Preconception Studies in Indonesia

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Outline

01 Preconception Period

02 Preparation Since Preconception

03 Longitudinal Study: From Preparation to Molecular

04 Conclusion and Recommendation
Preconception Period: anytime before pregnancy, up until the time of interview or recruitment

Periconception Period: 1 month (4 weeks) before conception up until 2-3 months of gestation or the period before conception, including: the period of conception, implantation, placentation and the stage of embryogenesis or organogenesis or called the early stages of pregnancy (early pregnancy).


Developmental Origins Of Health and Disease (DOHaD) Barker Hypothesis, 1990
Developmental Origins Of Behaviour, Health and Disease (DOBHaD), Van Den Bergh, 2011

The Brain is extremely vulnerable to a suboptimal environment in the womb.
Nutritional Problems in Indonesia

A cross-sectional study: 300 preconception women in Takalar District, South Sulawesi, Indonesia.

Conclusion: The prevalence of anemia and chronic energy deficiency (CED) is still high in preconception women and there is a significant borderline between anemia and CED.

Indonesian adolescent diet increases the risk of anemia

Source: Basic Health Research, 2018
Comparison of the Effects of Pre-Pregnant Iron Supplements During Pregnancy in an Effort to Reduce Iron Deficiency Anemia in Pregnant Women with Mild Anemia in Bali

Luh Seri Ani, I Made Bakta, INT Suryadhi, N Agus Bagiada, Universitas Udayana 2007

Provision of iron tablets from the pre-pregnancy period (treatment group) can prevent more IDA than giving iron tablets started in early pregnancy (control group) = 38.46%, the difference is statistically significant $p < 0.05$.
Micronutrient supply in pregnancy: Is diet enough?

Nutritional requirements increase markedly during pregnancy, while some micronutrient requirements increase more than the energy.

The intake of micronutrients was still lacking, vitamin B2 (72.9%), zinc (68.6%), iron (92.9%), and folic acid (90%).
The International Federation Of Gynecology and Obstetrics (FIGO) Recommendations on Preconception and Maternal Nutrition “Think Nutrition First”

Ideally, optimal nutrition will come from food source, but food fortification and or supplementation is advisable in some cases, particularly in low resource settings where women are undernourished.

Food taboos influence the amount, frequency and quality of nutrients as contributing factor against hemoglobin level and nutritional status of women before pregnancy.

Conclusion: the less protein and iron intake and lower upper arm circumference associated with a decrease in the bride's hemoglobin level.

The conclusion is Hb level in preconception women was affected by energy, protein, iron intake and nutritional status. However, the most significant factors with Hb level were energy intake and nutritional status.
Acceptance of and Compliance with Multi-micronutrient and Iron-Folic Acid Capsules in Banggai District, Indonesia

Yustiyanty Monoarfa, Anang Otoluwa, Lucy Widasari, Rahayu Yekti, Halimah Habib, Retno Handajani, Kuntoro Kuntoro, Erry Gumilar, Bambang Wirjatmadi, Abdul Razak Thaha

Background: One obstacle to increasing compliance with multi-micronutrient (MMN) or iron-folic acid (IFA) supplementation in pregnant women is the side effects, such as a bad smell, nausea, vomiting, stomachache, or headache. To address this problem, in this study, IFA and MMN were each encapsulated in soft capsules, and we evaluated the compliance and acceptance reported by respondents.

Methods: This study was conducted in three sub-districts of Banggai district from October 2016 to February 2017. The subjects were preconception women who were newlywed and 18-35 years of age and who did not have serious diseases, such as tuberculosis, heart disease, or kidney failure. Both IFA and MMN tablets were crushed and then placed in capsule shells with the same color and size. The capsules were randomly delivered to the respondents, who consumed a capsule once per week unless they were menstruating, at which time consumption was daily. Of the 102 preconception women who were recruited, 40 were interviewed about consumption and any side effects that they felt. The level of pleasure was scored on a 3-point hedonic scale, and the response for each sensory quality, namely, color, odor, taste and size, was rated 2 or 3 (likable or very likable). The data were analyzed based on distribution and frequency.

Results: showed that 36 respondents (90%) consumed the capsules consistently, as recommended. As many as 38 respondents (95%) liked the color, 37(92.5%) described no odor, 37(92.5%) liked the flavor, and 37 (92.5%) liked the size. Ten respondents (25%) reported an increase in appetite, and 5 respondents (12.5%) reported deeper sleep. Approximately 4 respondents (10%) reported headache, and 2 (5%) complained of constipation.

Conclusion: Encapsulation of MMN or IFA may be an alternative approach for increasing compliance with consumption and reducing side effects.

Keywords: Compliance, Acceptance, MMN, IFA
The Level of Hemoglobin and the Mean Corpuscular Volume (MCV) among Preconception Women in Banggai Regency

Yustiyanty Monoarfa, Lucy Widasari, Rahayu Yekti, Anang Otoluwa, Endang Retnowati, Erry Gumilar, Abdul Razak Thaha, Bambang Wirjatmadi

Methods
The research was conducted in three sub-districts of Banggai district, from October 2016 to February 2017. The subjects were newlywed preconception women who were visiting the religious affairs office to register their marriages; who were 18-35 years of age; and who did not have serious diseases, such as tuberculosis, heart disease, or kidney failure. A total of 102 preconception women were recruited. Venous blood samples were extracted, and hemoglobin and the MCV were measured using the SLS-hemoglobin method. The normal values for hemoglobin and the MCV are 12 g/dL and 80-100 fL, respectively.

Results
The results showed that of 102 preconception women, 16 women (15.7%) had a hemoglobin level under 12 g/dL or reported anemia, and 21 women (20.6%) had an MCV below 80fL. Of the 16 women who had anemia, 12 women (57.14%) had an MCV under 80 fL, which indicated that their anemia was correlated with the iron parameters in red blood cells.

Conclusions
The results of study indicated that anemia is frequent in preconception women and that iron plays an important role in this anemia. This study indicates the importance of multi-micronutrient supplementation in preconception women.
Preconception Period
From Preparation to Molecular
The study was conducted in three sub districts in Banggai, Central Sulawesi, with double blind randomized controlled community based trial design from October 2016 to February 2017.

During preconceptional period, the capsules was given once a week, while in pregnant women was once a day.

Total sample of 19 preconception women aged 18-35 years old, did not have serious diseases, such as tuberculosis, heart disease, or kidney failure were followed up until pregnant and given IFA and/or MMN supplementation.

The examination performed in the preconception period, the 12 weeks' gestation, 20 weeks' gestation and 38 weeks' gestation. At the 12th and 20th weeks of pregnancy, selenium was measured.

Gestational age at baseline and subsequent prenatal visits were derived from the date of last menstrual period (LMP).

Measurements of fetal size to report are FL (cm) between 22-24 weeks and 37-38 weeks gestation.

A trained dietary interviewer obtained food intake information from the subjects via 24-h dietary recalls and questionnaires.

Birth weight was measured using a Tanita Digital Baby Scale to the nearest 0.1 kilogram immediately after delivery at RSUD Luwuk the Regional Public Hospital.

The team of the first 1000 days of life provides 24-hour consultation services through android to ensure the consumption of capsule and question–answer of daily emerging issues during preconception period–positive pregnancy test up to the delivery.

One of the study strengths is great local government support and commitment along with the involvement of 2 universities.
The Implementation Of Posyandu For Preconception Women in Banggai District Starting at The Office Of religious Affairs (KUA) to Meet SDGs Target in Banggai, Central Sulawesi

Lucy Widasari, Yustiyanty Monoarfa, Rahayu Yekti, Anang S Otoluwa, Abdul Razak Thaha

The Program was started by giving information to the bridegrooms (Kursus Calon pengantin, SUSCATIN) at the Office of Religious Affair (KUA) as a routine activities every Thursday while they are visiting the office for getting letter of marriage regulation. The main sector in this implementation was nutrition education by adding material on the importance nutrition for the first 1000 days of life and reproductive health once a week for prospective bridal couples. The activity is filled with pre and posttest for prospective bride and groom to assess the increase the knowledge of reproductive health and nutrition.

A quasi-experimental pre and posttest with control group study included 92 unmarried women in West Java, Indonesia, This study indicated a sig difference in post-intervention scores, with the intervention group scoring higher than the control group in overall preconception health knowledge such as physical health ($p < 0.001$), nutrition ($p < 0.001$), and lifestyle ($p < 0.001$).
Development Integrated Premarital Service System (LAyanan TerpaDU PraNIkah-LADUNI) in Probolinggo District, East Java

Sri Sumarmi, Nunik Puspitasari, Tanto Walono, Anna Maria

A Qualitative research was conducted on 2009 at 4 sub districts by indepth interview, focus group discussion, and multisectoral meeting to explore information related to the existing premarital services at village level, subdistrict level and the policy from local Government at district level. Based on these information, researcher designed a comprehensive model of integrated premarital service system involving various institutions and its components in the community. At year 2010 LADUNI has been applied at 9 subdistrict requires strong support from the local Government.

Prosiding WKNPG X

Fig. The flow of Premarital Services System starts from the village, Puskesmas until Office of Religious Affair (KUA)
Intervention MMN From Preconception for Prospective Brides in Banggai Central Sulawesi

Yustiyanty Monoarfa, Lucy Widasari, Rahayu Yekti, Anang Otoluwa, Abdul Razak Thaha

Preconception Women
- Manage completeness letter of marriage regulation document in the sub-district office and carry out medical examinations at the district health center as well as perform courses bride and groom at Office Religious Affair

Sub district office
- Provide a covering letter to the prospective bride or married women to carry out a health check at the District Healthcare Center
- Check the certificate of health examination results from the health center

Integrated Health Center Cadres
1. Encompass women in the preconception period
2. Accompanying preconception women
3. Monitoring the consumption of MMN/IFA capsules

Office Religious Affair
- Added material on the importance of nutrition for the first 1000 days of life and reproductive health during the bride and groom course at Office Religious Affair
- Conduct medical check up every month to the health center and accompanied by Integrated Health Center cadres

PRECONCEPTION INTEGRATED HEALTH CENTER

Nutrition Corner
- Examination of nutritional status: measurement of body weight, height, MUAC, waist and hip circumference
- Give MMN supplements
- Nutrition Counseling
- Submit pocket book

Sub district office
- Integrated Health Center Cadres
- Conduct medical check up every month to the health center and accompanied by Integrated Health Center cadres

Office Religious Affair
- The prospective bride and groom bring 3 copies of LADUNI cards (red, yellow, white) to the Puskesmas
- Registration Counter
- General Polyclinic (Maternal and Child Health)
- Laboratory
  - Hb level examination to detect anemia
  - Other examinations, including pregnancy tests
- Nutrition Corner
  - Examination of nutritional status: measurement of body weight, height, MUAC, waist and hip circumference
  - Give MMN supplements
  - Nutrition Counseling
  - Submit pocket book

Left behind at the Puskesmas LADUNI card, prospective brides brought 2 cards (red and white) to take to the KUA

Intervention MMN From Preconception for Prospective Brides to Prevent Neonatal Stunting in Probolinggo District, East Java

Sri Sumarmi, Bambang Wirjatmadi, Kuntoro, Abdul Razak Thaha, Soekirman
Researcher team as a communicators should try to popularize the first 1000 days of life programmes. The media plays an important to encourage people to start health literacy, to raise awareness of healthy living behaviour as early as possible even before conception.


### Composition of the UNICEF/WHO/UNU international multiple micronutrient preparation (UNIMMAMP) and the iron and folic acid (IFA) supplement

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Form</th>
<th>IFA concentration</th>
<th>UNIMMAMP concentration</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>Retinol equivalent</td>
<td>800</td>
<td>—</td>
<td>μg</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Cholecalciferol</td>
<td>200</td>
<td>—</td>
<td>IU</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Tocopherol</td>
<td>10</td>
<td>—</td>
<td>mg</td>
</tr>
<tr>
<td>Vitamin B-1</td>
<td>Thiamine HCL</td>
<td>1.4</td>
<td>—</td>
<td>mg</td>
</tr>
<tr>
<td>Vitamin B-2</td>
<td>Riboflavin</td>
<td>1.4</td>
<td>—</td>
<td>mg</td>
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<tr>
<td>Niacin</td>
<td>Nicotinamide</td>
<td>18</td>
<td>—</td>
<td>mg</td>
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<tr>
<td>Folic acid</td>
<td>—</td>
<td>400</td>
<td>400</td>
<td>μg</td>
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<tr>
<td>Vitamin B-6</td>
<td>Pyridoxine</td>
<td>1.9</td>
<td>—</td>
<td>mg</td>
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<td>Vitamin B-12</td>
<td>Cyanocobalamin</td>
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<tr>
<td>Vitamin C</td>
<td>Ascorbic acid</td>
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<tr>
<td>Zinc</td>
<td>Zinc sulfate</td>
<td>15</td>
<td>—</td>
<td>mg</td>
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<tr>
<td>Iron</td>
<td>Ferrous fumarate</td>
<td>60</td>
<td>30</td>
<td>mg</td>
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<tr>
<td>Copper</td>
<td>Copper sulfate</td>
<td>2</td>
<td>—</td>
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<tr>
<td>Selenium</td>
<td>Sodium selenite</td>
<td>65</td>
<td>—</td>
<td>μg</td>
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<tr>
<td>Iodine</td>
<td>Potassium iodide</td>
<td>150</td>
<td>—</td>
<td>μg</td>
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</tbody>
</table>

Table: Composition of the UNICEF/WHO/UNU international multiple micronutrient preparation (UNIMMAMP) and the iron and folic acid (IFA) supplement.
Implementation of Integrated Service Management for Preconception Women in Banggai District

Siti Hadrayanti Ananda Harapin, Anang S Otoluwa, Abdul Razak Thaha

A Qualitative Study in 3 districts of Banggai Regency, involving 35 Informants including: Officers, targets, and stakeholders: Head of Religious Affair (KUA), KUA Officers, Bupati, Head of Health Service, Health Service Staff, Head of Puskesmas, District Secretary, Head of Religion Department, Lurah, Village Head, Midwife, Empowerment and Family Welfare (PKK) Chair, Community Leader, and Women involved in integrated service for preconception women.

Conclusion:
1. There was an increase in contact with the prenatal caregiver and the first contact (K1) examination for pregnant women.
2. The Integrated Services Management Program for Women Preconception is able and improves maternal knowledge.
<table>
<thead>
<tr>
<th>Examination</th>
<th>Preconception Period</th>
<th>12 Weeks Gestation</th>
<th>20 Weeks Gestation</th>
<th>38 Weeks Gestation</th>
<th>Pregnancy Outcome</th>
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<tbody>
<tr>
<td><strong>Maternal</strong></td>
<td></td>
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<tr>
<td>Blood Pressure Examination</td>
<td>√</td>
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<td>√</td>
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<tr>
<td>Urine Examination</td>
<td>√</td>
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<tr>
<td>Body Weight</td>
<td>√</td>
<td>√</td>
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<tr>
<td>Body Height</td>
<td>√</td>
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<tr>
<td>Mid-upper Arm Circumference (MUAC)</td>
<td>√</td>
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<td><strong>Dietary assessment</strong></td>
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<td>Food Frequency Questionnaire (FFQ)</td>
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<tr>
<td>Recall</td>
<td>√</td>
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<tr>
<td><strong>Placenta</strong></td>
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<td>Placenta weight</td>
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<td>Placenta diameter</td>
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<td>The thickness of the placenta</td>
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<td><strong>Newborn baby</strong></td>
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<td>APGAR Score</td>
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<td>Birth weight of infant born</td>
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<td>Length of infant born</td>
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<tr>
<td><strong>Routine blood tests</strong></td>
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<tr>
<td>Hemoglobin, Erythrocytes, Leukocytes, Sedimentation rate</td>
<td>√</td>
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<tr>
<td>Ultrasoundography : BPD,HC,AC,FL</td>
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<td>Selenium status</td>
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<td><strong>Antioxidant enzymes</strong></td>
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<td>Glutathione peroxidase (GPx)</td>
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<td><strong>Pro angiogenesis</strong></td>
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<td>VEGF</td>
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<td>PIGF</td>
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<td><strong>Anti angiogenesis</strong></td>
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<td>SFlt-1</td>
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<td><strong>Hormone</strong></td>
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<td>PLGH</td>
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<td><strong>Biomarker of oxidative stress</strong></td>
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<td>8-OHdG</td>
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<td>MDA</td>
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<td><strong>Mitochondrial</strong></td>
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<td>Copy Mitochondrial</td>
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</table>

Examinations carried out in longitudinal studies
Abdul Razak Thaha, Bambang Wirjatmadi, Erry Gumilar, Nurhaedar Jafar, Maisuri T Chalid, Agussalim Bukhari, Anang Otoluwa, Yustiyanty Monoarfa, Rahayu Yekti, Lucy Widasari, 2016
BMI of preconception women in both IFAS and MMS groups were mostly (63.2%) in the normoweight category, 10.5% underweight and 26.3% overweight.

Comparison of Mean Mid Upper Arm Circumference in Women with IFA and MMN Groups since Preconception

Lucy Widasari, Maisuri T Chalid, Nurhaedar Jafar, Abdul Razak Thaha

The average increase MUAC for pregnant women in the MMN group was higher than in the IFA group.

There was a significant difference between the two groups of IFA and MMN in preconception with the second trimester of pregnancy ($p = 0.014$).

Maternal nutritional status, as estimated by anthropometrics, is an important contributor to and infant birth weight and fetal growth.

Comparison of the mean MUAC of pregnant women in the IFA and MMN supplementation groups

MUAC was measured at the midpoint between the olecranon and acromion process, to the nearest 0.1 cm using a nonstretchable insertion tape, while the arm hung freely at the side.

Effect Of Preconceptional Supplementation of IFA and MMN On Hemoglobin Level During Pregnancy

The average hemoglobin level decreased from preconception to 2nd trimester of pregnancy. Comparison of levels hemoglobin between the IFA and MMN groups did not differ significantly.

Average of hemoglobin concentration tends to decrease in both groups. The initial Hb level of subjects within IFA group (control group) is higher compared to those in MMN group (treatment group), with the mean difference of 0.4 g/dL, then decrease in week-12 with mean difference of 0.2 g/dL, continue decrease until week-28, with mean difference of 0.1 g/dL.
The Effects of Selenium And Multiple Micronutrient Administration During Preconception Period On The Level Of Sflt-1/PIGF Ratio To Prevent Preeclampsia At The Molecular Level: A Randomized, Double Blind Controlled Trial in Banggai Regency

Yustiyanty Monoarfa, Handajani R, Retnowati E, Adriani M, Wirdjatmadi B, Gumilar E, Abdul Razak Thaha

The results:
- At the 12 weeks gestational age there was no significant differences in selenium values (p=0.390), SFlt-1/PIGF ratio (p=0.464) between the two groups
- At the 20 week gestational age the increase in the SFlt-1/PIGF ratio in the IFA group is higher than the MMN group

Placenta insufficiency and its poor obstetrical outcomes are correlated with an imbalance between angiogenic and anti-angiogenic factors. The soluble fms-like tyrosine kinase 1 (sFlt-1) to placental growth factor (PlGF) ratio, also called "the preeclampsia (PE)" fraction, was consecrated as the biomarker for PE detection.

Early prevention of preeclampsia can be conducted by observing preeclampsia markers before the occurrence of clinical symptoms and signs. It is expected that this study can contribute to the prevention of preeclampsia through nutrition intervention since the preconception period.
The mean Sflt1 / VEGF ratio of pregnant women in the MMN group was lower than in the IFA group, especially in the first trimester and the second trimester. There was a significant difference in the ratio between the two groups of IFA and MMN in each period (p <0.005) except in the 1st-2nd trimester.

In a deficient state of spiral artery supply, ischemia occurs which causes an increase in oxidative stress in the tissues, which causes a decrease in the ratio of CSE / H2S (Cystathionine γ-lyase / Hydrogen Sulfide) as a regulator of several physiological events, including vasodilation, angiogenesis, antiapoptosis and cellular signaling.
This situation in turn causes an imbalance of angiogenic factors in pregnancy in the form of an increase in the Sflt-1 value and a decrease in the VEGF value. (Utpal Sen, 2012).
There was no significant difference in the mean PL-GH in the IFA and MMN groups in each trimester of pregnancy.

Hormonal factors, interactions of maternal immune cells and proinflammatory cytokines affect the success of spiral artery remodeling. Maternal hormones are not transferred to the fetus, so the fetus must synthesize its own growth hormone. Placental Growth Hormone (PL-GH) is a specific hormone of pregnancy produced by genes one family gene of the hormone human GH, namely placental GH variant (GH-V), plays in the trophoblast invasion and fetal growth, as well as maternal adaptation to pregnancy.
Periconceptional Multimicronutrient Supplementation For The Prevention Of Maternal DNA Damage

Anang S Otoluwa, Veni Hadju, Suryani As’ad, Yustiyanty Monoarfa, Abdul Razak Thaha

- Research in 4 sub-districts of Makassar City January 2012 - October 2014
- Double blind randomized controlled trial
- 240 samples recruited at preconception, 43 of them were pregnant and were divided into the intervention (MMN) 23 and control (IFA) groups 20.

Results:
- The average level of 8OHdG decreased in both the intervention (-70.6 ± 249.3 pg/ml; p=0.47) and control groups (-86.2 ± 234.6 pg/ml; p=0.10). However, these changes were not significant.
- The mean difference in 8OHdG levels between the two groups was also not significant (p=0.57).

Conclusion: periconceptional MMN supplementation can prevent maternal DNA damage even though it does not produce significantly different results compared to IFA supplementation. Future studies are needed

Nutrition is very important to maintain the integrity of the genome because of its role as an enzyme cofactor or as part of a protein that plays a role in DNA synthesis and repair, prevention of DNA damage due to oxidative stress reactions, and maintain DNA methylation. Fenech, M. 2010. Micronuclei and Their Association With Sperm Abnormalities, Infertility, Pregnancy Loss, Pre-Eclampsia and Intra-Uterine Growth Restriction in Humans. Vol. 26 no.1 pp. 63-76.
Effects of Supplementation MMN and IFA Since Preconception on the level of 8-OHdG in Pregnant Woman A Randomized, Double Blind Controlled Trial in Banggai Regency
Rahayu Yekti, Abdul Razak Thaha, Nurhaedar Jafar, Agussalim Bukhari

Results: In the MMN group there was a decrease in 8-OHdG from preconception to the 2nd trimester (-0.25) of pregnancy while the IFA group there was an increase in 8-OHdG (0.14), but did not differ sig (p = 0.14).

The reduction in 8 OHdG in the 3rd trimester of pregnancy was better in the IFA group than in the MMN group, but the mechanism is not yet known.

8-Hydroxy-2’-deoxyguanosine (8-OHdG), produced by oxidation of the nucleoside deoxyguanosine and subsequently excreted directly into urine, has been identified as a sensitive marker for oxidative DNA damage. Increased oxidative stress in human pregnancy has also been implicated in the pathogenesis of preeclampsia, preterm birth, intrauterine growth retardation and low birth weight deliveries.


Results:

- The reduction in MDA from preconception to trimester 3 of pregnancy was greater in MMN (48.4) group compared to the IFA group (28.78) but not significantly different (p=0.59).
- The MMN supplementation given from preconception to the 38 week of pregnancy was able to reduce plasma MDA levels.

Malondialdehyde (MDA) is a product of lipid peroxidation and has been found to be elevated in conditions of oxidative stress. Insufficient blood flow to the placenta may establish a hypoxic environment, which upon reoxygenation results in ischemia/reperfusion injury, characterized by increased free radical generation and subsequent oxidative tissue damage.

The Effects Selenium and MMN Administration During Periconception Period On The Level Of Malondialdehyde: A Randomized, Double Blind Controlled Trial in Banggai Regency

Yustiyanty Monoarfa, Erry Gumilar, Lucy Widasari, Rahayu Yekti, Anang S Otoluwa, Abdul Razak Thaha

At the 12th weeks of pregnancy the level of MDA in MMN group was 121.2 ng/mL and IFA group was 1436 ng/mL, and at the 20th weeks in MMN group was 108.4 ng/mL and IFA group was 199.6 ng/mL.

There was no significant difference between MDA in two groups (p = 0.424) at 12th week, but at 20th weeks MMN group had a significantly lower MDA levels (p = 0.006) than IFA group.

**Conclusion:** The administration of selenium in MMN preparations since the preconception period has a better effect in reducing MDA levels compared to the IFA group. This condition is very good in preventing oxidative stress in pregnancy and preeclampsia early.
The Effects of Supplementation MMN and IFA During Preconception on Mitochondrial DNA Content in Pregnant Woman

Rahayu Yekti, Abdul Razak Thaha, Nurhaedar Jafar, Agussalim Bukhari

<table>
<thead>
<tr>
<th>Mitochondrial DNA</th>
<th>IFA Group Supplementation</th>
<th>MMN Group Supplementation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD: Median</td>
<td>Min-max</td>
</tr>
<tr>
<td>3rd trimester of pregnancy</td>
<td>33,51 ± 13,8: 32, 79</td>
<td>19,26-49,21</td>
</tr>
</tbody>
</table>

Results: The IFA group had more copies of mitochondrial DNA content (1.5 times): There was no significant difference in the number of copies of mitochondrial DNA content in the both groups in the 3rd trimester of pregnancy.

mtDNA content has been suggested as a marker of mitochondrial response to damage. MtDNA is especially sensitive to oxidative stress and is more prone to damage than nuclear DNA since compared to nuclear DNA, mtDNA lacks histone proteins and introns and has lower DNA repair activity, due to the lack of nuclear excision repair (NER) in mitochondria (Meyer et al., 2013; Kazak et al., 2012).
Correlation Of Fetal femur Length, Birth Length Between IFA and MMN Since Preconception Period: A Randomized, Double Blind Controlled Trial in Banggai Regency

Lucy Widasari, Maisuri T Chalid, Nurhaedar Jafar, Abdul Razak Thaha

Conclusion:
Femur length reflects the longitudinal growth of the fetus. Although there is no significant correlation in each group, mothers who received IFA intervention the fetus had shorter FL compared to MMN group.

Measurements of fetal size to report are FL (cm) between 22-24 weeks and 37-38 weeks gestation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Birth Length (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFA group</td>
<td>MMN group</td>
</tr>
<tr>
<td>FL 2nd Trimester pregnancy</td>
<td>0.545</td>
</tr>
<tr>
<td>FL 3rd Trimester pregnancy</td>
<td>0.255</td>
</tr>
</tbody>
</table>

Intrauterine Growth

Measurements of fetal size to report are FL (cm) between 22-24 weeks and 37-38 weeks gestation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Birth Length (p value)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>MMN group</td>
</tr>
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<td>0.545</td>
</tr>
<tr>
<td>FL 3rd Trimester pregnancy</td>
<td>0.255</td>
</tr>
</tbody>
</table>
Effects Of MMN and IFA Supplementation in Preconception Period Against Placental weight: A Randomized, Double Blind Controlled Trial in Banggai Regency

Lucy Widarsari, Maisuri T Chalid, Nurhaedar Jafar, Abdul Razak Thaha

Results: The mean placental weight of pregnant women in the MMN group was heavier than the IFA group, which was 600.42 gr and the results of statistical tests showed no significant difference between IFA and MMN groups (p = 0.384)

Placental weight, gestational age and gain body weight simultaneously influences birth weight. Among the three variables, placental weight has the greatest effect on birth weight, which is 57%.

(Sri Sumarmi, 2016)
Effects Of MMN and IFA Supplementation in Preconception Period Against Birth weight and Birth Length: A Randomized, Double Blind Controlled Trial in Banggai Regency

Lucy Widasari, Maisuri T Chalid, Nurhaedar Jafar, Abdul Razak Thaha

The mean birth weight of infants born to pregnant women in the MMN group was heavier at 3142.5 g vs 2948 g with a value (p=0.001)

The average length of infant born to pregnant women in MMN group was longer, 49.5 cm vs 47.8 cm with value (p=0.001)

<table>
<thead>
<tr>
<th>Birth length</th>
<th>IFA group supplementation (n=7)</th>
<th>MMN group supplementation (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Median</td>
</tr>
<tr>
<td></td>
<td>47.86 cm ± 2.41</td>
<td>48 cm</td>
</tr>
</tbody>
</table>

Birth length difference between IFA and MMN group

Difference 1.64 cm
95% CI 47.66 – 50.13
P value 0.001
Results:
Birth weight significantly correlated with
- Preconception body weight ($r=0.33; p=0.004$)
- BMI ($r=0.235; p=0.033$)
- Stature ($r=0.237; p=0.013$)
- Hemoglobin level at week-35 ($r=0.255; p=0.011$)
- Serum retinol week-35 ($r=0.236; p=0.032$)
- Concentration of serum hPL ($r=0.262; p=0.018$)
- Fetal IGF-1 ($r=0.286; p=0.022$)
- Length of birth correlated with serum retinol ($r=0.245; p=0.029$)
- hPL concentration ($r=0.049; p=0.001$)

Conclusion
Pre-conceptional body size is more important parameter for neonatal birth size than during pregnancy, meanwhile micronutrients status at last pregnancy more significant parameter for birth size than before or early pregnancy.

Prospective cohort study was conducted at Probolinggo District, East Java. Sample of 115 pregnant women were followed up starting from preconception period until delivery.
Micronutrients Supplementation During Preconception Period Improves Fetal Survival and Cord Blood Insulin Like Growth Factor-1

Sri Sumarmi, B Wirjatmadi, Kuntoro, E Gumilar, E.Retnowati

Fetal survival is defined as the ability of fetus to survive in uterine until delivery in complete gestation period or at term delivery (birth >37 weeks).

1. Several micronutrients play important role in synthesis of IGF-1.
2. Fetal survival rate in MMN group was significantly higher than those in Placebo-IFA group.
3. MMN supplementation prior to pregnancy also tends to increase umbilical cord serum IGF-1.

<table>
<thead>
<tr>
<th>Gestation age</th>
<th>MMN group (n = 57)</th>
<th>Placebo-IFA group (n = 55)</th>
<th>Total (n = 112)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Fetal survival*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survival (&gt;37 weeks)</td>
<td>56</td>
<td>98.2</td>
<td>45</td>
</tr>
<tr>
<td>Not survive (&lt;37 weeks)</td>
<td>1</td>
<td>1.8</td>
<td>10</td>
</tr>
<tr>
<td>Fetal age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscarriage (&lt;28 week)</td>
<td>1</td>
<td>1.8</td>
<td>4</td>
</tr>
<tr>
<td>Early preterm (28-35 weeks)</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
</tr>
<tr>
<td>Late preterm (35-37 weeks)</td>
<td>2</td>
<td>3.6</td>
<td>2</td>
</tr>
<tr>
<td>At term (&gt;37 weeks)</td>
<td>54</td>
<td>94.7</td>
<td>45</td>
</tr>
</tbody>
</table>

*Chi-square test: Contingency coefficient: 0.266, p = 0.003 (OR: 6.099, 95% CI: 0.934-39.847). MMN: Multi-micronutrients, BMI: Body mass index, MUAC: Mid upper arms circumference
Mechanism Of Effect Of Preconceptional Multi-micronutrients Supplementation On Birth Weight and Fetal Viability Related To Interleukin 12 And Human Placental Lactogen

Sri Sumarmi, B Wirjatmadi, Kuntoro, E Gumilar, E.Retnowati

1. Energy and protein intake predominantly affect birth weight beginning at preconception period until weeks 35th, and total weight gain does not affect birth weight. Micronutrients intake consistently affects birth weight beginning at preconception period, although in preconception period its effect is lower than energy effect. While energy effect decreases in the last trimester, micronutrients' effect increases dominantly through the increasing of hPL concentration and placental weight, accompanied with the decreasing of IL-12 concentration in weeks 35. The dominant effect of placental weight and hPL concentration are mediated by serum retinol.

2. Preconception MMS modifies the effect of total weight gain beginning at weeks-28 until weeks-35. This modification would cause the increasing of weight gain rate in last trimester and improve subcutaneous fat deposition.

3. Fetal viability is directly and dominantly affected by gestational age. Micronutrients form dietary intake and supplementation tend to affect gestational age depending on duration of intervention during preconception period.

4. Concentration of IL-12 most likely affects preterm birth. Therefore IL-12 may play an important role as an early indicator for prematurity. Multi-micronutrients supplementation during preconception period, at least 3 month prior to pregnancy, may prevent miscarriage and prematurity.
The Mechanism

Brain Formation

The importance of PRECONCEPTION nutrition

The importance of MATERNAL nutrition

Heme Synthesis

Reproduction (2001), 122, 527-535
Multisectoral Action to Improve Nutrition in Banggai District, Indonesia

Herwin Yatim, Anang S Otoluwa, Ramli Tongko, Abdul Razak Thaha

**Background** : Implementation of the Scaling Up Nutrition program requires strong commitment from local leaders and multisectoral action. The objectives were to show evidence of how a multisectoral approach was implemented and to determine whether this approach affected indicators related to the nutrition-sensitive intervention.

**Methodology** : We interviewed and collected data from the key informants at the departments and organizations serving as stakeholders for the multisectoral approach, such as the district irrigation, social, health, family planning, planning and development, agriculture and horticulture, and food security offices. We analyzed the data by examining the results after both the first year (2015) and the second year (2016) of implementation. Multisectoral action was started in the beginning of 2015. All stakeholders received information about the importance of nutrition in the first 1,000 days of life and the role of multisectoral approach from seminars, discussions, posters, and leaflets.

**Results** : Two regulations were produced, and a task force was established to coordinate implementation. After two years, we found that clean water coverage increased, from 81.8% in 2015 to 83.4% in 2016; that the percentage of households using latrines increased from 66.8% to 71.8%; that the median age for the first marriage for women has increased from 21 to 25; that the percentage of women using contraception increased from 62% to 65%; that the percentage of poor people with insurance increased from 39% to 51%; and that the percentage of poor people decreased from 9.84% to 9.48%.

**Conclusion** : Commitment from local leaders has been earned, and indicators related to the nutrition-sensitive intervention have shown increases. However, analysis of nutrition-specific indicators is needed.

**Keywords** : Multisector, nutrition, nutrition-sensitive intervention
Reducing Maternal Mortality and Stunting Through Preconception Posyandu

Suscatin and Integrated post for preconception women in Banggai District has become an innovative intervention to increase the health literacy status of preconception women, prevention and treatment of anemia and monitoring of pregnancy complication, including preeclampsia, and help reduce MMR.

Need strong commitment, integrated multisectoral stakeholder-networking and comprehensive approaches and interventions to improve the health of preconception women.
Conclusions and Recommendations (1)

1. Preconception care has a positive impact on maternal and child health outcomes: the mother-to-be are able to get early identification of pregnancy risk factors such as anemia before pregnancy, identifying and managing maternal conditions and behaviors during pregnancy which may pose a risk to both mother and newborn.

2. MMS given from preconception has a better effect than IFAS on
   ▪ Pregnancy status, including: Increase in body weight during pregnancy and increase in MUAC
   ▪ Pregnancy outcomes, including: placental weight, birth weight and birth length
   ▪ The administration of selenium in MMN preparations since the preconception period has a better effect in reducing MDA levels compared to the IFA group.
   ▪ MMS during preconception period, at least 3 month prior to pregnancy, may prevent miscarriage and prematurity.
   ▪ Several micronutrients play important role in synthesis of IGF-1.
3. Antioxidants are very important to prevent pregnancy complications associated with oxidative stress, therefore MMS since preconception is important to improve the antioxidant status of pregnant women.

4. Good health and nutrition before conception are key to a mother’s ability to meet the nutrient demands of pregnancy and breastfeeding, and are vital to the healthy development of her embryo, fetus, infant, and child.

5. More importantly, it should sensitise the government with various evidence-based studies to prioritise the nutritional and health needs of preconception women lead to new and innovative suggestions to improve the present situation. Investing in adolescent, preconception, and maternal nutrition will provide a range of cumulative benefits, delivering improvements in health across multiple sectors of society.
1. MMN should be given since preconception and to all women of childbearing age
2. Depending on the specific nutrient and its role in placental and fetal development, waiting until pregnancy may be too late to have a beneficial impact on the course of the pregnancy and its outcome
3. The education based on local context of women of childbearing age on the importance of adequate nutrition for the improvement of pregnancy outcomes should be a priority.
4. Continuing efficacy studies that have shown positive results with effectiveness studies as evidence for policy making.
5. It is now essential analyze some new scientific insights are translated into messages about the importance of a healthy lifestyle for healthy offspring, applicable to both adolescent girls and women.
1. Integration lessons related the importance preconception period at relevant study programs and evidence based learning from the field.

2. Develop knowledge and technology, new concepts and theories for promoting preconception healthcare.

Provide evidence specifically related to improving preconception services for women of reproductive age to assist with planning and preparation for healthy pregnancies, emphasizing the importance of healthy nutrition through scientific research.

1. Thematic practices for assisting the community: play on posyandu repositioning program: Focus on rescue the first 1000 days of life since preconception.

2. The development of fostered areas that are focused and sustainable.

3. Coordination with regional governments in initiate and ensuring the sustainability of development policies.

Academics can play a central role in
Ongoing Preconception Research and Publication


3. **Erni Yusnita Lalusu**. *Effect of MMN since Preconception on Blood Glucose Levels During Pregnancy in Banggai Regency*

4. **Dewi Pramoni**, Ikeu Tanziha, Dodik Briawan, Ali Khomsan. *The Effectiveness Of The Combination Of Nutrition Education And Nutritional Supplementation For Prospective Brides To Prevent The Incidence Of Stunting In Newborns*


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