Mal J Nutr 23(1): 1 - 7, 2017

INVITED REVIEW

Food Fortification in Indonesia

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ABSTRACT

The paper highlights the history, policy, programs of food fortification intervention and its impact on reducing micronutrient deficiency, especially iodine deficiency disorders (IDD), iron deficiency anaemia (IDA), and vitamin A deficiency (VAD) in Indonesia. General issues in the management of food fortification, and lessons learned from the Indonesian experience are discussed in this paper.

Key words : Cooking oil fortification, mandated fortification, micronutrient deficiency, salt iodisation, wheat flour fortification

OVERVIEW

Historically, food fortification was introduced in Indonesia in 1927 when the Dutch Government issued a regulation requiring iodisation of the 'people' salt in some districts in Java (Soekirman,1974). Salt production was a monopoly of *PN Garam*, an enterprise of the colonial government then. Food fortification technology was only introduced in USA in 1920. What this meant was that Indonesia "learnt" of the technology only some years after that (Backstrand, 2002). However, it was decades before food fortification was discussed in Indonesia, as a priority program of national development; this occurred in 1978.

The first priority nutrition program was iodisation of salt to prevent and reduce iodine deficiency disorders (IDD). A joint agreement among various Ministries (Health, Industry, Trade, Interior, and Agriculture) was issued in 1985 to explore the feasibility of salt iodisation in some endemic provinces. This was followed by a Presidential Decree that mandated salt iodisation in 1994. With the Decree, the iodised salt industry expanded. The fortification policy was further strengthened by the National Food Law enacted in 1996 which had a chapter on Food Fortification.

With the Food Law, the Ministry of Industry issued a mandatory regulation in 2001 for wheat flour to be fortified with iron, zinc, folic acid, vitamins B1 and B2. Pros and cons arose including misleading perceptions about the objectives of the wheat flour fortification. Despite initial objections, currently all wheat flour in the market is fortified with the five nutrients mentioned above.

In 2008, a pilot project to fortify cooking oil with vitamin A was conducted in Makassar by the Ministry of Health and Indonesia Fortification Initiative (KFI) came into being, funded by the Asia Development Bank (ADB). The project concluded

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that it was feasible to produce cooking oil fortified with vitamin A as a national program, from the technology, economic, management and nutrition perspectives. In 2012, a voluntary regulation on cooking oil fortification with vitamin A was issued by the Ministry of Industry, and it will become mandatory in 2018.

Meanwhile in 2015 the Government of Indonesia initiated a pilot project to fortify rice for the poor with Fe and folic acid, conducted by BAPPENAS, Ministry of Agriculture and the National Food Logistics Authority (BULOG), funded by ADB. The results of the project are under consideration.

What is the basis for selecting which food commodities to fortify? It is based on the recommendations by the National Food Fortification Strategic Plan. This Plan was formulated at a workshop in CIsarua, West Java, December, 2004, organised by the Ministries of Health and Industry, the Food Producers Association, KFI and UNICEF, (Soekirman & Martianto, 2004). The Plan's recommendations are in line with the World Health Organisation (WHO) Guideline on Food Fortification (WHO, 2006).

SALT IODISATION

The first data on the prevalence of goitre in Indonesia appeared in the WHO Monograph Number 44, based on a review of pre-war publications (Kelly & Snedden, 1960) The review reported a high prevalence of goitre along the mountainous islands - the "goitrous belt" of the Indonesian Archipelago, namely, Sumatra, Java, Bali, East Nusa Tenggara, Papua, Sulawesi, and Kalimantan. There were villages with cretin populations and stunted children with low IQ due to IDD. Various studies on these areas in the 1960s and 1970s found the total prevalence of goitre in schoolchildren to be 61.9% for boys and 67.3% forgirls. The prevalence was twice as high as that in Thailand and Brazil in the 1940s and 1950s respectively, and a little better than the situation in Tanzania in 1965 (Soekirman, 1974). The high prevalence of goitre in Indonesia until the 1970s indicated that the problem of IDD had been neglected from the time of the country's independence in 1945. According to Soekirman (1974), there are several reasons for the neglect. One reason being that most nutrition research until the 1970s focused on protein calorie malnutrition (PCM), vitamin A deficiency (VAD) and iron deficiency anaemia (IDA). The other reason was because IDD was mostly found in remote areas that were difficult to reach. Only after the Nutrition Research Centre, Ministry of Health had published the results of a relatively large-scale survey on IDD in school children in Sumatra, East Java and Bali in 1973, that the health authority and local governments became aware of the seriousness of the IDD problem and its implications for the country (Nain *et al*., 1973). This resulted in increasing government budgets for IDD control programs, which became a priority in nutrition intervention measures.

The study of the Ministry of Health and World Bank in 1997-1998 (WHO-WB-MoH, 2001), and the Ministry of Health National Health study (RISKESDAS, 2013) reported that iodised salt coverage increased in the 1990s from only 30% in the 1980s to 68%-70% in 1998-2013. However, the latest data also revealed that the quality of iodised salt consumed is declining. Households consuming adequately iodised salt declined from 57% in 2006-2010 to 47% in 2011-2016 (Atmarita, 2016 pers comm.).

The IDD status of the general population studied, as measured by the Median Urinary Concentration (MUIC), indicated a normal range (above 200ug/L). Nonetheless, among the vulnerable groups, only the school-age children showed a normal MUIC but not women of reproductive age and pregnant women. The latter had below normal MUIC, especially the poor (Kartono, 2016). As a low MUIC during pregnancy can lead to impaired fetal growth re-

sulting in low birth weight and childhood stunting, this finding should be a "yellow light" for those in Indonesia who are managing programs that aim to reduce stunting.

WHEAT FLOUR FORTIFICATION

Based on the 1997-1998 Family Life Survey (FLS), the prevalence of iron deficiency anaemia (IDA) in Indonesia was about 36% among pregnant women and 46% for under-five children (Kendrick *et al.*, 2015). This prevalence was higher than the levels in other countries in the region (WHO, 2011). Wheat flour fortification was considered a cost effective intervention to reduce IDA. Thus soon after the National Food Law was enacted in 1996, the Ministry of Health issued a Ministerial Decree on wheat flour fortification. Together, the Food Fortification Commission (abolished in early 2000s) and the Millers Association (APTINDO), assisted by UNICEF, prepared an operational plan for the fortification of wheat flour. The plan was discussed at the National Food and Nutrition Conference("Widyakarya Nasional Pangan dan Gizi"–WNPG) in 1998,organised by BAPPENAS and the National Science Institute (LIPI) (Soekirman, 2011). On 14th January 1999, the program on wheat flour fortification with iron was officially endorsed by the government, represented by the State Minister for Food and witnessed by the UNICEF representative for Indonesia. In 2001, the Ministry of Industry enacted a National Standard Indonesia (SNI) on mandatory wheat flour fortification. All wheat flour except for non-food flour had to be fortified with 50 ppm of iron, 2 ppm of folic acid, 30 ppm of zinc oxide, 2.5 ppm of vitamin B1 and 4 ppm of vitamin B2. At that time, the iron fortificant was not specified.

The wheat flour fortification policy was challenged by a Government Agency for Competitive Trade (KPPU). They issued a press release on 27 September 2003 stating that wheat fortification could be a potential trade barrier and cast doubts on the benefits of flour fortification. It reflected lack of knowledge on the importance of the fortification policy. Despite the mandated law, illegal importation of unfortified flour was still available in the market then.

In 2007/2008, the global economic crisis resulted in price escalation of food commodities, including wheat flour. Food fortification was among the reasons blamed for the increase in food items. In February 2008, the cabinet revoked the mandated SNI on fortified wheat flour, after being in force for more than six years. This unexpected turnabout was strongly challenged by the press and the nutrition community, as well as the wheat flour producers. For months after the revocation, the government was criticised for being inconsistent with its development policy to reduce poverty. The KFI as an independent community organisation committed to food fortification together with APTINDO led the protest. Soekirman as the KFI Director wrote a letter to President SBY to reconsider the revocation for the sake of the poor. In August 2008, the government responded positively by reinstating the mandated fortification with improvement in its implementation (Soekirman, 2016). Currently, Indonesia has 30 wheat flour mills which have a 98% share of the Indonesian fortified wheat flour market (Wijaya, 2017, pers comm).

How about the impact? The Food Fortification Initiative (FFI) Report in 2014 reported that 79 countries had mandatory wheat flour fortification. Multiple studies on efficacy have demonstrated a reduction in the prevalence of anaemia, through increasing serum ferritin, but not haemoglobin levels. Indonesia has not conducted such a study, assuming that a reduction in the prevalence of anemia has also taken place in the country. In fact, some scientists insisted that there was no urgency to replicate an efficacy study in Indonesia. Only

one evaluation study was conducted by Sandjaja *et al.* (2008) in North Jakarta. Using a cross-sectional design based on flour consumption, the study found no clear association between the declining trend of anaemia and the intake of fortified wheat flour (Kendrick *et al.*, 2015). Although Sandjaja's study was not well accepted owing to its study design weakness, it was generally well received by government policy makers, who had been skeptical about the mandated law. The KFI believes this contributed to the "success" of high level lobby to revoke the mandated law in 2008.

Meanwhile in 2009, WHO recommended that Indonesia change the current use of electrolytic iron with a higher bioavailable iron compound, such as iron fumarate or sodium iron EDTA. The previous WHO recommendation only mentioned 50 ppm iron compound without specifying the type of iron. Electrolytic iron was selected by the Indonesian and international experts who attended the 1998 National Nutrition Seminar (WNPG,1998). There were no studies in Indonesia concerning the effectiveness of the iron compound used in the fortification, except for Sandjaja's study and the rigorous analyses of the FLS data series on anemia (1997, 2000 and 2007) by Kendrick *et al.* (2015). The analysis concluded that "Wheat flour fortification does not appear to have significantly contributed to the reduction in prevalence of anemia among women of child-bearing age in Indonesia". The lack of impact of wheat flour fortification on IDA in Indonesia is being resolved by changing the iron compound from electrolytic iron to an iron compound with higher bioavailability, such as iron fumarate or sodium iron NDTA.

COOKING OIL FORTIFICATION

VAD manifested by serum retinol concentrations (less than 0.7µmol/L), persists as a public health problem in Indonesia, affecting from 10% to over 50% of the population. In the WHO Global map of VAD for 1995-2005, Indonesia was noted as a moderate country for VAD prevalence (>10%-<20%). The national campaign providing a high-dose vitamin A capsule twice a year for children under 5 years of age since the 1970s had successfully reduced the prevalence of xerophthalmia - the clinical sign of vitamin A deficiency- to 0.33% in 1992. Thus, xeropthalmia is no longer considered a public health problem in Indonesia. However, Indonesia has not yet been able to achieve the coverage of vitamin A capsule distribution to the level necessary to eliminate low serum vitamin A concentrations (defined as < 5% of children with serum retinol concentrations < 20 µg/dL) (Sandjaja *et al.*, 2015).

The most common cause of VAD is insufficient dietary intake of vitamin A, which is normally found in animal-source foods, as preformed vitamin A (or retinol), and plant-source foods as pro-vitamin A. Unfortunately, vitamin A rich foods are relatively expensive for the poor. In fact, Dr. Oomen, the first Dutch medical doctor who did research on xeropthalmia and blindness in Indonesia, described xeropthalmia as the disease of "a poor man's child" (Oomen, 1974). This still holds true. Despite debates on the choice of intervention, food-based or non-food-based programs to prevent VAD, Indonesia has been implementing both (Latham, 2010; Soekirman, 2010. It is admitted that non-food-based programs, such as providing a high-dose supplement and food fortification have proven to be "quick yielding" and "more visible" outcomes to policy makers in reducing VAD, while being relevant to a poor environment as well.

Indonesia began experimenting vitamin A fortification with monosodium glutamate (MSG) in the 1980s. It was found effective in improving serum retinol levels of children (Muhilal *et al.*,1988). It was discon-

tinued in the 1990s due to a technical problem in that the colour of MSG was found unacceptable to both the producer and consumer. In 2008, the Ministry of Health and KFI conducted a pilot project to fortify cooking palm oil with vitamin A in Makassar, funded by ADB. The project developed a small scale pilot plant to produce fortified palm-cooking oil with vitamin A. An effectiveness study in the pilot area was conducted among school children; another study on consumer acceptance and willingness to pay was also carried out. The overall result of the pilot project was considered a success. (KFI, 2008; Soekirman *et al.,* 2012). In 2010, the Makassar pilot project was scaled-up nation-wide for five years (2010-2015) with funding from the Ministry of Health, Global Alliance for Improved Nutrition (GAIN), and Deutsche Gesellschaft fur Internationale Zusammenarbeit (GTZ) Germany. By the end of the project in 2015, it had succeeded in fortifying about 50% (680.000 MT) of total branded palm-cooking oil with vitamin A, covering about 78.4 million people assumed to consume 11.5 kg/capita/year. The most rewarding result of the palm oil fortification project is the impact on the vitamin A status of children and women. The VAD prevalence (serum retinol <20 mg/dl) was reduced to 50% for all ages, with the highest reduction seen among school children and women of reproductive age (Sandjaja *et al*., 2015). In order to cover all people (rich, poor, urban, rural) and "to reach the unreached", palm oil fortification with vitamin A will be mandated in 2018.

LESSONS LEARNT

The most important lesson that we have learnt before initiating food fortification is to "educate" government policy makers and the food industry on the 'what', 'why' and 'how' of food fortification. It is also important to provide the knowledge and evidence linking food fortification and reduction of micronutrient deficiencies that have a devastating impact on child physical growth and brain development.

Second, a national food fortification program has to be based on a national strategic plan or a road-map, formulated by the government, food industry, academicians, politicians, and professional organisations related to food and nutrition. Indonesia formulated such as a national strategic plan in 2004. The strategic plan addresses issues related to technology, trade, business, politics and management.

An important lesson learnt from the wheat flour fortification in Indonesia is that an impact evaluation should have been carried out sooner rather than many years after its implementation. The KFI believes this provoked political and trade issues resulting in the temporary revocation of the mandated wheat fortification policy in 2008.

There was also an issue of "why wheat and not rice" by those who questioned the priority accorded to fortifying wheat flour. The question was raised not only in Indonesia, but also in China, Vietnam, Thailand, and Malaysia. The KFI and APT-INDO chairmen were invited by UNICEF and the Flour Fortification Initiative (FFI) to present technical and professional explanations on this question at several international meetings in those countries in early 2000s (Soekirman & Wijaya, 2010).

Indonesia has encountered technical, business and political issues that have hindered the implementation of palm cooking oil fortification. There are some cooking oil producers who argue for the use of beta-carotene as a fortificant instead of vitamin A. In dealing with these issues, one has to understand the scientific, business, and political ramifications.

Finally, in order to manage a national food fortification program, a Public-Private-Partnership (PPP) approach is essential. The ADB Asia Conference on Food

Fortification in Manila 2001 recommended the establishment of an inter-sector, inter-discipline, independent and non-government organisation to manage the national food fortification program. In Indonesia, the Nutrition Foundation for the Development of Food Nutrition (KFI), founded and chaired by the present author, was inspired by the ADB Manila recommendation.

ACKNOWLEDGEMENTS

The authors acknowledge the permission given by Dr Atmarita to cite the most updated information on salt iodised consumption from the (late) Djoko Kartono, and the most updated data on wheat flour market share in Indonesia from Dr. BudiantoWijaya.

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