

Supplementation and fortification program in eradicating micronutrient deficiencies in Indonesia

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Article Review

ABSTRACT

ARTICLE INFO

Keywords:

supplementation,
fortification,
Fe,
folic acid,
deficiency

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DOI: 10.20885/JKKI.Vol12.Iss3.art11

History:

Received: June 21, 2020

Accepted: December 31, 2021

Online: December 31, 2021

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Micronutrients play a significant role in metabolism reaction although this only needs a few micronutrients such as iron (Fe) and folic acid as folate substitutes. Fortification and supplementation program aims to meet the requirement of micronutrients by providing synthetic formula. The Indonesian government has applied iron-folic acid fortification (IFA) in flour. Moreover, the current IFA supplementation program was given to vulnerable groups, pregnant mothers and women at reproductive age, including adolescent girls. The program has been applied for almost five decades, but the micronutrients deficiencies remain high. This study aims to review effects of the supplementation and fortification to vulnerable groups in Indonesia. This is necessary to determine their effectiveness within a specified period since the program has been applied for decades and to assess whether an additional program is needed or not. The data of this study were collected from verified international journal articles in the National Centre for Biotechnology Information (NCBI)/PubMed and Cochrane Library website. 11 articles related to the program were obtained. The program has been conducted for an extended period, yet its effectiveness should be reinforced to diminish the micronutrient deficiencies. It is mandatory to reformulate an additional program to strengthen the program. Nutrition education program, campaign for a healthy and balanced diet, protein consumption based local resources can be designated to assist the eradication of micronutrient deficiencies.

Zat gizi mikro memiliki peran penting dalam metabolisme tubuh, walau diperlukan dalam jumlah kecil, seperti zat besi (Fe) dan asam folat sebagai pengganti folat. Program fortifikasi dan suplementasi dimaksudkan untuk memenuhi kebutuhan zat gizi mikro dengan menggunakan sediaan sintesis. Pemerintah Indonesia menerapkan program fortifikasi zat besi dan asam folat pada terigu. Serta program suplementasi Fe dan asam folat dalam bentuk tablet tambah darah (TTD) diberikan pada kelompok rawan, yakni ibu hamil dan wanita usia subur termasuk remaja putri. Program ini sudah dilaksanakan hampir lima dekade namun defisiensi zat gizi mikro masih tetap tinggi. Tulisan ini bertujuan untuk memberi informasi mengenai penelitian pengaruh fortifikasi dan suplementasi pada kelompok penerima program di Indonesia. Hal ini penting dilakukan untuk mengetahui efektifitas program yang sudah dilakukan dalam rentang waktu yang memadai, dan apakah perlu formulasi program pendampingan untuk kegiatan utama. Telusuran pustaka dilakukan dengan mengumpulkan referensi dari jurnal internasional melalui kanal National Centre for Biotechnology Information (NCBI)/Pubmed dan Cochrane Library. Ditemukan 11 artikel yang mengkaji keputusan Menteri Kesehatan dan program yang sudah dilaksanakan. Program yang sudah berlangsung dalam waktu yang lama, namun efektifitas masih perlu diperkuat untuk menurunkan kekurangan zat gizi mikro. Program edukasi gizi, kampanye hidup sehat dan berimbang, konsumsi protein hewani berbasis bahan lokal dapat dipilih untuk membantu eradikasi defisiensi zat gizi mikro.

INTRODUCTION

Developing countries is risk groups of having macro-and micronutrient deficiencies. The most vulnerable groups of micronutrient deficiencies are pregnant women and adolescent girls. The World Health Organization (WHO) issued antenatal care for a positive pregnancy experience, a recommendation during gestation. WHO stated that mandatory supplementation consists of 30-60mg Fe and 400µg folic acid to minimize an adverse pregnancy outcome. Additional supplementation types varied such as calcium, zinc, vitamin A and intermittent folic acid based on pregnant woman's health status. Supplementation and fortification are aimed to meet the requirement of micronutrients in the target population.^{1,3}

A pregnant mother who receives iron-folic acid (IFA) supplementation during pregnancy will get maternal health and outcome. Mothers with sufficient micronutrients will have a lower risk of having a new-born with neural tube defect, low birth weight (LBW) and growth deterioration.^{4,6} The health status of a conceived foetus is determined by the mother's health status known as the first one thousand days of life, from early conception until two years old.⁷

A common problem among pregnant women is that the micronutrient deficiencies prevail before the gestation period, restoring the nutrient storage before pregnancy in the adolescent period. Some possible causes of micronutrient deficiencies in Indonesia are low quality and variety of consumed food, food restriction due to taboo and belief existed in a community.^{8,9}

This study aims to review some literatures to determine the effectiveness of the existing programs, IFA supplementation and fortification, applied in Indonesia and published in reputable international journal since those programs have been conducted for more than a decade. Improvement on the program is required to enhance the nutrient status for having a better quality of life in the future.

METHODS

Specified keywords were applied in the National Centre for Biotechnology Information (NCBI)/PubMed and Cochrane Library to obtain the articles. The keywords are 'Supplementation AND women AND Indonesia', 'fortification AND Indonesia', 'iron-folic acid AND women AND Indonesia'. Inclusion criteria included in this study were (1) published reputable English journal articles, (2) published articles from 1st Januari 2010 to 1st June 2020 considering the Ministry of Health Decree no. 88 2014, (3) the study area was not in Indonesia, and (4) articles about IFA supplementation. Exclusion criteria of this study were (1) articles that was not in English, (2) their studies were conducted more than ten years ago, (3) their study area was not in Indonesia, (4) their studies about multi micronutrient studies. From the initial search, 65 articles were identified. 22 articles were duplicate, while 23 documents were categorized as eligible articles. 20 writings met the inclusion criteria; finally, 11 articles were collected and relevant to this study. Those articles were elaborated in detail, had methods, discussed subjects included in the review, and showed their result. The data based on the articles were demonstrated in the table in the next section.

The effectiveness of the program was determined by comparing the suggested prevalence of anaemia within the population and the compliance of the supplement intakes to eradicate the micronutrient deficiencies. Besides, coverage and adherence to consume the supplement were observed to assess their effectiveness.¹⁰

RESULTS

This section demonstrates results of articles related to the IFA supplementation and fortification program in Indonesia. Eleven articles were separated into two tables. Table 1 showed articles related to the IFA supplementation, while table 2 revealed articles related to the fortification program. The tables highlighted the author, method, number of subjects and main

result in each report collected.

In assessing the effectiveness, the utilization from existing data of Basic Health Research (Riskesmas) was applied.^{11,12} Data included

coverage, compliance and prevalence of anaemia in target group and compared to the WHO suggestion.¹⁰

Table1. Articles related to IFA supplementation program based on Ministry of Health Decree in Indonesia

No	Authors, year	Research methods	Subject recruited	Results
1	Titaley et al., 2010	Secondary data analysis from Indonesia Demographic and Health survey in 1994, 1997, 2002-2003	40.572 infants, 442 experienced neonatal death	IFA supplementation during pregnancy would reduce the risk of neonatal death, and this program was applied to low-middle income countries similar to Indonesia.
2	Titaley et al., 2012	Secondary data analysis from Indonesia Demographic and Health Survey in 2002-2007	26.591 live-born infants	Postnatal care on day 1 increased risks of neonatal death. The mother who received IFA during pregnancy would reduce 51% risks of early neonatal death.
3	Titaley et al., 2015	Secondary analysis of Indonesia Demographic and Health Survey in 2002-2007	26.591 live-born infants	Increasing awareness at the community level, coverage, and access to health facilities would escalate the IFA supplement consumption to improve the foetus's health consequences.
4	Barkley et al., 2015	Indonesia Family Life Survey (IFLS) in 1997/8, 2007/8	83% of the total Indonesian population	The prevalence of anaemia in 2007/8 was lower than in 1997/8.
5	Wiradnyani et al., 2016	Secondary data analysis of Indonesia Demographic and Health Survey in 2002/3, 2007 and 2012	19.133 mothers who given birth within two years prior to the interview.	Increasing knowledge and risk of being pregnant, the spouse's support frequency of ANC would determine the compliance of IFA consumption.
6	Siekmans et al., 2018	Qualitative data	Formative research year in 2012-2013 in several countries	Insufficient supplements consumed and inappropriate health counselling were identifiable factors related to increasing coverage and compliance of IFA consumption.
7	Soekardjo et al., 2018	The policy at the national level and regional department on strategy, law, regulation, and the guideline of the program	Interview with 74 key persons related to stakeholders and experts in the related field.	A number of policies that support the program for adolescent girls is limited. Coordination at multisectors at the government level is required to maintain the existing program.
8	Triharini et al., 2018	Cross-sectional study design	102 pregnant mothers who received the ANC at the public health centre (PHC)	The compliance in IFA consumption was affected by perceived benefit, perceived barrier, and family support.

Table 2. Articles related to iron and folic acid fortification program based on Ministry of Health Decree in 2003

No	Authors, year	Research methods	Subjects	Results
1	Spohrer et al., 2013	Secondary data on consumption, policy, and local material industry, marketing data, and oral communication.	Industry, authority, market data, and research	Instant noodles with fortified flour consumption meet the 45-51% requirement of iron, based on recommended nutrient intake (RNI) for the children
2	Dijkhuizen et al., 2013	Published and unpublished data	Evaluation report with specified circumstances, obstacles, objectives, and results.	A legal framework is necessary for the success of the fortification program.
3	Berger et al., 2019	Secondary data on policy and the magnitude of the problem	Collaborative research named SMILING Project	Regular monitoring is mandatory to obtain nutritional status data to assess the benefit of the intervention program.

DISCUSSION

The collected articles can be identified from several perspectives such as policy, program evaluation and factors affecting the sustainability of IFA supplementation and fortification. At the policy level, some articles emphasize the necessity of strict regulation formulation for the target group to increase the coverage and efficiency of the IFA supplementation and fortification.^{13,15} It is compulsory to support authority to strengthen collaboration of multisectoral programs to conserve resources. This issue has been particularly highlighted for adolescent girls' programs; this group will have pregnancy in future years.^{16,17} More comprehensive efforts are mandatory to conduct regular surveillance for monitoring and updating data to design an effective intervention program.¹⁵ Food fortification is considered an effective program to meet the requirement of micronutrients of target population. Enrichment of potential nutrients to food products will be an appropriate approach to reduce the micronutrient deficiencies that will contribute to health quality. Fortification programs have

contributed to reduce risks of having neural tube defects, cardiovascular disease and growth and development of children.^{4,18,20} Every sector needs to involve and pay attention to the IFA supplementation and fortification programs. Those programs have been applied for two decades, but the prevalence of micronutrients remain high, so, it is mandatory to evaluate the existing program to formulate additional and extensive efforts to enhance the main program.

Indonesia is one of the countries in Southeast Asia with a high problem of micronutrient deficiencies. A high prevalence of anaemia among pregnant mothers and adolescent girls is commonly found within the region.^{11,12} Anaemia is one of public health problems caused by micronutrient deficiencies, namely Fe, folate, vitamin B12, vitamin A, and so forth.^{21,22} Anaemia during pregnancy will endanger the maternal and foetus health because the requirement of nutrients is high in this period.²³ Macro and micro-nutrient requirements are high because of cell differentiation and foetus fulfillment.²⁴ The shortage of nutrients before pregnancy can jeopardize the pregnancy

period, both the mother and the foetus. Some clinical trials confirmed that new born from an undernourished mother would impair growth and development and neonatal death.^{1,25,30}

The IFA supplementation for pregnant mothers has been applied since 1975, but maternal and child health problems remain high. The higher prevalence of micronutrient deficiencies is determined by low compliance in consuming the IFA supplement.^{31,32} Other possible causes are lack of health officers' knowledge to educate the target group.³³ Indonesia has applied a new dosage of folic acid referring to a recommendation of the World Health Organization (WHO).³⁴ Women at reproductive age are the recipient of the program.³⁵ A number of policies to support adolescent girls is limited. Currently, only two programs support this group, i.e., IFA supplementation and weight management at school programs.¹³

Titaley conducted data analysis on 40.576 neonates, including 442 who experienced neonatal death. Titaley concluded that IFA supplementation had a significant protective effect on neonatal mortality.^{1,29} The Titaley's study confirmed previous findings that emphasize the benefit of micronutrients during pregnancy to prevent birth defects.^{36,38} Some factors contributed to low compliance of the IFA supplementation. The factors were low access and coverage of health service, poor quality of health officers in providing counselling to the target group and shortage of supplements due to supplement distribution.^{30,33} A community-based program can include the trusted community leaders to overcome the accessibility to the health facility and to support the program.³⁹ Regular trainings for health officers can advance their knowledge as health frontline in health facility.⁴⁰ Increasing the number and supplement distribution is mandatory to meet the WHO and Ministry of Health recommendation, 90 pills during pregnancy and once/week for women at

reproductive age.^{35,41}

Nutrition education is also important to implement; this program can reach the target population and family members in households. Family support for pregnant women significantly increases supplement consumption.^{31,33} It also includes educating to consume nutritious food, although known as taboo in the community.⁹ Improving service and ability of health officers is required to increase their capacity and capability in providing service at health facilities.⁴²

Fortification is food enrichment by adding essential micronutrients that are consumed by most of population. This program is aimed to increase micronutrients required for metabolism. In Indonesia, some food products are fortified, i.e., salt, flour, and cooking oil. Salt fortification is with iodine, Fe, folic acid for flour, and vitamin A for cooking oil.⁴³ The flour fortification program adds Fe and folic acid, as stated in the Ministry of Health Decree no 1452/MENKES/SK/X/2003.⁴³ Micronutrients added are minimum 2µg folic acid, 50µg Fe, 30µg Zn, 2.5µg vitamin B1 (thiamine) and 4ppm vitamin B2 (riboflavin) for 100 g flour.⁴⁴ The fortification program had been applied in the USA since the Food and Drug Administration (FDA) declared the food product's fortification program. Fortification products like flour, rice, pasta, cornflour and other product contain flour. Fortificant added are 140µg folic acid for 100g food products.⁴⁵ The fortification program can contribute to reduce the prevalence of micronutrients and risks of cardiovascular diseases, to become a potential effective program and to reach high coverage of the target population.^{3,15}

The program's effectiveness should include coverage, compliance and problem levels after the government applied for the supplementation program. The hypothetical coverage and the adherence to taking the pills reached 100%.⁴⁶ In 2011, WHO released a recommendation for weekly IFA supplementation for women

at reproductive age in areas with anaemia prevalence of 20% or higher, given in each three-month cycle.¹⁰ The supplementation aimed to reduce the prevalence below 20%. In Indonesia, compliance with supplements was insufficient to meet the reduction of anaemia prevalence.³³ The IFA supplementation program's coverage reached 90%, but the compliance was less than 50%, linear to the prevalence of anaemia (above 20%).^{11,12} The prevalence of anaemia with 20% indicates a serious public health problem as the supplementation program has been implemented for almost five decades. The effectiveness of the supplementation program is low and required a modifiable program to lessen the anaemia problem. As a supporting program, the fortification is still unable to eradicate the micronutrient deficiencies.

Optimizing digital media can be utilized to reach broader target population as other countries did.^{45,47} The authority may promote digitalization of nutrition education programs to provide various educational content. Public health problems should include multi sectors to formulate a sufficient, effective, and reliable program, especially in Indonesia.

CONCLUSION

IFA supplementation and fortification have been implemented for almost five decades, but micronutrient deficiencies are still a serious public health problem that multi stakeholders should consider. This concluded that the effectiveness of the program should be improved to diminish the micronutrient deficiencies.

The shortage of micronutrient deficiencies can reduce the quality of life. Multisector approach will have a significant impact on strengthening and enhancing existing programs. It is also necessary to promote a diversification program by utilizing digital media.

CONFLICT OF INTEREST

The author declared that there was no conflict of interest related to this study.

ACKNOWLEDGEMENT

This research was funded by the Directorate General of Higher Education, Ministry of Education and Culture Republic of Indonesia" through Penelitian Disertasi Doktor scheme no. 010.22/LP/UG/III/2018.

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