

*Short Communication*

## Malnutrition in Albania, related problems and flour fortification as a solution

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Micronutrient deficiencies are caused mainly by an inadequate intake of vitamins and minerals, as a consequence of an unbalanced diet composed mostly of carbohydrates in the conditions of poverty, the inability to take a variety of nutrients, the lack of knowledge on the most appropriate feeding practices and the relatively high incidence of infectious diseases. From a public health perspective, the importance of these deficiencies depends on the magnitude of their impact on health, especially among pregnant women, infants and children, given the consequences in the development of the fetus, in the growth of the child, the resistance to infections and the work performance later during the adult life. According to the Albanian Demographic Health Survey (ADHS) 2008 to 2009, conducted jointly by the Albanian Institute of Public Health (IPH) and the National Institute of Statistics (INSTAT), the nutrition status of the Albanian population indicates amongst many other characteristic, that anemia prevalence is highest among children living in mountainous areas, coastal areas and rural areas, respectively. In addition, 19% of women have anemia with the highest prevalence in breastfeeding women and those living in rural areas. Therefore this study aims at evaluating the cost-effective analysis of interventions targeting malnutrition in Albania and how to improve them especially through flour fortification.

**Key words:** Malnutrition, micronutrients, vitamins, minerals, deficiency, fortification, Albania.

### INTRODUCTION

Malnutrition, including undernutrition and overnutrition, and the interconnected physical and mental development, is a worldwide concern, still more pronounced in the developing countries. As such, nutrition is indispensably the cornerstone of the development agenda both at local

policy level and international aid and cooperation level.

The elaboration of the thesis for further actions is based on analysis of the public health situation in the country, available scientific evidence, expert opinions and recommendations supported and endorsed by World

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Health Organization (WHO), United Nations International Children Education Fund (UNICEF), Food and Agricultural Organization (FAO), Food Fortification Initiative (FFI), and a cost-effective analysis of the interventions targeting malnutrition in Albania. It reflects the position of the public health experts and is addressed to the food industry, the flour industry and all policymakers and decision-makers involved in designing and implementing a Programme of Flour Fortification in Albania (Jack, 2010; Oakley and Tulchinsky, 2010). The core recommendations stand on the type and the quantities of vitamins and minerals that should be added intentionally to the flour derived from wheat, in order to raise the intake of micronutrients and reduce the prevalence of micronutrient-related deficiencies in the population, considering it as a public health intervention (Jack, 2010; Stevens et al., 2011).

## METHODOLOGY

Data from baseline assessments, follow-up assessments and evaluations within the framework of the National Project "Reducing malnutrition among children in Albania", supported jointly by United Nation Agencies (UNICEF, FAO, WHO), were used in the elaboration of the thesis. Following the findings of the Albanian Demographic Health Survey (ADHS) 2008 to 2009 and the public health profile of the country, indicating that residents in mountainous and rural areas suffer more than residents in other areas of the country from anemia, wasting, stunting, mental disorders, immunodeficiency, infectious diseases, late stages of various diseases, further exploring studies were conducted during 2010, to better understand the reasons and the situation of anemia in the rural and mountainous regions of Kukes and Shkodra and two suburban areas of Tirana (the capital city).

## RESULTS

### Iron deficiency anemia

1. This includes 30% of children less than five years of age had anemia. The anemia prevalence was higher among children under five years of age living in the suburban areas of Tirana.
2. 29% of school age children had anemia. The highest level of anemia among school children was found among children in the northwestern region of Shkodra (42.9 %).
3. 42.6% of women of reproductive age had anemia. The highest level of anemia among women of reproductive age was found in the northern region of Kukes (57.1%).

Neural tube defects, as a consequence of the lack or insufficiency of the intake of folic acid before and during the first weeks of pregnancy, are manifested as spina bifida, anencephaly, or encephalocele:

1. The incidence at country level: 1.07 cases per 1000 live births.
2. The incidence in Tirana: 2.1 cases per 1000 live births.

3. The proportional mortality from neural tube defects: 17% of the total deaths among population 0 to 1 years of age (Jack, 2010).

## DISCUSSION

Taking into consideration the findings of the aforesaid studies and based on the WHO classification of the magnitude of anemia, considering anemia levels 5 to 19.9% as an intermediate public health problem, and anemia level 20 to 39.9% as a serious public health problem, a group of Albanian public health professionals and clinicians concluded that malnutrition related to micronutrient deficiencies should be considered a public health problem in Albania and that an action plan is paramount. According to the Document of Consensus of Copenhagen (2008), some of the most cost-effective measures for reducing malnutrition are:

1. Fortification of food with microelements such as iron, iodine, etc.
2. Supplements of micronutrient to children such as Vitamin A, zinc, etc.
3. Bio fortification.
4. Nutrition programs at community level.
5. Parasite control programs as school level.

A cost-effectiveness study conducted under the National Project "Reducing malnutrition among children in Albania" showed that the economic impact of malnutrition in the country accounts for 107 million USD or 1% of gross domestic product (GDP). Around 2/3 of the population could be protected from the effects of iron and folic acid deficiencies through the implementation of a programme of flour fortification. The cost of the fortifying premix is calculated at 2 USD for 1 ton of flour (0.2 Albanian Lek\*/kg) and the cost per person at 0.07 Albanian Lek/person/day.

Flour fortification is considered as of the most successful long term strategies for the elimination of iron, folic acid, and vitamin B12 deficiencies and their related health consequences, because of the following strategic advantages:

1. It is consumed by all social economic strata of the population, including low-income groups which are more likely of being at risk of malnutrition;
2. It is not costly and provides one of the most cost-effective means for covering large populations at risk;
3. It can be distributed throughout the country, accessible by target groups;
4. It is consumed daily and in constant quantities contributing to one's physiologic needs for micronutrients;
5. It can be processed in large quantities, allowing for the controlled fortification;

**Table 1.** Average level of the recommended micronutrients for the flour fortification based on the flour extraction rate, the composition of the fortification substance and the daily consumption per person.

Nutrient	Flour extraction Rate	Composition	The quantity of the nutrient to be added (ppm) based on the daily flour consumption per person (g/day)
			>300 g/day
Iron	High	NaFeEDTA	15
Folic acid	Low or high	Folic acid	1.0
Vitamin B12	Low or high	Cyancobalamin	0.008

6. It does not change the organoleptic qualities of flour, such as appearance, taste, color;

7. It is stable despite the minimal interaction with the fortification micronutrients, preserving the right concentration of nutrients following further processes and cooking;

8. It is safe because the low dose of micronutrients cannot lead to any accidental overdose of the fortification micronutrients;

9. It is socially acceptable because it doesn't require any change in the dietary habits;

10. It is sustainable because it is a market-based strategy.

Flour fortification is based on fundamental public health principles aiming at the effective and safe prevention of mineral and vitamin deficiencies within a population. The world experience tells us that 65 countries in the world have in place obligatory flour fortification legislation with at least two micronutrients: iron and folic acid. The selection of flour fortification micronutrients is based on the compromise between reasonable cost, fortificant bioavailability and the acceptance of any organoleptic changes, assuring the safety of the product.

The following recommendations focus on selected micronutrients whose intake is deficient by the Albanian population and that offer the possibility for inclusion in a national flour fortification programme (MOH-MDGIF-UN, 2011; John, 1998).

### Iron

Iron is essential for the physical and mental health of the pregnant women and children as well as for the physical activity and the work productivity at all ages. The timely treatment of iron deficiency is associated with health improvements and a 20% increase of the work productivity at national level (WHO, 2009). There is solid scientific evidence on the daily-recommended supplementary quantity of iron that is associated with an improvement of the iron sufficiency at the population level. Based on the individual daily flour consumption, there are 4 regimens of flour fortification. Iron as NaFeEDTA is recommended for the fortification of the flour that is rich in phytates because it is 2 to 3 times more bioavailable compared to other iron compounds. It does not accelerate the process of the flour turning rancid if stored for a long time. Based on the consensus

statement of the joint group of experts of WHO, FAO, UNICEF, Global Alliance for Improved Nutrition (GAIN), The Micronutrient Initiative (MI) and FFI and based on:

1. The average flour consumption rate in the Albanian population: 360 gram per person per day;
2. The flour extraction rate: high (about 70%);
3. The fortification formulation: NaFeEDTA.

The average dose of the supplemented iron is recommended at 15 ppm.

### Folic acid

Folic acid is one of the most important micronutrients needed for the development of the human being. The intake of sufficient quantities of folic acid by pregnant women prior to conception reduces by 50% the number of neural tube defects at infants. Actually, around 22,000 neural tube defects are prevented through the flour fortification with folic acid. Based on the consensus statement of the joint group of experts of WHO, FAO, UNICEF, GAIN-MI and FFI, folic acid as foliate form is recommended for flour fortification and the average dose of the supplemented folic acid is 1.0 ppm.

### Vitamin B12 (cobalamin)

Cereal does not contain vitamin B12, which is present only in animal products. Vitamin B12 deficiency is encountered at all ages in developing countries and mostly among the elderly population. The deficiency of vitamin B12 can lead to anemia, neurological disorders, cognitive disorders, negative pregnancy outcomes and damages of the bone mineralization among other consequences. Evidence shows that vitamin B12 deficiency exists in Europe and the supplementation in small quantities of it can prevent the deficiency. An obligatory flour fortification system in Europe can eliminate the vitamin B12 deficiency existence in the continent. Cyanocobalamin is the formulation recommended for vitamin B12 flour fortification and average dose of the supplemented vitamin B12 is 0.008 ppm. The following table (Table 1) represents a summary of the average level of the recommended micronutrients for flour

for flour fortification based on the flour extraction rate, the composition of the fortification substance and the daily consumption per person.

### The type of flour proposed for fortification

Based on the Albania assessment of milling industry for the purpose of wheat, the average annual flour consumption in Albania is 460,000 tons (432,000 tons processed in the country and 27,000 tons imported). The principal types of wheat flour processed in the country are 00, 40, 45, 50, 60 and 70, which are the ones that are recommended for fortification (Oakley and Tulchinsky, 2010; WHO, 2009; Winkels et al., 2008).

### Conclusion

The malnutrition of children and women at reproductive age in Albania, and the related effects on health, as a result of the insufficiency of micronutrients in the daily diet such as iron, folic acid and vitamin B12, is considered a serious public health problem in Albania. Flour fortification is one of the principal long-term strategies for reducing micronutrient deficiency at the population level, leading to subsequent health improvement. At the same time, this intervention provides a unique opportunity to the milling industry for expanding its market and increasing its profits, playing a key role to the improvement of the nutrition and health of the population.

### Conflict of interest

The authors declare that there are no conflicts of interest.

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