# The Effectiveness of Administration of Multiple Micronutrient Supplement (MMS) Tablets on Hemoglobin Levels of Pregnant Women in Pare-Pare City, Indonesia

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# The Effectiveness of Administration of Multiple Micronutrient Supplement (MMS) Tablets on Hemoglobin Levels of Pregnant Women in Pare-Pare City, Indonesia

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**ABSTRACT**

The World Health Organization (WHO) states that anemia is the 10 biggest health problem in this modern century, where groups at high risk of anemia are women of childbearing age, pregnant women, school-age children, and adolescents. This study aims to analyze the effectiveness of Multiple Micronutrient supplements (MMS) tablet administration on hemoglobin levels of pregnant women. This study used a quantitative research type with a quasi-experimental approach using a group pre-post test study design, mean/median analysis, and paired sample t-test analysis. The research was conducted for three months at the Lapadde Health Center and Lumpue Health Center in Pare-Pare City with a sample of 310 respondents. The inclusion criteria in this study were third-trimester pregnant women consuming MMS from the beginning of pregnancy, having initial Hb data, and having consumed MMS for at least 1 month. Check Hb using the Easy Touch tool. The incidence of anemia was measured based on hemoglobin levels using the Easy Touch tool, and data on characteristics and MMS supplementation were collected through a questionnaire that was filled in directly by the respondent and through the interview method. The results of the Chi-Square test showed that the consumption of MMS tablets was significantly associated with the incidence of anemia in pregnant women. ($p<0.05$) Pregnant women who experienced anemia did not regularly consume MMS every day as much as 26% and 79.6% liked to consume MMS tablets. There was a change in hemoglobin levels of pregnant women before consuming MMS and after consuming MMS, where The hemoglobin of pregnant women before consuming MMS was

12 g/dL ± 1.583 SD and after consuming MMS was 13.64 g/dL ± 2.047 SD with P ≤ 0.05. Further research is needed by adding other variables, in this case looking at consumption patterns of pregnant women and other factors related to hemoglobin levels of pregnant women and can be considered for conducting pure experiments.



## 1. Introduction

Nutritional problems are a reflection of many interrelated factors, either directly or indirectly. Several studies explain that nutritional problems are a reflection of parenting, eating patterns, and nutrient intake that is not correct due to various factors in society [1]. Pregnant women generally have less hemoglobin (Hb) levels caused by iron deficiency. Iron deficiency can cause interference or obstacles to the growth of the fetus, both body cells and brain cells. Abnormal Hb levels can result in fetal death in the womb, abortion, birth defects, and low birth weight, this causes higher maternal morbidity and mortality and perinatal death. Pregnant women whose hemoglobin levels are not normal can increase the risk of morbidity and mortality for mothers and babies born with low birth weight and premature birth [2].

WHO reports that the prevalence of anemia in pregnant women worldwide is 41.8% [3]. In Asia, the prevalence of anemia at the age of 15-45 years has reached 191 million people and Indonesia ranks 8th out of 11 countries in Asia after Sri Lanka with an anemia prevalence of 7.5 million people at the age of 10-19 years [3]. So far iron tablets have been given to pregnant women to prevent anemia, iron deficiency, low body weight, and premature birth, but until now the prevalence of anemia, stunted children and low birth weight is still high. Even the WHO target to reduce anemia, stunted children, and low body weight by 50%, 40%, and 30% by 2025 cannot be achieved. Based on the results of Health Research in 2018 the prevalence of anemia in pregnant women increased in 2013, namely 37.1% to 48.9% in 2018 [4]. Based on the 2019 Health Profile of South Sulawesi, 28.1% of pregnant women experienced anemia. Based on data from the Pare-Pare City Health Office, the incidence of anemia in pregnant women in 2020 is 7% of the total number of pregnant women examined. 2% of them are from the Lapadde health center and the other 3% are from the Lumpue health center. Lapadde health center and Lumpue health center are the 2 health centers with the highest number of anemic pregnant women in Pare-Pare City [5].

As part of a global strategy to prevent micronutrient deficiencies in pregnant women, UNICEF recommends that MMS be used for prenatal supplementation as an initial program in developing countries. Based on this recommendation, several developing countries conducted research on the possibility of replacing iron tablets with micronutrients, including Indonesia. The government's efforts to tackle low Hb levels in pregnant women are by giving 120 tablets of Multiple Micronutrient Supplement (MMS) or 90 tablets of iron to pregnant women during pregnancy, which is enough to drink 1 tablet every day. In addition to overcoming low Hb levels, MMS is also useful for supporting the health of pregnant women during their pregnancy, while the benefits of MMS for babies are to support and optimize fetal growth and development [6].

As a form of collaboration between UNHAS and the City Government of Pare-Pare, MMS administration in Pare-Pare Municipality has been distributed to all Community Health Centers in Pare-Pare Municipality so that as a whole the Blood Supplement Tablets (TTD) in Pare-Pare Municipality have been replaced by

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the administration of tablets. MMS which started in July 2020. Pregnant women can get MMS tablets when pregnant women check their pregnancies at the Puskesmas.

This study is a longitudinal study to evaluate the effect of multimicronutrient administration on pregnant women in Pare-Pare on maternal anemia and infant growth. This is an opportunity for more effect on the health of mothers and babies. Based on the background description, the researchers were interested in knowing the effectiveness of giving MMS tablets on hemoglobin levels of pregnant women at the Lumpue Health Center and Lapadde Health Center, Pare-Pare City.

## 2. RESEARCH METHODS

This study uses a type of research used is quantitative research with a quasi-experimental approach or quasi-experimental with one group pre-post-test design with the intervention group, namely the administration of MMS supplementation to pregnant women without using a control group. The number of samples in this study was 310 respondents who were in the Lumpue Health Center and Lapadde Health Center in Pare-Pare City. Data collection was carried out on third-trimester pregnant women.

In this study, measurements of Hb levels of pregnant women before treatment (pre-test) were carried out at the Puskesmas when pregnant women visited which was carried out by Puskesmas, then intervened by giving MMS tablets to be consumed every day. After that, the researchers again measured Hb levels (post-test) after pregnant women consumed MMS for 1 month.

This research has received approval from the health research ethics commission (KEPK) Faculty of Public Health, Hasanuddin University with number 4508/UN4.14.1/TP.01.02/2022.

## 3. RESULTS

### *3.1 Characteristics of Respondents*

In table 1, based on the age group of the respondents after consuming MMS tablets for age characteristics, the respondents who experienced anemia had at most <20 years of age with a Bachelor/Masters/Doctor education level, for job characteristics most respondents who experienced anemia had jobs as private employees with primapara category parity

**Table 1.** Distribution of Characteristics Based on Hemoglobin Status of Pregnant Women

| Characteristic | Hb Trimester III | | | | Sum | |
|---|---|---|---|---|---|---|
| | Anemia (g/dL) | | Usual (g/dL) | | | |
| | n | % | n | % | n (310) | % |
| **Age (Years)** | | | | | | |
| <20 | 4 | 13.3 | 26 | 86.7 | 30 | 100 |
| 20-35 | 29 | 11.7 | 218 | 88.3 | 247 | 100 |
| >35 | 2 | 6.1 | 31 | 93.3 | 33 | 100 |
| **Education** | | | | | | |
| Elementary | 0 | 0 | 3 | 100 | 3 | 100 |
| Junior School | 3 | 11.1 | 24 | 88.9 | 27 | 100 |
| High School | 6 | 9.7 | 56 | 90.3 | 62 | 100 |
| Diploma (D1,D2,D3) | 12 | 9.6 | 113 | 90.4 | 125 | 100 |
| Bachelor / Master / Doctor | 14 | 15.1 | 79 | 84.9 | 93 | 100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Work** | | | | | | |
| Housewives | 26 | 10.9 | 212 | 89.1 | 238 | 100 |
| Day Laborer | | | | | | |
| Civil servants | 0 | 0 | 7 | 100 | 7 | 100 |
| Private Employees | 1 | 8.3 | 11 | 91.7 | 12 | 100 |
| Honorary Employees | 6 | 22.2 | 21 | 77.8 | 27 | 100 |
| Merchant | 1 | 7.7 | 12 | 92.3 | 13 | 100 |
| | 1 | 7.7 | 12 | 92.3 | 13 | 100 |
| **Parity** | | | | | | |
| primapara | 23 | 12.5 | 161 | 87.5 | 184 | 100 |
| multipara | 12 | 9.5 | 114 | 90.5 | 126 | 100 |
| **Interval** | | | | | | |
| <2 years | 17 | 11.3 | 133 | 88.7 | 150 | 100 |
| ≥2 years | 18 | 11.3 | 142 | 88.8 | 160 | 100 |

Source: Primary Data, 2022.

### *3.2 Consumption of MMS Tablets*

In table 2, the results of the analysis showed that in the first trimester 147 pregnant women were anemic and after taking MMS the Hb levels of pregnant women in the III trimester were anemia only 54 people and from the analysis of the Wilcoxon Signed Ranks Test obtained a value of Z = -12724 and a p-value = 0.000 < 0.05, then Ho was rejected. There are differences in changes in hemoglobin levels in pregnant women who receive MMS.

**Table 2.** Distribution of Changes in Hb Levels of Pregnant Women Before and After MMS Consumption

| MMS consumption | Hb criteria | | | | P Value |
|---|---|---|---|---|---|
| | Anemia (g/dL) | | Normal (g/dL) | | |
| | n | % | n | % | |
| Before Consuming | 147 | 47.4 | 163 | 52.6 | ***0.064** |
| After consuming | 54 | 17.4 | 256 | 82.6 | |

Source: Primary Data, 2022.

* Significant at p<0.05 using chi-square test

In table 3, the results of the analysis show that the average Hb and Lila levels of pregnant women before consuming and after consuming MMS show the average Hb level before consuming MMS and after consuming MMS has increased with a delta of 1.64.

**Table 3.** Average Hb Levels of Pregnant Women Before and After MMS Consumption

| Category | Average Before Taking MMS | Average After taking MMS | Delta | P Value |
|---|---|---|---|---|
| Hb | 12 g/dL ± 1,583 | 13.64 g/dL ± 2,047 | 1.64 | ***0.000** |

Source: Primary Data, 2022.

* Significant at p<0.05 using paired sample t-test

In table 4, the results of the analysis show that the distribution of consumption of MMS tablets based on the hemoglobin status of pregnant women shows that pregnant women who are anemic at most do not regularly consume MMS every day as much as 26%, while the distribution of pregnant women who like MMS tablets based on anemia shows that mothers pregnant women who experienced anemia most liked taking MMS tablets as much as 79.6% and only 20.4% of anemic pregnant women who did not like MMS tablets.

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**Table 4.** Distribution of MMS Tablet Consumption Based on Hemoglobin Status of Pregnant Women

| Category | Hb criteria | | | | Sum | | P Value |
|---|---|---|---|---|---|---|---|
| | Anemia | | Usual | | | | |
| | n | % | n | % | n | % | |
| **Daily Consumption of MMS** | | | | | | | |
| Not Routine | 45 | 26 | 128 | 74 | 173 | 100 | |
| Routine | 9 | 6.6 | 128 | 93.4 | 137 | 100 | |
| Total | 54 | | 256 | | 310 | | |
| **Like/Not Taking MMS Tablets** | | | | | | | **0.000*** |
| Not | 11 | 20.4 | 32 | 12.5 | 43 | 13.9 | |
| Yes | 43 | 79.6 | 224 | 87.5 | 267 | 86.1 | |
| **Total** | **54** | | **256** | | **310** | **100** | |

Source: Primary Data, 2022.
* Significant at p<0.05 using chi-square test

In table 5, the results of the analysis show that the distribution of duration of consumption of MMS tablets based on the hemoglobin status of pregnant women shows that pregnant women who are anemic consume the most MMS tablets only for 5-10 weeks, and for pregnant women who like MMS tablets based on anemia states that the mother Pregnant women with anemia most like to take MMS tablets.

**Table 5.** Distribution of Duration of MMS Tablet Consumption Based on Hemoglobin Status of Pregnant Women

| Duration of Consumption | Hb Before taking MMS | | | | Hb After Taking MMS | | | | Sum | | P Value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Anemia | | Usual | | Anemia | | Usual | | | | |
| | n | % | n | % | n | % | n | % | n | % | |
| 4 Weeks | 8 | 2.6 | 0 | 0 | 5 | 62.5 | 3 | 37.5 | 8 | 100 | |
| 5-10 Weeks | 15 | 4.8 | 0 | 0 | 10 | 66.7 | 5 | 33.3 | 15 | 100 | |
| 11-20 Weeks | 39 | 12.6 | 18 | 5.8 | 7 | 12.3 | 50 | 87.7 | 57 | 100 | ***0.000** |
| 21-30 Weeks | 75 | 24.2 | 135 | 43.5 | 29 | 13.8 | 181 | 86.2 | 210 | 100 | |
| >30 Weeks | 10 | 3.2 | 10 | 3.2 | 3 | 15 | 17 | 85 | 20 | 100 | |
| **Total** | **147** | **47.2** | **163** | **52.6** | **54** | **17.4** | **256** | **82.6** | **310** | **100** | |

Source: Primary Data, 2022.
* Significant at p<0.05 using chi-square test

## 4. DISCUSSION

### *4.1 Characteristics of Respondents*

The results showed that the majority of respondents were anemic with age <20 years as much as 13.3% with a Bachelor's/Masters/Doctor education level of 15.1%. Women aged between 15 to 19 years have a higher risk of experiencing anemia or Hb levels <11gr/dl, [7], [8]. According to WHO, 16 billion teenage girls give birth each year, about 11% of all worldwide. If the mother's age at the time of pregnancy is too young (<20 years) there will be a risk of anemia because, at that age, there is still growth that requires more nutrition than the above age. If the required nutrients are not met, there will be nutritional competition between the

mother and baby [9]. According to the Ministry of Health of the Republic of Indonesia (2001), Hb levels of 7.0 – 10.0 g/dl are mostly found in the age group <20 years (46%) and the age group 35 years or more (48%).

Age over 35 years is not recommended to get pregnant because at that age the mother's health condition decreases, uterine function decreases, egg cell quality decreases, and medical complications of pregnancy and childbirth increase. With risks that may occur, namely miscarriage, preeclampsia, eclampsia, bleeding, LBW, and the emergence of difficulties in childbirth [10].

Based on the research that has been done, it can also be seen that the majority of respondents who have anemia have taken higher education, namely Bachelor/Masters/Doctor as much as 15.1%. In its 2012 report, UNICEF argues that one of the obstacles in dealing with nutritional problems in mothers and children is knowledge and inappropriate practices. In general, people are not aware of the importance of nutrition during pregnancy and the first two years of life. More specifically, women are not aware of the importance of nutrition for themselves, for example, 81% of pregnant women received or purchased iron-folate tablets in 2010, but only 18% consumed the tablets as recommended for at least 90 days during pregnancy [11].

From the number of respondents, it is known that as many as 22.2% of pregnant women who are anemic have jobs as private employees with a primapara category parity of 12.5%. Spacing that is too close to <2 years will cause the low quality of the fetus or child and will also be detrimental to the health of the mother. Spacing that is too close will cause the mother not to get the opportunity to repair her own body where the mother needs enough energy to recover after giving birth to her child. The mother is also still breastfeeding and must meet nutritional needs during breastfeeding, where while breastfeeding the mother needs additional calories every day to fulfill her nutrition and milk production, getting pregnant again will cause nutritional problems for the mother and the fetus or the following baby [12].

***4.2 Effectiveness of the MMS Delivery Program***

All respondents were pregnant women with gestational age entering the third trimester who had consumed MMS tablets. Based on the research that has been done, it can be seen that as many as 16.8% of pregnant women who are anemic experience CED. The nutritional, health, and emotional state of pregnant women as well as the experience of the mother during pregnancy will determine the quality of the baby born and its further development. If the mother's health status before and during pregnancy is in good condition, there is a great chance that the fetus she contains will grow well and the safety of the mother during the birth process is also guaranteed. One of the problems in pregnancy related to nutrition is chronic energy deficiency (KEK).

Based on the results of the analysis, there was a change in the hemoglobin level of pregnant women before and after an intervention. Examination of hemoglobin levels in early pregnancy is needed to determine anemia in pregnant women and examination of hemoglobin levels in late pregnancy is needed to determine the success of increasing hemoglobin levels after consuming MMN in pregnant women. So it is known that in the first trimester 147 pregnant women experienced anemia and after consuming MMS and being checked again found an increase in Hb levels of pregnant women in the third trimester, the number of pregnant women who were anemic was only 54 people, so it was known that there were differences in changes in hemoglobin levels in pregnant women who receive MMS. This is in line with research conducted by Novianto which showed that there was a change in hemoglobin levels after the administration of the MMS tablet intervention with an increasing difference of 0.38 gr/dL so that the administration of MMS supplements could increase hemoglobin levels [13].

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Micronutrient supplementation such as multivitamins (MVM) and multi-micronutrients (MMN) can provide better results on pregnancy outcomes compared to single supplementation, for example only Fe, or a combination of 2-3 nutrients, for example, a combination of Fe with Folic Acid or vitamin C. The need for pregnant women for Fe increases, especially during the second and third trimesters due to an increase in blood volume and plasma volume during pregnancy. This will cause hemodilution or dilution of blood cells and decreased hemoglobin levels. The amount of iron absorbed from food and reserves in the body is usually insufficient for the mother during pregnancy, so it is necessary to increase iron intake through Fe tablet supplementation to help restore hemoglobin levels in pregnant women [14].

A pregnant woman who consumes MMN will avoid the problem of anemia because MMN functions to increase hemoglobin levels in pregnant women. This will harm pregnant women and the fetus they contain, such as bleeding, low birth weight babies, prolonged labor, and increased risk of defects in the baby. Hemoglobin is a large molecule and also determines the weight of blood. The hemoglobin level can be estimated by determining the specific gravity of the blood. Hemoglobin levels can be determined by measuring the absorption of a colored hemoglobin solution at a wavelength of 546 mm. Hemoglobin level is one indicator in pregnant women suffer from anemia or not [12].

The results of research that has been carried out on the distribution of consumption of MMMS tablets based on the state of anemia of pregnant women show that pregnant women who experience anemia mostly because they do not regularly consume MMS every day are 26%. A mother's compliance in consuming tablets received during pregnancy is an important factor in improving the quality of her pregnancy. The results of the study are in line with Zagre et al. (2007) regarding the level of adherence of pregnant women in the multi-micronutrient group as much as 44.4% while the Fe-Folic Acid group was 43.8%. The mean increase in hemoglobin levels after the intervention was higher in obedient subjects, namely 0.68 g/dL, whereas in non-adherent subjects, the average increase was 0.38 g/dL [1].

Seeing the distribution of duration of consumption of MMS tablets based on the state of anemia of pregnant women shows that pregnant women who experience anemia consume the most MMS tablets only for 5-10 weeks as much as 66.7% and with several <30 tablets as much as 88.9%. The variable number of tablets consumed affects levels of Hb concerning the intake of nutrients, especially vitamin C. The results of Nurlaili's 2014 study with 30 hemoglobin respondents for pregnant women who consumed multiple micro-nutrient tablets mostly had normal hemoglobin status of 67% [15].

## 5. CONCLUSIONS AND SUGGESTIONS

Based on the results of the analysis of the data obtained from this study, it was found that the average hemoglobin level of pregnant women before consuming MMS was 8.75 g/dL and the average hemoglobin level of pregnant women after consuming MMS was 13.64 g/dL so there was a change in the hemoglobin level of pregnant women. in the Lumpue Health Center and Lapadde Health Center in Pare-Pare Municipality, it was indicated by the delta of changes, there were differences in changes in hemoglobin levels in pregnant women who received MMS. Based on the results of the research that has been done and the conclusions that have been obtained, several suggestions can be given, namely a sweeping of the health center for all pregnant women regarding the MMS tablet administration program to help reduce the increasing incidence of anemia in pregnant women in the city of Pare-Pare.

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