Journal of Obstetrics, Gynecology and Cancer Research | ISSN: 2476-5848

The Effect of Iron-Folic Acid (IFA) on the Size of the Mid-Upper Arm Circumference of Pregnant Women During Pregnancy

Najmiatul Fitria[1*], Nauratul Ikramah[2], Ade Sukma[3], Hansen Nasif[1]

1. *Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, Andalas University, Padang, Indonesia*
2. *Bachelor Program, School of Pharmacy, Andalas University, Padang, Indonesia*
3. *Department of Livestock and Product Technology, School of Animal Sciences, Universitas Andalas, Padang, Indonesia*

Article Info

10.30699/jogcr.9.3.276

Received: 2023/10/22;
Accepted: 2024/02/05;
Published Online: 15 May 2024;

Use your device to scan and read the article online

Corresponding Information:
Najmiatul Fitria,
Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, Andalas University, Padang, Indonesia

Email: najmiatulfitria@phar.unand.ac.id

ABSTRACT

Background & Objective: Pregnant women need more nutritional intake than before pregnancy. If this nutritional intake is insufficient for the mother, it will result in Chronic Energy Deficiency (CED). To determine if pregnant women are experiencing malnutrition or cannot be known by measuring the Mid-Upper Arm Circumference (MUAC). Based on service regulations for pregnant women in Indonesia, the minimum number of Iron-Folic Acid (IFA) tablets pregnant women get is 120. Regarding this condition, a study was conducted to analyze the relationship between the amount of IFA consumption on MUAC and several other therapeutic outcomes.

Materials & Methods: This study used a cross-sectional method by examining the patient's medical records. Patients who received IFA as many as 120 tablets or more will become the exposure group. Data will be analyzed descriptively using chi-square.

Results: The MUAC size significantly differed at the end of pregnancy (P=0.01). However, overall, there was no significant difference between the two groups.

Conclusion: The IFA administration generally gives good results, but the optimal number of IFA doses still needs further study.

Keywords: Iron, Folic Acid, Circumference Pregnancy, Dietary Supplement

Copyright © 2024, This is an original open-access article distributed under the terms of the Creative Commons Attribution-noncommercial 4.0 International License which permits copy and redistribution of the material just in noncommercial usages with proper citation.

Introduction

The Mid-Upper Arm Circumference (MUAC) is a simple way to determine the nutritional status of pregnant women. Lila measurements are carried out in women of childbearing age and pregnant women to predict the presence of energy and protein deficiencies that are chronic or that have occurred for a long time **(1)** According to the 2012 Indonesian demographic survey, the mortality rate in pregnant women is 359 per 100,000 live births, and the main cause of anemia is iron deficiency needed by the body **(2)** This anemia deficiency is also a sign of chronic energy deficiency (CED), which can be identified by measuring the MUAC.

In previous research, measurements of Mid-upper arm circumference (MUAC) showed effectiveness against iron folic acid because pregnant women who consume IFA can increase the size of the upper arm circumference, increase birth rates, and reduce infant mortality. At the same time, the effect of IFA on the blood pressure of pregnant women has also been proven to reduce the risk of preeclampsia. It has been explained that one of the ways folic acid reduces the risk of preeclampsia is by increasing the function of endothelial cells, which are preeclampsia pathogenic agents. In addition, pregnancy is also a condition that requires more nutrition than women who are not pregnant. Suppose the energy and protein intake is insufficient for the mother. In that case, it will result in Chronic Energy Deficiency (CED) to find out that pregnant women have malnutrition or cannot be known from measuring Mid-Upper Arm Circumference (MUAC). As a result of CED, pregnant women are at risk of giving birth to Low-Birth-Weight Babies (LBW) **(3-6)**.

To reduce unwanted events such as CED, according to the Minister of Health regulation, PMK No. 97 of 2014 concerning Health services for Pregnant Women, pregnancy services consist of the first visit, second visit, third visit, and fourth visit. The first visit is the first interaction of pregnant women with health workers who are responsible and have the competence to get integrated and comprehensive services according to the standard first visit once during the 1st trimester (0-12 weeks). The 2nd visit is a follow-up visit after the first visit, usually this visit in the 2nd trimester (> 12 – 24 weeks), and the 3rd and 4th visits during the 3rd trimester (> 24 weeks until birth) **(7)**.

In previous research, IFA supplements can reduce anemia **(8)** during childbirth by 70%. The data was taken by extrapolating the results from 61 studies with a risk ratio (RR) of 0.30 and 95%CI of 0.19 – 0.49 **(9, 10)**. Furthermore, the MUAC values of 23.0 cm in men and 22.0 cm in women are useful cut-off points for simple nutritional status screening. This value can provide a more refined classification of CED. Furthermore, by calculating the number of visits based on the number of days, the minimum number of tablets obtained by pregnant women is 120 tablets. One of the government's efforts to overcome the case of CED is to give IFA tablets during pregnancy. Based on this background, a study was conducted to analyze the relationship between the amount of IFA consumption on MUAC to overcome the CED **(11)**.

Methods

Setting and Location

This research was carried out in the Work Area of the Syamtalira Bayu Health Center, Aceh, which was conducted from March to May 2022. The data sources used were medical records and visit books at the KIA Polyclinic at the Syamtalira Bayu Health Center.

Research design

The design of this study was cross-sectional in the span of gestation. The process and reporting of the results of this study refer to The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) **(12-14)**. Data analysis was carried out descriptively using compare means to see the mean difference between the two observation groups.

Population and Sampling

The sampling process uses purposive and non-random sampling methods. Patient data that met the inclusion criteria in this study were pregnant women who carried out routine controls at the Syamtalira Health Center, had an MCH book **(7)** and received IFA supplements. Meanwhile, pregnant women in the first trimester with MUAC ≥25 cm and not referred back patients with chronic disease complications were the exclusion criteria in this study. There is data on 170 patients carrying out pregnancy control at the Syamtalira Bayu Health Center. A total of 108 patients met all inclusion criteria, with details of 100 patients who made their first visit to the third visit and received less than 120 IFA tablets. In comparison, patients who made the first visit to the fourth visit were eight (who received more than 120 IFA tablets), according to PMK No 97 of 2014 **(7)**.

Variables and data measurement

All dependent variables were used as predictors, including sociodemographic data such as age (age) and parity (nulliparity or multiparity). Patients who received IFA of 120 tablets or more would become the exposure group, while patients who received less than 120 tablets of IFA during their pregnancy were the non-exposure group. The IFA composition consists of 30 mg of iron (ferrous fumarate) and 400 mcg of folic acid **(1)**. The outcome variable is in the form of numeric data, namely the MUAC value. In this study, blood pressure values were used as additional results.

Registration and Ethical approval

A research permit application letter was obtained from the Faculty of Pharmacy, Universitas Andalas. In addition, this research has passed an ethical review from the Research Ethics Commission of the Faculty of Medicine, Andalas University, with number 691/UN.16.2/KEP-FK/2022. In this study, all participants were determined based on existing data in the administration section of the Syamtalirabayu Health Center to avoid selection bias **(14, 15)**.

Data Analisis

The data obtained will be analyzed descriptively. First, variables related to outcome exposure will be statistically analyzed using Chi-square. Meanwhile, compare means were used in one-way ANOVA to see the mean difference between groups. Finally, a binary logistic regression analysis was performed to determine the magnitude of the Odd Ratio (OR).

Results

Based on the data obtained, patients were grouped based on the number of visits and sociodemographic characteristics, which were the productive age of women (fertile age). According to the 2014 Ministry of Health, the productive period of women ranges from 20 years to 49 years, which is divided into three phases, namely < 20 years, 20 years - 35 years, and >35 years and parity status **(1)**. The sociodemographic description can be seen in Table 1.

Table 1. Overview of Sociodemographic Characteristics of Pregnancy Control Patient Data at the Syamtalira Bayu Health Center in 2021

Characteristic	Group A (≥ 120 tablets)		Group B (<120 tablets)	
	N (8)	%	N (00)	%
Women's childbearing age (year)				
< 20	1	12,5	8	8
20-35	5	62,5	59	59
> 35	2	25	33	33
Parity				
Nuliparity	4	50	43	43
Multiparity	4	50	57	57
Total	8	100	100	100

The table above is a table that describes the sociodemographic characteristics of this study. The characteristics are women of childbearing age and parity status.

Table 2. Comparison of mean clinical parameter values in the two study groups

Parameter	Group A (≥ 120 tablets) (mean±SD)		Group B (<120 tablets) (mean±SD)		*p-value*
	Mean±SD	95% CI	Mean±SD	95% CI	
MUAC					
Beginning	23,67±0.83	23.03-24.30	24.42±1.07	24.21-24.63	0,43
End	23.67±0.83	23.03-24.30	24.60±1.06	24.39-24.81	0,01*
Systolic Blood Pressure					
Beginning	105.00±5.00	101.16-108.84	105.57±9.02	103.77-107.37	0,85
End	105.00±5.00	101.16-108.84	105,93±8.39	104.26-107.60	0,75
Diastolic Blood Pressure					
Beginning	67,22±4.41	63.83-70.61	69,72±4,14	68.80-70.54	0,08
End	67.22±4.41	63.83-70.61	71.25 ± 6.01	70.16-72.55	0,05*

MUAC Mid-Upper Arm Circumference, *p<0.05

Table 2 shows that the IFA award is on the borderline of the significance limit, where the p-value = 0.05. This number means it still does not reflect the difference between the two groups. The relationship between IFA between grouse can be found in Table 3.

Table 3. The relationship between IFA administration and therapeutic outcomes

	Group A (≥ 120 tablets)	Group B (<120 tablets)	OR	*p*-value
MUAC				
Improvement	0	16	0.00	0.35
No Improvement	9	82		
Systolic blood pressure				
Improvement	0	10	0.00	1.00
No Improvement	9	89		

	Group A (≥ 120 tablets)	Group B (<120 tablets)	OR	*p*-value
Diastolic blood pressure				
Improvement	0	10	0.00	0.30
No Improvement	9	88		

MUAC Mid-Upper Arm Circumference

The data above shows no significant relationship exists between the number of IFA tablets administered to MUAC or blood pressure, whether by administering 120 tablets or more.

Discussion

Age is an important factor in determining the clinical conditions of pregnant women, such as MUAC and their blood pressure, because age can also affect the mother's pregnancy and childbirth. According to the Ministry of Health, the productive or ideal age is 20-35. Previous research explained that pregnant women aged less than 20 years have not optimal development of their reproductive organs and physiological functions so that they can give birth to babies with LBW because they suffer from CED and CED caused by MUAC, which is > 23.5 cm, while women who are pregnant over 35 years of age is also not recommended because in this age range various diseases often appear, one of which is hypertension. So the best age to get pregnant is 20–35 years **(16)**. In comparison, parity is a history of the number born and has a close relationship during pregnancy. In the same study, it was explained that the higher the parity status, the lower the ability of the uterus to provide nutrition for the fetus so that the distribution of nutrients to the mother and fetus is hampered so that the mother's MUAC is small. Good parity, which is two times, means that the mother who has given birth more than once has a higher health risk than the mother who has just given birth **(17)**.

As for blood pressure, in previous studies, the initial reproductive age was <20 years, and the late reproductive age was > 35 years; more often experienced preeclampsia because those aged <20 years easily experienced an increase in blood pressure and aged > 35 years were often affected by several diseases such as hypertension and diabetes Mellitus **(18-20)**. This result is different from research by Zhao, Xu **(21)** which stated that IFA affected pregnant women's blood pressure **(21)**. Meanwhile, parity status also explains that pregnant women who are pregnant for the first time or who have just given birth once have a higher risk than pregnant women who have given birth more than once.

Pregnancy is a condition that requires additional iron to increase the number of red blood cells and forms red blood cells in the fetus as well as the placenta. So that the deficiency of iron and folic acid, which are important supplements for pregnancy science, needs to be addressed as best as possible. Giving iron can help build iron stores, producing hemoglobin (Hb) **(22)**.

Iron preparations are generally given in tablet form and can prevent anemia due to the physiological process of hemodilutionthat occurs during pregnancy. The recommended dose of iron is 30-60 mg/day from early pregnancy to the end of pregnancy to avoid deficiency during pregnancy **(23)**. The provision of iron tablets is not arbitrary but must be in accordance with the personal needs of each pregnant woman who consumes them because more or less iron will have side effects for the pregnant woman. For example, suppose the excess or deficiency of iron can contribute to producing reactive oxygen. In that case, blood pressure and oxidative stress also increase, adversely affecting endothelial function **(19, 24, 25)**. So, giving iron tablets to pregnant women has a target, which is to prevent anemia in pregnant women **(5, 26)**.

Previous studies also stated that other micronutrients could affect the increase in MUAC and improve blood pressure in pregnant women besides IFA **(3, 27)**. Among the micronutrients that can be added to supplements for pregnant women include cyanocobalamin (vitamin B12), omega-3, and omega-6 **(27, 28)**.

Meanwhile, the therapeutic target of the use and administration of folic acid is that hyperhomocysteinemia can be reduced by folic acid supplementation **(29)**, and concerns have been raised about how folic acid supplementation can prevent gestational hypertension or preeclampsia. However, the results of previous studies show that multivitamins containing folic acid are known to reduce hypertension or preeclampsia **(30)**.

This research has the strength that it was carried out directly at the first-level health facility (*puskesmas),* where the *puskesmas* is the place for the first pregnancy check-up in a sub-district. In addition, the government's policy that requires all pregnant women who are about to give birth to take a COVID-19 antigen test means that data on pregnant women can be obtained in as much detail as possible. But unfortunately, getting data on hemoglobin levels for pregnant women in this retrospective study is difficult because the Hb examination was only carried out once during the first pregnancy visit.

Conclusion

Iron and folic acid consumption are necessary during pregnancy, starting from the early stages until after delivery. Therefore, many factors must be considered in determining the exact value of the supplementation dose during pregnancy. However, even though the administration of IFA gives good results in general, the optimal number of IFA doses at this time has not yielded satisfactory results.

Acknowledgments

The author(s) are very grateful to the Faculty of Pharmacy, Andalas University, for the research permission that has been granted. Besides that, the author(s) are also thankful for the cooperation in the data collection process that the Syamtalira Bayu Health Center has provided.

Authors' Contribution

The NF provided the overall idea of the study, the NI collected and analyzed the data, and the AS and HN provided input on nutrition and therapy. NF also wrote the entire manuscript.

Ethical Approval

Ethical approval was obtained from the Research Ethics Commission of the Faculty of Medicine, Andalas University, with number 691/UN.16.2/KEP-FK/2022.

Conflict of Interest

Authors declare no conflicting interest in this manuscript.

Funding

No funding or grant for this study.

References

1. Fitria N. Pregnancy complications. Health Economics of Screening and Prevention. ridderprint. [Thesis fully internal (DIV), University of Groningen]. University of Groningen. 2021. [DOI:10.33612/diss.167808473]
2. Pentieva K, Selhub J, Paul L, Molloy AM, McNulty B, Ward M, et al. Evidence from a Randomized Trial That Exposure to Supplemental Folic Acid at Recommended Levels during Pregnancy Does Not Lead to Increased Unmetabolized Folic Acid Concentrations in Maternal or Cord Blood12. J Nutr. 2016;146(3):494-500. [DOI:10.3945/jn.115.223644] [PMID]
3. Keats EC, Haider BA, Tam E, Bhutta ZA. Multiple-micronutrient supplementation for women during pregnancy. Cochrane Database Syst Rev. 2019;2019(3):CD004905. [DOI:10.1002/14651858.CD004905.pub6] [PMID] [PMCID]
4. Haider BA, Bhutta ZA. Multiple-micronutrient supplementation for women during pregnancy. Cochrane Database Syst Rev. 2017;4(4): Cd004905. [DOI:10.1002/14651858.CD004905.pub5]
5. Pena-Rosas JP, Viteri FE. Effects of routine oral iron supplementation with or without folic acid for women during pregnancy. Cochrane Database Syst Rev. 2006(3):Cd004736. [PMID] [DOI:10.1002/14651858.CD004736.pub2]
6. Fitria N, Sari YO, Putry AR, Putrizeti F, Sukma A, editors. Future challenge on probiotics uses from fermented milk on the endocrine disorder in human2021: IOP Publishing. [DOI:10.1088/1755-1315/888/1/012047]
7. Ministry of Health RoI. PMK No 97/2014. Pelayanan Kesehatan Masa Sebelum Hamil, Masa Hamil, Persalinan, dan Masa Sesudah Melahirkan, Penyelenggaraan Pelayanan Kontrasepsi, Serta Pelayanan Kesehatan Seksual. 2014.
8. Manickavasagam M. Haemoglobin Level of Pregnant Women on First Appointment to Antenatal Care Clinic and Their Awareness on Anemia During Pregnancy. J Obstet Gynecol Cancer Res. 2021;6(2):57-64. [DOI:10.30699/jogcr.5.2.57]
9. Peña-Rosas JP, De-Regil LM, Garcia-Casal MN, Dowswell T. Daily oral iron supplementation during pregnancy. Cochrane Database Syst Rev. 2015;2015(7):Cd004736. [DOI:10.1002/14651858.CD004736.pub5]
10. Roozbeh N, Hajian S, Darvish S, Kiani Z. The Risk Factors Affecting Low Birth Weight in Iran: An Update Systematic Review. J Obstet Gynecol Cancer Res. 2022;7(3):131-43. [DOI:10.30699/jogcr.7.3.131]
11. Musa IR, Omar SM, Adam I. Mid-upper arm circumference as a substitute for body mass index in the assessment of nutritional status among

adults in eastern Sudan. BMC Public Health. 2022;22(1):2056. [PMID] [PMCID] [DOI:10.1186/s12889-022-14536-4]

12. Vandenbroucke JP, von Elm E, Altman DG, Gøtzsche PC, Mulrow CD, Pocock SJ, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. Int J Surg. 2014;12(12):1500-24. [DOI:10.1016/j.ijsu.2014.07.014] [PMID]
13. Cuschieri S. The STROBE guidelines. Saudi J Anaesth. 2019;13(Suppl 1):S31-s4. [PMCID] [DOI:10.4103/sja.SJA_543_18] [PMID]
14. Fitria N, Idrus L, Putri AR, Sari YO. The usability testing of the integrated electronic healthcare services for diabetes mellitus patients during the pandemic in Indonesia. Digit Health. 2023;9: 20552076231173227. [PMID] [PMCID] [DOI:10.1177/20552076231173227]
15. Baldwin JR, Pingault JB, Schoeler T, Sallis HM, Munafò MR. Protecting against researcher bias in secondary data analysis: challenges and potential solutions. Eur J Epidemiol. 2022;37(1):1-10. [DOI:10.1007/s10654-021-00839-0] [PMID] [PMCID]
16. Reski RN, Hadju V, Indriasari R, Muis M. Anemia, chronic energy deficiency and their relationship in preconception women. Enfermería Clín. 2020;30:76-80. [DOI:10.1016/j.enfcli.2020.06.018]
17. Ekowati D, Ani LS, Windiani IGAT. High parity and chronic energy deficiency increase risk for low birth weight in Situbondo District. Public Health Prev Medi Arch. 2017;5(1):28-32. https://doi.org/10.15562/phpma.v5i1.38 [DOI:10.53638/phpma.2017.v5.i1.p07]
18. Wenger Nanette K, Arnold A, Bairey Merz CN, Cooper-DeHoff Rhonda M, Ferdinand Keith C, Fleg Jerome L, et al. Hypertension Across a Woman's Life Cycle. J Am Coll Cardiol. 2018; 71(16):1797-813. [PMID] [PMCID] [DOI:10.1016/j.jacc.2018.02.033]
19. Sanghvi TG, Harvey PWJ, Wainwright E. Maternal iron-folic acid supplementation programs: evidence of impact and implementation. Food Nutr Bull. 2010; 31(2_suppl2):S100-S7. [DOI:10.1177/15648265100312S202] [PMID]
20. Fitria N, Wulansari S, Sari YO. Potential Interactions Analysis of Antihypertensive Drugs Used in Geriatric. Int J Appl Pharm. 2023;15(1): 29-33. [DOI:10.22159/ijap.2023.v15s1.47503]
21. Zhao G, Xu G, Zhou M, Jiang Y, Richards B, Clark KM, et al. Prenatal Iron Supplementation Reduces Maternal Anemia, Iron Deficiency, and Iron Deficiency Anemia in a Randomized Clinical Trial in Rural China, but Iron Deficiency Remains Widespread in Mothers and Neonates. J Nutr. 2015;145(8):1916-23. [DOI:10.3945/jn.114.208678] [PMID] [PMCID]
22. Geze Tenaw S, Girma Fage S, Assefa N, Kenay Tura A. Determinants of maternal near-miss in private hospitals in eastern Ethiopia: A nested case-control study. Womens Health (Lond). 2021;17:17455065211061949. [PMCID] [DOI:10.1177/17455065211061949] [PMID]
23. da Silva Lopes K, Yamaji N, Rahman MO, Suto M, Takemoto Y, Garcia-Casal MN, Ota E. Nutrition-specific interventions for preventing and controlling anaemia throughout the life cycle: an overview of systematic reviews. Cochrane Database Syst Rev. 2021;9(9):Cd013092. [DOI:10.1002/14651858.CD013092.pub2] [PMID] [PMCID]
24. Ascić-Buturović B, Heljić B. Effects of hyperglycemia and iron deficiency on kidney and heart function in type 2 diabetes disease. Bosn J Basic Med Sci. 2006;6(1):78-81. [PMCID] [DOI:10.17305/bjbms.2006.3217] [PMID]
25. Desriani, Azamris, Ghaissani SS, Kinanti SR, Warisman MA, Fitria N. Design and characterization of a SYBR Green I-based melting curve method for investigation of HER2I655V polymorphism in breast cancer. J Genet Eng Biotechnol. 2021;19(1):6.[PMCID] [DOI:10.1186/s43141-020-00108-9] [PMID]
26. Roche ML, Samson KLI, Green TJ, Karakochuk CD, Martinez H. Perspective: Weekly Iron and Folic Acid Supplementation (WIFAS): A Critical Review and Rationale for Inclusion in the Essential Medicines List to Accelerate Anemia and Neural Tube Defects Reduction. Adv Nutr. 2021;12(2):334-42. [PMID] [PMCID] [DOI:10.1093/advances/nmaa169]
27. Zec M, Roje D, Matovinović M, Antičević V, Librenjak Škare L, Jerončić A, et al. Vitamin B12 Supplementation in Addition to Folic Acid and Iron Improves Hematological and Biochemical Markers in Pregnancy: A Randomized Controlled Trial. J Med Food. 2020;23(10):1054-9. [DOI:10.1089/jmf.2019.0233] [PMID]
28. Diana FM, Fitria N. Association of Omega 3 and Omega 6 and Child Development: A Systematic Review. Nutrición Clínica y Dietética Hospitalaria. 2022;42(2).
29. Juwita DA, Qalbi YA, Fitria N. The Relationship Between The Time of Use of Antiretroviral Therapy (ART) and the Amount of Viral Load in Acquired Immunodeficiency Syndrome. Int J Appl Pharm. 2023;15(1):24-8. [DOI:10.22159/ijap.2023.v15s1.47502]
30. Salenius M, Pyykkö J, Ashorn U, Dewey KG, Gondwe A, Harjunmaa U, et al. Association

between prenatal provision of lipid-based nutrient supplements and caesarean delivery: Findings from a randomised controlled trial in Malawi. Matern Child Nutr. 2022;18(4):e13414. [DOI:10.1111/mcn.13414] [PMID] [PMCID]

How to Cite This Article:

Fitria, N., Ikramah, N., Sukma, A., Nasif, H. The Effect of Iron-Folic Acid (IFA) on the Size of the Mid-Upper Arm Circumference of Pregnant Women During Pregnancy. J Obstet Gynecol Cancer Res. 2024;9(3):276-82.

Download citation: RIS | EndNote | Mendeley | BibTeX |