference in the mean rank of knowledge of pregnant women in the pre-test (U = 686,000, P-value = 0.228), and there is a significant difference in the mean rank of knowledge in the post-test (U = 587,500, P-value = 0.002). Higher levels were found in the intervention group compared to the control group. Meanwhile, for the attitude variable, the results of the hypothesis test show that there is no difference in the mean rank of attitudes of pregnant women at the pre-test (U = 779,000, P-value = 0.824), and there is a significant difference in the mean rank of attitudes at the posttest (U = 363,000, P-value = 0.000). Higher in the intervention group compared to the control group. In the behavioral variable, the results of the hypothesis test showed that there was no difference in the mean rank of the behavior of pregnant women in the pre-test (U = 642.000, P-value = 0.096), and there was a difference in the mean rank of behavior in the post-test (U = 469.500, P-value = 0.001) which was significantly higher—in the intervention group compared with the control group.

Conclusion

This current study found that Community as a partner intervention can prevent anemia and stunting. In this study, the village cadres were trained before providing health education for pregnant women on preventing anemia in pregnant women, preventing stunting, and the role of families in preventing these two problems. The role of the cadre is a form of primary prevention in the second component of the community model of the community as partner theory (13). Cadre is one of the partners in preventing disease, one of which is behavior to prevent anemia and stunting (14). After the training, the cadre actively performed health education with the researcher's supervision. So pregnant women can easily understand the information about anemia and stunting from cadre. Village cadres are the most basic spearheads in every village. Cadres should be trained continuously to have

knowledge and skills in health promotion, at least at the family and village level. Because cadres are the closest people whom pregnant women can reach, it is hoped that mothers can carry out essential consultations directly with cadres at the village level so that if there are problems, cadres can quickly discuss them with village health workers or community health centers (15). Furthermore, Community as a Partner should ideally be implemented from the start of pregnancy by involving the cadre effectively so that pregnant women receive early information about their health during pregnancy, mainly to prevent anemia and stunting. The better the cadre's knowledge in a village, the better the behavior of the pregnant women in preventing anemia and stunting. Increasing health cadres' knowledge about anemia prevention will create positive rights for pregnant women because their knowledge will be transformed for pregnant women in their area. Apart from being transformed, health cadres will also support and accompany pregnant women in implementing anemia prevention. It is hoped that this will reduce the rate of anemia in pregnant women (16). Then, this study found that community as partners can increase mothers' knowledge of preventing anemia and stunting. In this research, the results were that pregnant women's knowledge in the intervention group before education did not experience anemia by 50%, and after education, they experienced an increase in non-anemia by 63%. This shows that education or health education related to anemia, which researchers carried out in 3 meetings, was very effective in increasing mothers' knowledge. This aligns with a previous study that showed that community as partners is one model that can be applied to reduce stressors, including system balance, a healthy community, community health maintenance, and community health promotion (8). The treatment given by researchers to intervention group respondents, besides providing anemia education, also provides education regarding the prevention and treatment of anemia, including nutrition education during pregnancy, one of which is maintaining a healthy and varied diet rich in substances. Iron includes lean red meat, fish and poultry, nuts, cereals, dark green leafy vegetables, and fruits rich in vitamin C to help absorb iron, and this information is needed to prevent the occurrence of malnutrition and nutritional imbalances during pregnancy (17). Moreover, avoiding and limiting foods that slow down iron absorption is essential, such as bran, drinks, and foods high in caffeine, tea, coffee, and chocolate (18). Moreover, this current study found that community as partners intervention can also increase mothers' attitudes in preventing anemia and stunting. The results of this study also show that there has been a statistically significant increase in attitudes toward the prevention of anemia and stunting in the intervention group at the post-test compared with the control group (P-value = 0.000). From the research results, it can also be seen that there was an increase in the percentage of positive attitudes in the intervention group by 34.2% points (from 51.2% to 85.4%). This shows that the Community as partner based integrated approach improves pregnant women's attitudes toward preventing anemia and stunting. The attitude of pregnant women related to anemia and stunting is significant for preventing the complications of pregnancy. Pregnant women who routinely undergo pregnancy checks at health services have a lower prevalence of anemia (17.4%) than those who come only once (35.3%); this is due to the availability and availability of iron and folic acid supplementation (19). Providing iron and folic acid supplementation is a critical intervention that is very important in reducing anemia rates (14). Apart from the importance of iron and folic acid supplementation, several factors that influence anemia, such as knowledge, greatly influence the incidence of anemia. Factors that increase maternal knowledge include maternal age and experience, parity, experience, employment, income, information provision, education, communication materials, and support from public health workers (14). Other research also explains that one intervention in improving pregnant women's and childbirth health is empowering the mothers through assistance from village health cadres. In this case, the mother becomes more positive and cares about her health during pregnancy, which impacts the child's health, including exclusive breastfeeding in preventing stunting (20). Community-as-partner-based integrated interventions can lead to changes in attitudes among pregnant women in preventing anemia and stunting. This is because intervention can increase the mother's overall knowledge about the dangers of

anemia in pregnancy so that it becomes one of the factors that can cause stunting in the future (8). In addition, this current study found that community as partners intervention can also increase mothers' behavior for preventing anemia and stunting. Based on this research, there was an increase in behavior before and after the intervention in the intervention group with a P-value of 0.002, while in the control group, the P-value was -1.355. Community-based interventions consisting of health promotion and empowerment of pregnant women are the most effective methods in reducing anemia in mothers, and maternal empowerment is the best way to prevent anemia in pregnant women compared to other methods (21). This is supported by research by Abdisa et al. (22), which states that community-based nutrition education can increase mothers' positive attitudes towards consuming iron as an effort to prevent anemia and stunting, namely an increase in positive attitudes 5.6 times higher in the group intervention compared with the control group (22). Other research explains that community-based health education can increase positive attitudes nine times towards iron supplements compared to the control group. There is an overall positive change in mothers' beliefs, opinions, and perceptions towards iron supplements (14). Anemia prevention in pregnant women can be done with appropriate health behavior. Health behaviors preventing anemia and stunting include maintaining a diet high in iron, regularly consuming iron tablets, and routinely carrying out Antenatal Care. This prevention can reduce the prevalence of anemia (23). Behavior to prevent anemia and stunting is strongly influenced by knowledge. The higher the pregnant women's knowledge, the better the behavior of pregnant women in preventing anemia. Behavioral efforts to prevent anemia are carried out by empowering the community (24). The anemia prevention behavior implemented in this research was through counseling about nutrition for pregnant women with anemia, giving iron tablets and counseling on compliance with consuming iron tablets, and health education about antenatal care. This health education was provided for four months, with an approach carried out by cadres to increase their knowledge and skills. This is supported by a previous study that concluded that the behavior of preventing anemia and stunting in pregnant women using the community as a partner approach is very effectively implemented in the community (13). It is hoped that good knowledge, attitudes, and behavior can prevent anemia and stunting from early pregnancy. In this study, the birth weight and length of the respondents showed that all respondents in the intervention group had normal baby weight and baby length (100%). Meanwhile, in the control group, 5.1% of babies had a body weight of < 2500 grams, and 12.8% had a body length of < 48 cm. This shows that pregnant women who receive Community as partner intervention have better birth weights for their babies. However, this study indicated no difference in respondents' Hb levels before and after the intervention. This study showed that of the 80 respondents, there were anemia Hb levels in 17 (21.2%) at the post-test, where there was no difference in Hb levels at the post-test (P-value = 0.130) between the control group and the intervention group. This condition can be caused because the Hb assessment immediately after delivery tends to show a low value due to the effects of massive bleeding during the birthing process. This is in line with research by Yefet et al. (25), the maximum decrease in Hb levels occurs in the first 6-12 hours after normal vaginal delivery and stabilizes after 24-48 hours. At 48 hours postpartum, 95% and 86% of women who experienced a decrease in Hb ≤ 9.5 and < 7 g/dl, respectively, reached this threshold. A decrease in Hb ≥ 2 g/dl is consistent with a diagnosis of post-partum hemorrhage and should be followed for at least 48 hours after delivery. Maternal hemoglobin levels are an indicator of anemia and are one of the causes of stunting in children. The risk of stunting can be prevented by improving nutrition before one thousand days of life (1000 HPK) from pregnancy until the child is two years old. The cause of anemia in pregnant women is malnutrition and lack of iron in the food consumed by pregnant women. Anemia that occurs in pregnant women with insufficient nutrition and iron is vulnerable to the risk of having an obstructed baby (26). A clinical study of more than 10,500 women giving birth in four low- and middle-income countries found that a decrease in hemoglobin, the protein in red blood cells that carries oxygen, by 10 grams per liter of blood alone before birth increased the risk of life-threatening bleeding

after birth by 23% (27). Based on research on 282 women, the majority aged between 25-34 years (62.77%) after giving birth in Northwest Ethiopia, the proportion of post-partum anemia was 47.16% with severe anemia (28). Most anemia experienced (94%) is normocytic anemia of the normochromic type. This occurs in connection with bleeding due to post-partum, Caesarean section, iron deficiency, and folate supplements during pregnancy (28). Anemia is widespread globally and disproportionately affects post-partum women. This is the leading cause of maternal mortality and morbidity globally (29). According to the World Health Organization and the Centers for Disease Control and Prevention, maternal Hb levels are measured on the first day after hospital admission. The results of maternal ferritin levels upon admission to the hospital and on the first day after post-partum are the most common test results for identifying iron deficiency during pregnancy. Cases of mild and severe post-partum anemia occurred, respectively, with Hb <12 g/dl and Hb <8 g/dl (30). Maternal hemoglobin levels are an indicator of anemia and are one of the causes of stunting in children. This study showed that of the 80 respondents, there were anemia Hb levels in 17 (21.2%) at the post-test, where there was no difference in Hb levels at the post-test (P-value = 0.130) between the control group and the intervention group. One of the causes of anemia among respondents during the post-test was the condition of the respondents after giving birth or post-partum. Decreased Hb levels in post-partum mothers can be caused by light or moderate bleeding during delivery; according to research conducted in 2022, there is a significant difference between maternal Hb levels before and after giving birth with the average decrease in post-partum Hb levels being 1.2 gr/dL (31). Abnormal post-partum maternal Hb levels were also discovered in a study, who found that out of 25 post-partum mothers, 20 had decreased Hb levels (32). A history of anemia during pregnancy also influences low Hb levels after delivery. Previous research (33) showed that 84% of mothers with low Hb levels during post-partum had a history of anemia during their pregnancy. Anemia experienced by the mother during the post-partum period can affect the recovery process and increase the risk of infection in the mother, so checking Hb levels in the first 14 days post-partum is very important to do (34). Mothers who experience post-partum bleeding and anemia need to be monitored and treated with iron tablet supplementation 6-12 weeks post-partum (35). The study shows that the Community as a Partner is the proper intervention to prevent anemia and stunting in Aceh Besar. The interventions effectively increase the intervention group's knowledge, attitudes, and behavior. However, the interventions did not increase the Hb level significantly, and it is recommended that the Hb value be measured again at least one week postpartum because, in the early postpartum period, the mother experiences heavy bleeding, so she is susceptible to anemia. Community nurses in community health centers were suggested to provide community-based interventions for preventing anemia and stunting.

Acknowledgments: We thank the pregnant women who participated in this study. We also thank the Aceh Besar District Health Service for granting permission and facilitating this research.

Funding: This research was supported by Universitas Syiah Kuala, Banda Aceh, Aceh, Indonesia.

Ethics Committee: This study was approved by the Ethics Committee of the Nursing Faculty, Universitas Syiah Kuala, Banda Aceh, Aceh Province, with code No. 113001060623, July 23, 2023

Conflict of Interest: The authors declare that he or she has no commercial associations (e.g., consultancies, stock ownership, equity interest, patent/licensing arrangement, etc.) that might pose a conflict of interest in connection with the submitted article.

Authors Contribution: The main author DD (the person who conducted research and wrote the primary draft of the manuscript and developed the Concept, Design, Resources, Materials, Data Collection and Processing, Analysis and Interpretation, Literature Search, Writing Manuscript), HD (Concept, Design, Resources, Materials), S (Concept, Design, Resources, Materials, and Interpretation, Literature Search), MR, AF (Concept, Design, Resources, Materials, Data Collection and Processing, Analysis and Interpretation, Literature Search, Writing Manuscript), MK, EH, F, DA (Data Collection and Processing, Analysis and Interpretation). Furthermore, all authors read and approved the manuscript.

References

1. Darmawati D, Siregar TN, Kamil H, et al. Exploring Indonesian mothers' perspectives on anemia during pregnancy: a qualitative approach. Enferm Clin. 2020;S1130-8621(20):30551-9. doi: 10.1016/j.enfcli.2020.11.002
2. Wirawan S, Abdi LK, Nuriyansari B, et al. The effect of giving iron tablets and iron tablets plus vitamin C on hemoglobin levels in pregnant women [in Indonesian]. Bul Penelit Sist Kesehat. 2015;18(3):285-92.
3. Currie C, Watson L, Rice P. Adolescent health in the 21st century. J R Coll Physicians Edinb. 2015;45(4):258-60. doi: 10.4997/JRCPE.2015.401
4. Traore SS, Bo Y, Kou G, et al. Iron supplementation and deworming during pregnancy reduces the risk of anemia and stunting in infants less than 2 years of age: a study from sub-Saharan Africa. BMC Pregnancy Childbirth. 2023;23(1): 1-8. doi: 10.1186/s12884-023-05399-7
5. Adilah LH, Syafiq A, Sukoso S. Correlation of anemia in pregnant women with stunting incidence: a review. Indones J Multidiscip Sci. 2023;2(9):3155-69. doi: 10.55324/ijoms.v2i9.545
6. Kemenkes RI. Prevention of stunting in children [in Indonesian]. Direktorat Promosi Kesehatan Dan Pemberdayaan Masyarakat Kementerian Kesehatan RI. 2021. p. 1-2. Available from: https://promkes.kemkes.go.id/pencegahan-stunting
7. Duran B, Oetzel J, Magarati M, et al. Toward health equity: a national study of promising practices in community-based participatory research. Prog Community Health Partnersh. 2019;13(4):337-52. doi: 10.1353/cpr.2019.0062
8. Anderson ET, McFarlane J. Community as partner: theory and practice in nursing. 8th ed. Philadelphia: Lippincott Williams & Wilkins; 2014. p. 1-389.
9. Kusumawardani LH, Rasdiyanah R, Rachmawati U, et al. Community-based stunting intervention strategies: literature review. Dunia Keperawatan. 2020;8(2):259. doi: 10.20527/dk.v8i2.8555
10. Oyedele OA, Wright SC, Maja TM. Community participation in teenage pregnancy prevention using the community-as-partner model. Int J Nurs Midwifery. 2014;6(6):80-9. doi: 10.5897/UNM2014.0137
11. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.
12. Polit DF, Beck CT. Resource manual for nursing research: generating and assessing evidence for nursing practice. 9th ed. Philadelphia: Lippincott Williams & Wilkins; 2012.
13. Oyedele O, Wright S, Maja T. Community participation in teenage pregnancy prevention using the community-as-partner model. Int J Nurs Midwifery. 2014;6(6):80-9. doi: 10.5897/UNM2014.0137
14. Kamau MW, Mirie W, Kimani ST. Maternal knowledge on iron and folic acid supplementation and associated factors among pregnant women in a rural county in Kenya. Int J Africa Nurs Sci. 2019;10:74-80. doi: 10.1016/j.ijans.2019.01.005
15. Ramadhan K, Maradindo YE, Nurfatimah N, et al. The cadre lecture is an effort to increase the knowledge of posyandu cadres in preventing stunting [in Indonesian]. JMM. 2021;5(4):1751-9. doi: 10.31764/jmm.v5i4.5091
16. Solehati T, Sari CWM, Lukman M, et al. The influence of health education on knowledge of early detection and prevention of anemia in efforts to reduce maternal mortality rates in posyandu cadres [in Indonesian]. J Keperawatan Komprehensif. 2018;4(1):7-12. doi: 10.33755/jkk.v4i1.75
17. Goletzke J, Buyken AE, Louie JCY, et al. Dietary micronutrient intake during pregnancy is a function of carbohydrate quality. Am J Clin Nutr. 2015;102(3):626-32. doi: 10.3945/ajcn.114.104836
18. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: World Health Organization; 2018. p. 1-10. Available from: https://apps.who.int/iris/handle/10665/259947
19. Stephen G, Mgongo M, Hashim TH, et al. Anaemia in pregnancy: prevalence, risk factors, and adverse perinatal outcomes in northern Tanzania. Anemia. 2018;2018:1-10. doi: 10.1155/2018/1846280
20. Muhamad Z, Mahmudiono T, Abihail CT, et al. Preliminary study: the effectiveness of nutrition education intervention targeting short-statured pregnant women to prevent gestational stunting. Nutrients. 2023;15(19):1-11. doi: 10.3390/nu15194305
21. Das JK, Lassi ZS, Hoodbhoy Z, et al. Nutrition for the next generation: older children and adolescents. Ann Nutr Metab. 2018;72(suppl 3):56-64. doi: 10.1159/000487385
22. Abdisa DK, Jaleta DD, Tsegaye D, et al. Effect of community-based nutritional education on knowledge, attitude and compliance to IFA supplementation among pregnant women in rural areas of southwest Ethiopia: a quasi-experimental study. BMC Public Health. 2023;23(1):1-10. doi: 10.1186/s12889-023-16798-y
23. Rahmawati A. Analysis of behavioral factors to prevent anemia in pregnant women using Lawrence W. Green's theory approach [in Indonesian]. 2019;41-3. Available from: http://repository.unair.ac.id/97117/5/5
24. Aruan LY, Nadeak Y, Sipayung ID, et al. Community empowerment in preventing and treating anemia in pregnant women at Bandar Klippa Tembung sub-health center Percut Sei Tuan district, Deli Serdang. Nusant J Pengabdi Kpd Masy. 2022;2(2). doi: 10.55606/nusantara.v2i2.173425
25. Yefet E, Yossef A, Suleiman A, et al. Hemoglobin drop following post-partum hemorrhage. Sci Rep. 2020;10(1):1-8. doi: 10.1038/s41598-020-77799-0
26. Sullivan L, Brumfield C. The first 1,000 days: nourishing America's future. Washington, DC: 1,000 Days; 2019. p. 1-64.
27. Mansukhani R, Shakur-Still H, Chaudhri R, et al. Maternal anaemia and the risk of post-partum haemorrhage: a cohort analysis of data from the WOMAN-2 trial.

Lancet Glob Health. 2023;11(8):e1249-59. doi: 10.1016/S2214-109X(23)00245-0
28. Bambo GM, Kebede SS, Sitotaw C, et al. Post-partum anemia and its determinant factors among postnatal women in two selected health institutes in Gondar, northwest Ethiopia: a facility-based, cross-sectional study. Front Med. 2023;10:1-12. doi: 10.3389/fmed.2023.1105307
29. Town C, May SA, Horwitz A, et al. Proceedings of the 2023 International Maternal Newborn Health Conference. Reprod Health. 2024;18(suppl 5):1-155. doi: 10.1186/s12919-024-00289-y
30. Jefferds MED, Mei Z, Addo Y, et al. Iron deficiency in the United States: limitations in guidelines, data, and monitoring of disparities. Am J Public Health. 2022;112(Suppl 9):S826-35. doi: 10.2105/AJPH.2022.306998
31. Fasiha, Wabula WM, Nendissa MM. Effect of normal delivery on decreasing HB levels [in Indonesian]. J Bidadari. 2022;2(1):10-15. doi: 10.32695/jbd.v2i1.334
32. Zurimi S. Identification of hemoglobin levels in post-partum mothers [in Indonesian]. Glob Health Sci. 2019;6(1):57-61. doi: 10.33846/ghs6201
33. Yuanti Y, Rusmiati D. Contribution of type of delivery to the incident of anemia in post-partum mothers [in Indonesian]. Pros Semin Nas Has Ris dan Pengabdi. 2021;4:28-35.
34. Næss-Andresen ML, Jenum AK, Berg JP, et al. Prevalence of post-partum anaemia and iron deficiency by serum ferritin, soluble transferrin receptor and total body iron, and associations with ethnicity and clinical factors: a Norwegian population-based cohort study. J Nutr Sci. 2022;11:e45. doi: 10.1017/jns.2022.45
35. Elmore C, Ellis J. Screening, treatment, and monitoring of iron deficiency anemia in pregnancy and post-partum. J Midwifery Womens Health. 2022;67(3):321-31. doi: 10.1111/jmwh.13370

Correspondence:
Received: 22 July 2024
Accepted: 8 October 2024
Darmawati-Darmawati
Maternity of Nursing Department, Faculty of Nursing, Universitas Syiah Kuala, Banda Aceh, Indonesia. Teungku Tanoh Abee Street, Postal code 23111, Banda Aceh, Indonesia.
ORCID ID: 0000-0003-4125-8457
E-mail: darmawati.fkep@usk.ac.id