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Can Weekly Home Visits by The Community Improve Iron Supplementation Intake among Pregnant Women?

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ABSTRACT

***Background**: Anemia is one of the significant health problems among pregnant women; one of the interventions by the government is through iron supplementation. The adherence rate among pregnant women to consume iron supplementation is still low. **Objective**: This study aims to determine the effectiveness of community empowerment on adherence to iron supplementation among pregnant women. **Methods**: This research was a mixed method with a quantitative and qualitative approach and used a quasi-experimental study. The pre- and post-tests of adherence rates were conducted using the Morisky Medication Adherence Scale (MMAS-8) questionnaire. The research sample was 261 pregnant women in eight villages in the Tongas Public Health Center (PHC) working area. A total of 50 Community Health Workers (CHWs) visited pregnant women's homes weekly to give health education and monitoring activities from October 2022 to April 2023. The statistical test used Wilcoxon and Chi-square. **Results**: There is a significant difference in adherence between before and after the weekly home visit with a p-value < 0.001 and there is no correlation between adherence rate in the post-test and the level of education of mothers with a p-value > 0.05. The mothers know the benefit of supplementation and families support it. **Conclusion**: the CHW's weekly home visit can effectively improve the iron supplementation intake among pregnant women regardless of the level of education, and improve the knowledge of supplementation benefits and family support. It is recommended to continue the activity and the budget, and include iron adherence materials in all health activities for pregnant women.*

***Keywords**: Community, Home Visit, Iron Supplementation, Pregnant Women.*

INTRODUCTION

Indonesia has a high maternal mortality rate (MMR) with 189 per 100.000 live births based on the long-form result of the Indonesian population census in 2020 while the target of Sustainable Development Goals (SDGs) in 2030 is 70 per 100.000 live births (Central Bureau of Statistic of Indonesia., 2023). The World Health Organization (WHO) in 2023 stated that the determinants of MMR include the health problems of pregnant women that are mostly preventable and anemia is one of the causes that could higher the risk of maternal and neonatal mortality. It is estimated up to 37% of pregnant women all over the world are suffering from anemia (WHO, 2023). However, in Indonesia, it is even higher than worldwide prevalence. There were 48.9% of pregnant women with anemia (Ministry of Health of Indonesia, 2018).

In Indonesia, iron supplementation among pregnant women is one of the government policies that is used to overcome the high prevalence of anemia. Unfortunately, basic health research showed low adherence in pregnant women as only 37.7% consume iron supplementation (Ministry of Health of Indonesia, 2018). Moreover, research in other countries also finds a low prevalence of adherence to consuming iron folic acid among pregnant women in Ethiopia, which is lower than WHO recommendations (Sendeku, Azeze and Fenta, 2020). Adherence to iron supplementation is significantly related to anemia among pregnant women (Bangun *et al.*, 2021). Additionally, iron supplementation for pregnant women as per regulation is given during the pregnancy with a minimum of 90 days and continues until the post-partum period is finished (Direktorat Jenderal Peraturan Perundang-undangan, 2021). Consequently, anemia and adherence to iron supplementation among pregnant women are still problems in Indonesia.

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Previous research showed the positive result of direct observation from community health volunteers of pregnant women consuming to improve their adherence to iron supplementation (Bairwa *et al.*, 2017). It can enhance awareness as well as the mother's adherence (Wiradnyani *et al.*, 2016).

As a form of social support from CHW, the neighbors of pregnant women, it is aligned with the theory of social networks and social support which theory states that social support influences health behavior including medication adherence. At the individual level, it can improve problem-solving, information, and control capacity. At community level, it can improve community empowerment and competency (Glanz & Rimer, 2008).

Other research showed significant effectiveness in lowering anemia by monthly home visits by community health workers by control and intervention groups (Ilboudo *et al.*, 2021). Meanwhile, direct observation through four visits during 100 days of intervention showed effectiveness (Bilimale, 2010). The research used a sample with inclusion criteria including those who attend health facilities and are absent from chronic disease while using the same approach of weekly home visits by the community to measure the knowledge and attitude of mothers (Kamau *et al.*, 2019). The advantage was the effectivity can be assessed by comparing two groups, intervention and control. However, the inclusion criteria will limit some pregnant women from obtaining social support from the community because they did not participate in the program. The total population will allow for assessing all pregnant women's participation. In addition, a qualitative approach is also needed to explore the impact.

The Puskesmas (PHC) of Tongas has a different program of weekly home visits to all pregnant women by Community Health Workers (CHW). Firstly, they give CHWs training so they can give education through including the capacity to monitor, educate, and motivate the adherence to iron supplementation consumption among pregnant women. In conclusion, it is important to evaluate the program and social support through community empowerment by CHW for improving adherence to iron supplementation among pregnant women.

This study aims to analyze pregnant women's adherence to iron supplementation before and after health education and monitoring through weekly home visits by CHW in Tongas, Indonesia. The difference will indicate the effectiveness of the program in adherence to iron supplementation.

METHODS

This research was a sequential mixed method, quantitative and qualitative research. The quantitative research used a quasi-experimental study design. This research aimed to analyze the effect of health education and monitoring through weekly home visits by CHW on pregnant women's adherence to iron supplementation in Tongas, Kabupaten Probolinggo, Indonesia. The highest maternal mortality in 2021 was in the working area of Tongas PHC.

The study phases are shown in Figure 1. The first phase was identifying the total population of pregnant women in eight villages in Tongas PHC's working area then those who gave consent became the sample. The second phase was giving the training CHWs so they were skilled in giving health education and monitoring to pregnant women and their families toward iron supplementation and nutritious food. They were able to use monitoring forms and educate with posters. Meanwhile, the village midwives collected data for pre-tests of pregnant women in their village. The third phase was the implementation of the intervention. The CHWs visited the pregnant women weekly for seven months (total 28 times of home visits) and collected post-tests at the last home visit. The last phase was a discussion among representatives of 10 participants and 10 family members from one representative village (Sumberkramat).

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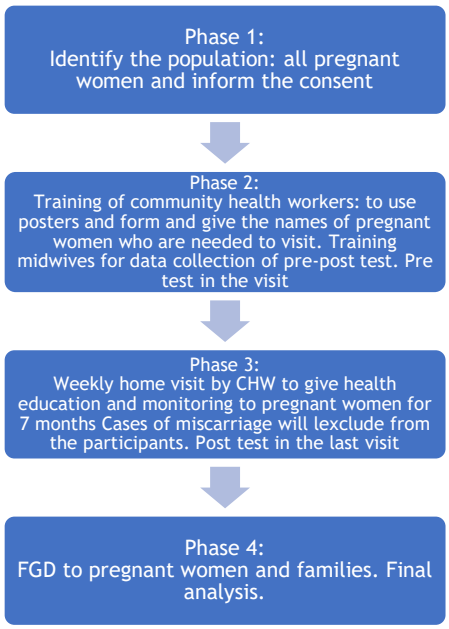

Fig.1 Study Phases

This research used a total population of 261 pregnant women from eight villages in the working area of Tongas PHC and data were collected from village midwives. All pregnant women were involved and research showed many contributing factors to adherence levels and indicated the importance of participating in all pregnant women.

A total of 50 CHWs trained and had several pregnant women to be assisted near their homes. The number of 50 CHWs was because there were 37 sub-villages in total and there was more than one CHW for sub-village with density of population and number of pregnant women. CHW gave health education and monitoring through weekly home visits for seven months from October 2022 to April 2023. The CHW brought forms and posters to educate pregnant women and their families. Along with CHW training, there was training for midwives for data collection for pre and post-test.

The variable to be tested was adherence rate which implies the level of adherence in consuming iron folic acid among pregnant women and is determined by the answers to eight questions in the MMAS-8 questionnaire. Meanwhile, in qualitative analysis, the explanation of the perceived benefit from the mother and family to the program was explored.

The questionnaire for the pre and post-test used the Morisky Medication Adherence Scale (MMAS-8) which consisted of eight questions. The questionnaire was tested for validity and reliability using a sample of pregnant women from another area. The eight questions of MMAS-8 consist of:

1. Do you sometimes forget to take your vitamins?
2. During the past two weeks, was there a day when you did not take your vitamins?
3. Have you ever reduced or stopped taking vitamins without informing your doctor/midwife because you felt worse/uncomfortable while taking the medication?
4. When traveling or leaving home, do you sometimes forget to take your medication with you?
5. Did you take all your vitamins yesterday?
6. When feeling better, do you sometimes choose to stop taking your vitamins?
7. Some people feel uncomfortable if they have to take vitamins every day, do you ever feel that way?
8. How often do you forget to take your vitamins?

All of those questions if answered “yes” were then marked 1 point or it was unfavorable to adherence. The total points will determine the adherence rate and be categorized as high adherence if 0 questions with a “yes” answer; moderate adherence if one or two questions with a “yes” answer; and high adherence if more than two questions with a “yes” answer. This research uses categories from MMAS-8 that were collected by midwives.

Data analysis used an inferential test and tested for normality before choosing the test. The data were not normally distributed so the Wilcoxon was used to determine differences in adherence rate before and after the intervention. Data analysis used three categories and codes:

1. High adherence
2. Moderate adherence
3. Low adherence

After quantitative data were measured, the qualitative method was provided to assess the importance of the weekly home visit by CHW. This approach used focus group discussion with guidelines. There were 10 mothers and their families, so the total number of participants was 20 persons The FGD was conducted in May 2023 and data were analyzed starting from May 2023.

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This research was approved for ethical clearance by the Public Health Faculty of Universitas Airlangga.

RESULTS AND DISCUSSION

After training by PHC, the phase of intervention was by giving health education and monitoring through weekly home visits by CHW. From the pre-test that was collected by midwives, the characteristics of participants were analyzed. Figure 2 shows the process of weekly home visits by CHWs for pregnant women and their families.

Fig 2. Weekly Home Visits by Community Health Workers to Pregnant Women

Quantitative Analysis

The total number of participants in this research was 261 pregnant women aged 20 to 35 years old. According to Table 1, there are about 81.61% in this category. However, there are still pregnant women with younger ages and at risk who are less than 20 years old. It is about 9.96% in this category. Meanwhile, other high-risk pregnancies are also for pregnant women in the age category above 35 (36-44 years old) which is 8.43%. The ideal pregnancy age is between 20 and 35 years old.

Research showed that pregnant women aged more than 35 had a significantly higher risk of maternal mortality (Karlsen *et al.*, 2011). Moreover, very young pregnant women under 20 years and above 35 years old women were also at risk of having low birth weight children. Maternal age at delivery is significantly related to low birth weight in Indonesia. Thus, it is important to come up with strategies to prevent early marriage or delivering the baby at very old age (Tarigan, Simanjuntak and Nainggolan, 2023). Additionally, the prevalence of anemia among young people aged 15-24 years old is as high as 32% in Indonesia (Ministry of Health of Indonesia, 2018).

Table 1 Characteristics of participants

Characteristics	Participants	
	n	%
Mother's Age		
14-19	26	9.96
20-35	213	81.61
36-44	22	8.43
Mother's Education		
Elementary Graduate	156	59.77
Middle School Graduate	39	14.94
High School Graduate	53	20.31
University Graduate	13	4.98

Note: n = number of respondents
Source: Primary data, 2023

Table 1 shows the majority of respondents in the majority are graduates from primary school. There are about 59, 77%%, in this category. However, the other 40, 22%, were middle school, high school, and university graduates while only 4.98% had university degrees.

The education status is important for pregnant women in processing health information and regarding their health conditions. Moreover, pregnant women with low levels of education were associated with higher maternal mortality so there is a need to pay attention to wider social determinants in strategies to reduce mortality (Karlsen *et al.*, 2011). Maternal mortality in Iran is distributed unequally which suggests the urgency of promoting health literacy for women with lower

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education (Amini-Rarani, Mansouri and Nosratabadi, 2021). Thus, it is important to do health promotion in areas with low levels of education community.

Table 2. Pre-test and Post-test of adherence level among pregnant women

Participants	Pre-test Adherence		Post-test Adherence	
	n	%	n	%
Adherence level: Low	143	54.79	13	4.98
Moderate	114	43.68	87	33.33
High	4	1.53	161	61.69

Note: n = number of respondents
Source: Primary data, 2023

The graph shows significant differences in number of pregnant women before and after intervention. Before the intervention, there were more likely pregnant women with low and moderate levels of adherence towards iron supplementation. However, it changes after the intervention with the majority in the high and moderate category of adherence

Table 3. Correlation test for adherence on pre-test and level of education of participants

level of education * Adherence Pretest Crosstabulation

			Adherence Pretest			
			low	moderate	high	Total
level of education	Primary School	Count	108	46	2	156
		Expected Count	85.5	68.1	2.4	156.0
	Middle School	Count	16	23	0	39
		Expected Count	21.4	17.0	.6	39.0
	High School	Count	18	34	1	53
		Expected Count	29.0	23.1	.8	53.0
	University	Count	1	11	1	13
		Expected Count	7.1	5.7	.2	13.0
Total		Count	143	114	4	261
		Expected Count	143.0	114.0	4.0	261.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	40.025[a]	6	<.001
Likelihood Ratio	41.413	6	<.001
Linear-by-Linear Association	34.440	1	<.001
N of Valid Cases	261		

a. 4 cells (33.3%) have expected count less than 5. The minimum expected count is .20.

Source: Primary data, 2023

According to the crosstab test result as shown in Table 3,there is a significant correlation between the level of education and adherence rate on the pre-test. It also shows the number of mothers with low adherence are those who graduate from primary school, 108 persons. This result supports previous studies' findings that the level of education of mothers played important role in medication adherence among pregnant women. Research in Ethiopia showed that the educational status of pregnant women, knowledge about iron supplementation, and receiving health education about the benefits of iron folic acid were associated with adherence to iron supplementation among pregnant women (Sendeku, Azeze and Fenta, 2020). Moreover, women's education was one of the determinants that contributed to the improvement of iron folic acid consumption (Singh *et al.*, 2020).

Research in Indonesia showed a significant interaction between family support for iron supplementation and women's educational level to predict adherence. Improving pregnant women's knowledge and involving the family, especially the husband, was essential for less educated women to improve their adherence to iron-folic acid (Wiradnyani *et al.*, 2016). Meanwhile, the data ARE different on the post-test as shown in Table 4.

Table 4. Correlation test for adherence on post-test and level of education of participants

level of education * Adherence Posttest Crosstabulation

			Adherence Posttest			
			low	moderate	high	Total
level of education	Primary School	Count	10	61	85	156
		Expected Count	7.8	52.0	96.2	156.0
	Middle School	Count	2	12	25	39
		Expected Count	1.9	13.0	24.1	39.0
	High School	Count	1	12	40	53
		Expected Count	2.6	17.7	32.7	53.0
	University	Count	0	2	11	13
		Expected Count	.6	4.3	8.0	13.0
Total		Count	13	87	161	261
		Expected Count	13.0	87.0	161.0	261.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.105[a]	6	.085
Likelihood Ratio	12.316	6	.055
Linear-by-Linear Association	10.658	1	.001
N of Valid Cases	261		

a. 4 cells (33.3%) have expected count less than 5. The minimum expected count is .65.

According to Table 4, the statistical test shows no correlation between adherence rate in post-test and level of education among pregnant women. It showed that after the intervention the improvement in adherence rate could be at any level of education. Thus, the intervention has the potential to be implemented even in communities with low levels of education.

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Table 5. Statistical test for adherence difference before and after CHW's weekly home visit

Ranks

		N	Mean Rank	Sum of Ranks
Adherence Posttest - Adherence Pretest	Negative Ranks	4[a]	80.00	320.00
	Positive Ranks	223[b]	114.61	25558.00
	Ties	34[c]		
	Total	261		

a. Adherence Posttest < Adherence Pretest
b. Adherence Posttest > Adherence Pretest
c. Adherence Posttest = Adherence Pretest

Test Statistics[a]

	Adherence Posttest - Adherence Pretest
Z	-13.369[b]
Asymp. Sig. (2-tailed)	<.001

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Source: Primary data, 2023

Table 5 is based on the results of the Wilcoxon test that compares the difference between before and after the CHW's health education and monitoring through weekly home visits as the intervention. It is significantly different with p-value < 0.001.

The difference between before and after the weekly home visit by CHW implies the effectivity of CHW's role in improving iron supplementation intake among pregnant women. This finding is also in line with previous research about community-based health education.

The community-based health education in Kenya can improve the knowledge and attitude of pregnant women and underlines the need for integration between community-based action with antenatal iron distribution (Kamau *et al.*, 2019).

Many types of research show the improvement of pregnant women's adherence to iron supplementation by direct observation and the anemia prevalence was decreased after the intervention (Bairwa *et al.*, 2017). Moreover, in rural areas in India, the direct observer who monitors the iron supplementation among pregnant women is effective in improving adherence by counting adherence rate from the difference in the number of pills given and the number of remaining pills (Bilimale, 2010).

These research findings support the previous studies of involving community volunteers in the weekly monitoring and distribution of IFA using intervention and control groups (Kamau *et al.*, 2019). However, this research also shows effectiveness using the total population or only the intervention group. This study design without a control group has the limitation mentioned in the book section which states that, through a control group, the researcher can observe and make conclusions that changes that happened in the intervention group are because of the treatment, not other factors(Joy et al., 2005). This study finds that home visits by CHWs to form health behavior or medication adherence is one form of social support theory implementation (Glanz & Rimer, 2008).

Daily iron supplementation can reduce the incidence of anemia among them as well as reduce the risk of low birth weight among babies (Imdad et al, 2012). Thus, it is important to prevent anemia through iron supplementation and monitor adherence (Bangun *et al.*, 2021). The adherence score toward iron supplementation can increase the hemoglobin by 18.4% or every adherence score improvement will increase the hemoglobin of 0.02 (Krismawati, Widjanarko and Rahfiludin, 2022). Additionally, taking iron pills is essential for increasing the level of hemoglobin in pregnant women with anemia and the closest people have an important role in improving adherence towards iron supplementation (Cahya Skania, Dasuki and Utami, 2020). Thus, the family is also crucial to be involved in home visit activities as in this research, and the closest people also include CHW as the nearest neighbor with health concerns.

The printed media used in this research was as successful as other research for influencing adherence to iron supplementation among pregnant women. In Tempuran, research in Indonesia showed that leaflets and WhatsApp were effective health promotion media to improve adherence and it was also measured by MMAS-8 (Aliva, Rahayu and Margowati, 2021). Moreover, counseling with brochures also improved the adherence to iron supplementation among pregnant women in Lumajang regency, which was also measured with MMAS-8 (Pratama, Puspasari and Christianty, 2019).

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In addition, the lack of reminder mechanisms was the major reason for low adherence, and raising community awareness could be the solution (Lyoba *et al.*, 2020). Regular health education and monitoring through weekly home visits by the CHW or cadre could be one of the reminder mechanisms to deliver health education about the benefits of iron supplementation. Research findings in Uganda showed pregnant women who received health education about the goals of iron folic acid and the danger of in-adherence toward it, obtained sufficient counseling and explanation about side effects were significantly related to adherence to taking iron folic acid (Nimwesiga, Murezi and Taremwa, 2021). Counseling in this research is done privately through weekly home visits. However, other research suggested counseling with interactive methods in small groups of pregnant women every two weeks for three months was effective in improving the knowledge, attitude, and practices among pregnant women (Permatasari *et al.*, 2021).

Qualitative Analysis

Based on quantitative analysis results from MMAS-8 questions about daily IFA intake to seek the adherence rate, it showed a significant difference before and after the intervention. This finding also showed the effectiveness of intervention in improving adherence among pregnant women. Better adherence was also analyzed using qualitative methods to explore whether the knowledge or perceived benefit among pregnant women played an important role. According to the FGD, as shown in Figure 3, there were several main findings from meetings among mothers and families. They can explain the importance of consuming IFA. This finding underlines the other research result that stated that knowledge about IFA benefits was the reason for IFA adherence among pregnant women (Ministry of Health of Indonesia, 2018; Nimwesiga, Murezi and Taremwa, 2021).

> *"…It is important so that mother can be saved, our midwife told so. I also feel comfortable with my body, if it is not then I will return the vitamin to the midwife"*
> *(R, Pregnant Woman, 10th May 2023)*

> *"…Home visits by cadre help us to know what the function of consuming medicine, then the baby also be healthy" (Y, Husband, 10th May 2023*)

Social support can improve the knowledge or awareness that influences health behavior including medication adherence (Glanz & Rimer, 2008). Meanwhile, regarding the family, as they gained more knowledge about the vitamin, they played an important role in supporting the pregnant women in improving their adherence. Other studies found family support and close persons can increase medication adherence and the important role of involving family members in improving IFA adherence (Wiradnyani *et al.*, 2016; Cahya Skania, Dasuki and Utami, 2020).

> *"…My husband always waiting for me to drink the vitamin at night"*
> (A, Pregnant Woman, 10th May 2023)
> *"…I will be waiting for her to drink the vitamin. Sometimes we argue…"*
> (S, Husband, 10th May 2023)

The satisfaction is also stated by mothers and families, they are also hopeful for the continuity or sustainability of the program. A study found the importance of scaling up activity for direct observation through community volunteers when handling anemia among vulnerable groups.

> *"…Please continue this activity, once a week is good…"*
> (S, Pregnant Woman, 10th May 2023)
> *"…Yes, let's continue weekly home visits by cadre Mam. I feel pity for the next pregnant woman if it is stopped"*
> (Y, Husband, 10th May 2023)

The process of FGD is shown in Figure 3:

Fig 3. FGD after the intervention phase

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The quantitative stated difference in adherence rate before and after the intervention. The study also found no correlation between the level of education and adherence rate in the post-test, which means even pregnant women with low education levels can also improve the adherence rate through this intervention. It is argued by Wiradnyani and Singh's studies that the level of education determines adherence, but supports Wiradnyani's other finding that family support is an important determinant among less educated pregnant women (Wiradnyani *et al.*, 2016; Singh *et al.*, 2020).

Meanwhile, in the qualitative study results as triangulation for quantitative study findings, qualitative analysis showed the mother took the IFA after the intervention or the visit from CHW. This study also found that the knowledge of IFA benefits and family support is crucial to improve adherence. Thus, community empowerment not only can improve the mother's adherence but also knowledge of IFA's benefits and family support among mothers. These findings support the previous study that found the perceived benefit of IFA and family support is determined by adherence to IFA (Triharini *et al.*, 2018).

Moreover, the mothers and families were satisfied and hoped for continuity which implies to support community involvement in improving IFA intake among pregnant women. It also proves the consistent finding between data from the survey and from the FGD.

CONCLUSIONS

This research is limited to the intervention group only or without the control group but takes the sample as the total population. Its result supported previous researchers that indicated the importance of health education and monitoring through weekly home visits for pregnant women by CHW as a form of social support that can influence knowledge, family support, and health behavior of adherence. The effectiveness of the intervention is regardless of the level of education of pregnant women. Community Health Workers (CHW) health education and monitoring through weekly home visits, and motivating pregnant women and their families effectively improve the adherence to take iron supplementation among pregnant women. It is suggested to maintain the continuity of both activity and budget, to scale up, to use a control group, and to include iron supplementation monitoring in all kinds of pregnant women's health programs, health education media, and CHW training materials. According to the positive impacts, community empowerment is a strength for maternal health improvement.

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