Review Article

Micronutrient deficiency and its alleviation: The case of Malaysia

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Since attaining independence in 1957, Malaysia has achieved marked socio-economic development including advances made in the health care delivery system. Vital statistics over the decades showed much improvement in the health status of Malaysians in general. For example, the infant, toddler and maternal mortality rates have declined to levels reflective of developed countries namely, 9.5, 0.7 and 0.2 per 1,000 live births respectively in 1997. The nutritional status of Malaysians mirrors a society that is undergoing nutrition transition. Consequences of the dual burden of under- and over-nutrition are evident in various age groups in rural and urban areas. Nutrition problems which persist include underweight and stunting in children, anaemia in young children, women and the elderly, iodine deficiency disorders in interior population groups in Sarawak and Sabah, folic acid deficiency among pregnant women, and subclinical retinol deficiency in young children. The Ministry of Health has played a pivotal role in implementing various nutrition intervention programmes towards the alleviation of these problems. These programmes will be elaborated.

Key words: iodine, iron, Malaysia, programmes, retinol.

Introduction

Micronutrient deficiency is described as a hidden hunger. Unlike the gnawing hunger that results from not having food, the hunger for micronutrients goes unnoticed, even by those affected.[1] Consequences of subclinical forms of micronutrient deficiency can be far reaching, affecting physical growth and causing problems with immunological and cognitive maturation that may be irreversible.[2]

Worldwide, the most serious forms of micronutrient malnutrition are iron deficiency, vitamin A deficiency and iodine deficiency disorders. These disorders presently affect 2 billion people or one-third of the world population. A multitude of strategies and intervention programmes have been implemented to combat these micronutrient deficiencies. These approaches include breeding for micronutrient-dense staple food, food fortification, use of supplements, and nutrition education. The efficiency and efficacy of some of these activities have been reviewed.[2–4]

The present article examines the case of Malaysia, which has been undergoing rapid economic development in recent decades. In the latest Human Development Report[5] Malaysia was seen to have a better socioeconomic and health status than several countries in the South-East Asian region, in terms of life expectancy at birth (74.5 years for women and 70.1 years for men), and infant, toddler and maternal mortality rates (9, 10, and 39 per 100 000 live births, respectively) (Tables 1,2).

Typical of a country that is in nutrition transition, Malaysia is burdened with both undernutrition and overnutrition challenges. On the one hand, protein–energy malnutrition persists in the form of underweight and stunting among young children in rural areas, ranging between 20–30% and 25–35%, respectively.[6] The figures are higher among Orang Asli (aborigine) children and those from the interior communities in Sarawak and Sabah. In contrast, prevalence of overweight in children from urban areas is emerging and levels of 10–15% have been reported.[7] Overweight among adults has been growing and the Second National Health and Morbidity Survey of the Ministry of Health Malaysia found 26.5% overweight (body mass index ≥25.0–29.0 kg/m^2).[8] While the prevalence of overweight children in rural areas remains very low (<2%), the same cannot be said for rural adults. Overweight among adults from rural areas has been spiraling and levels of 20% and 28% among men and women, respectively, have been found.[9]

Iron deficiency

The most important micronutrient malnutrition in Malaysia from the point of view of persistence and prevalence, is iron deficiency. During the British administration prior to the country's independence in 1957, there were several documentations

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Table 1. Human development indices[5]

	GDP per capita	Life expectancy at birth		Underweight under-5
	($US)	Female	Male	%
Singapore	31 139	79.5	75.1	NA
Indonesia	972	67.5	63.7	34
Malaysia	4251	74.5	70.1	19
Philippines	1092	70.5	66.8	28
Thailand	2593	72.1	65.9	19
Vietnam	331	70.0	65.3	41

GDP, gross domestic product; NA, not available.

Table 2. Human development indices[5]

	Mortality rate per 100 000 live births		
	Infant	<5 years	Maternal
Singapore	4	5	6
Indonesia	40	56	450
Malaysia	9	10	39
Philippines	32	44	170
Thailand	30	37	44
Vietnam	31	42	160

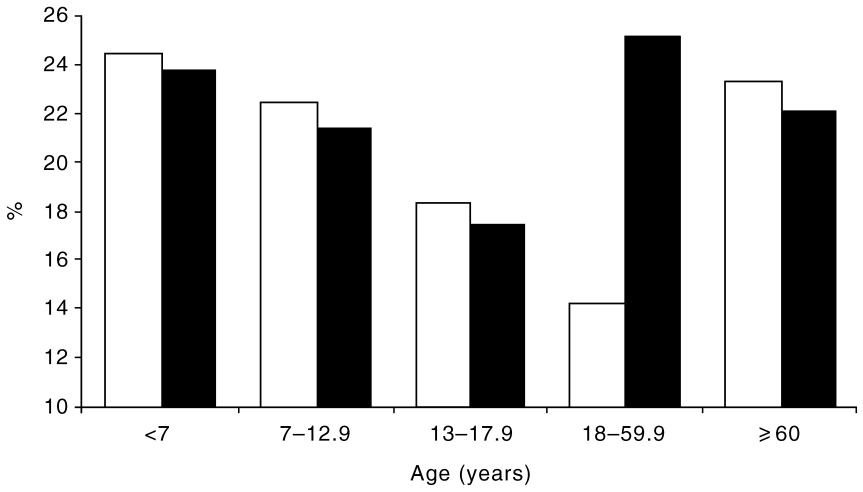

Figure 1. Prevalence of anaemia.[13] (□), male; (■), female.

of serious nutritional anaemias (including iron, B12 and folic acid deficiency) among rubber estate workers and pregnant women, as reviewed in the literature by Tee.[10] Over the decades, anaemia has been identified in various age groups. Among preschool children, a prevalence ranging from 18% to 33% in rural areas was recorded.[11–13] The latter study that assessed anaemia in over 8000 subjects in rural communities, also identified a high prevalence of anaemia in children aged 7–12 years of both sexes (22%), female subjects aged from 18 to under 60 years (25%) and the elderly of both sexes (23%) (Fig. 1). Figure 2 shows the mean haemoglobin concentrations by age groups for this study,[13] showing that a larger proportion of the curves for the younger age groups is placed toward the lower end of the haemoglobin levels, compared to the curves for the older age groups.

A survey in 1999–2000 by the Ministry of Health and supported by UNICEF[14] confirmed the persistence of quite a high prevalence of anaemia in young children. The proportion of children aged below 5 years with haemoglobin concentrations <11 g/dL was found in 18.3% and 20.8% of the boys and girls, respectively (Table 3). The age group that appears to have the highest prevalence is that of 12 months to under 24 months, an age period that coincides with cessation of breast milk and reliance largely on complementary foods.

In poor households, complementary foods are usually based on rice or flour made from wheat or tapioca with little protein and heme iron. Besides poor dietary intake, helminthic infection is another important contributing factor to the higher anaemia rates in young children. In the study on poor

villages, Chong *et al.* found that 71% of the preschool children and 90% of the primary school children were infected.[12] High levels of worm infection are often reported among Orang Asli children and children living in estates, reflecting poor sanitation and inadequate water supply in their communities.

Vitamin A deficiency

Early reports on clinical forms of vitamin A deficiency have been recorded since the 1920s, up to the 1960s. Cases of keratomalacia, xerophthalmia, conjunctival xerosis and other ocular symptoms related to vitamin A deficiency were reported, particularly among young undernourished children.[15,16] By the 1970s there were fewer reports on clinical signs of vitamin A deficiency, reflecting an overall improvement in the health and nutrition situation of the population, in tandem with the country's economic progress.

Nonetheless, subclinical forms of vitamin A deficiency continue as determined by biochemical assessment. The Interdepartmental Committee on Nutrition for National Defense found that 25% of male and 31% of female children aged 5–9 years had blood vitamin A levels ≤0.7 μmol/L (< 20 μg/dL).[17] Ng and Chong found that 32% of preschool children from rural areas had a blood retinol level of ≤0.7 μmol/L.[18] The latter finding, when judged against the current WHO[19] criteria, indicates that Malaysia had a severe subclinical vitamin A deficiency status at that time. Low consumption of protein and fat was the main contributing factor to the poor vitamin A condition of poor rural children.

It can be said that the vitamin A situation has improved, according to the recent Ministry of Health and UNICEF survey, which included assessment of blood retinol in more than 400 children under 5 years. It was found that 2.5% of the male and 4.5% of the female children had a blood retinol level ≤0.7 μmol/L (Table 4). Based on this finding, Malaysia may be said to have a mild subclinical vitamin A deficiency status. Thus, unlike the situation with anaemia that remains at a relatively high level, vitamin A deficiency seems to have abated over the past couple of decades with respect to severity.

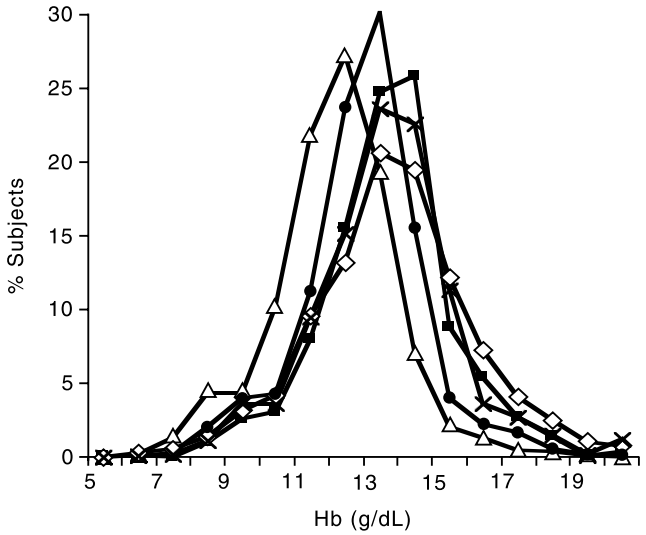

Figure 2. Mean haemoglobin levels by age group (both sexes).[13] (△), <7 years; (●), 7–12.9 years; (■), 13–17 years; (◆), 18–59.9 years; (×), ≥60 years.

Iodine deficiency disorders

In the 1970s and 1980s, several studies highlighted the widespread occurrence of goitre in Sarawak. Palpable goitre was detected in young children and adults.[20,21] In a review by Tan of studies that had been undertaken since the 1950s, it was estimated that approximately half of the 25 districts in Sarawak could be classified as goitrous with high prevalence rates of palpable goitre.[22] The gravity of the problem led to legislation being passed in 1982, making the import of iodized salt compulsory. Its availability increased from 28% in gazetted goitrous areas in 1988 to 65% in 1995. Another approach toward delivering iodine to the community was through the fitting of an iodinator into the existing gravity-fed water supply in the village.[23] Since its implementation in 1993, the use of the iodinator had reached 300 villages and 40 boarding schools by 1997.

Goitre is prevalent among Orang Asli women and to a lesser extent in children, not only from the interior communities but also in peri-urban villages.[24] Poor dietary intake of iodine-rich food and high intake of goitrogenic food such as tapioca roots and leaves are implicated in the aetiology of goitre among Orang Asli.

In order to determine the goitre rate in young children based on WHO/UNICEF/ICCIDD recommendations, the Ministry of Health carried out a survey of more than 7000 children aged 8–10 years in peninsular Malaysia. Based on iodine determination of urine specimens and international cut-off points, the goitre prevalence of children in urban and rural areas were 1.4% and 3.1%, respectively, with girls in both areas having slightly higher goitre rates.

Table 3. Prevalence of anaemia (<11 g/dL) MOH/UNICEF study[14]

Age (months)	Male		Female	
	%	*n*	%	*n*
Below 12	24.4	41	9.1	33
12 to <24	28.1	57	38.5	39
24 to <48	12.5	104	19.4	103
48 to <60	13.3	45	15.6	32
All ages	18.3	247	20.8	20.7

Table 4. Prevalence of vitamin A deficiency (≤0.7 μmol/L)[14]

Age (months)	Male		Female	
	%	*n*	%	*n*
Below 12	5.6	36	9.1	33
12 to <24	1.9	54	8.2	37
24 to <48	2.9	104	2.0	99
48 to <60	4.6	44	3.1	32
All ages	2.5	238	4.5	201

Alleviation of micronutrient deficiency: existing regulations and programmes

The National Coordinating Committee on Food and Nutrition (NCCFN) was formed in 1994 in response to the global commitment to eradicate malnutrition made at the FAO/WHO International Conference on Nutrition (ICN) held in Rome in 1992. Toward this end, the National Plan of Action for Nutrition (NPAN) was developed for Malaysia in 1995, and this consists of detailed strategies and activities for each of the nine thrust areas identified at the ICN. One thrust area refers directly to micronutrients; namely, 'preventing and controlling specific micronutrient deficiencies', while the remaining eight thrusts can be said to have indirect implications on micronutrients.

The main objectives of the NPAN thrust area on preventing and controlling micronutrient deficiency in Malaysia include the following: (i) to reduce the prevalence of anaemia among (a) preschool children and (b) pregnant women from 30% in 1990 to 20% by 2000, respectively; (ii) to reduce the proportion of children aged 8–11 years with goitre to <5%; and (iii) to increase the median urinary iodine excretion of school-age children to >10 μg/dL.

Various public programmes have been implemented in an effort to attain these objectives. These intervention efforts provide specific micronutrients or nutritious food items that are aimed at improving the overall nutritional status of the recipients.

Micronutrient and food supplement programmes

The Ministry of Health has been providing iron, folic acid and B complex to antenatal mothers for many years.

Underweight children from families whose income is below the poverty income line (as determined by the Economic Planning Unit) are eligible to receive a monthly package of essential food items. Iron and multivitamins are included in this package or food basket subject to the availability of the supplements. This programme is specially supported by the Prime Minister's Department.

Cooked meals are given to preschool children in preschools that are managed by the Ministry of Rural Development (Kemas preschools). Multivitamins are provided by some centres and iron may be included.

Full cream milk powder is distributed through the Maternal and Child Health Clinics to selected cases such as underweight children aged 6 months–7 years, pregnant women who have not gained adequate weight, and lactating mothers with multiple births from low socio-income status. The milk powder is given for three consecutive months, after which each case is reviewed and supplementation is continued if necessary.

The School Supplementary Feeding Programme of the Ministry of Education provides a meal that meets one-quarter to one-third of the recommended daily allowances for energy and protein, to primary school children from low-income families.

The Ministry of Education also provides milk in 250-mL packages on certain days a week to primary school children in rural and urban areas. Children from low-income families do not have to pay for the milk while other children pay a subsidized price.

Nutrition education programmes

Nutrition education is an important activity of the Ministry of Health. The Family Health Clinics routinely disseminate nutrition education on balanced diet, food preparation techniques and promotion of iron-rich foods.

As a follow-up activity of the NPAN, a Technical Working Group for Training has been carrying out training of trainers from various agencies using modules that include emphasis on balanced diet and healthy lifestyles.

The importance of breast-feeding including its nutritional and immunological significance, has been advocated for many years by the Ministry of Health and non-government organizations.

The Ministry of Education includes basic aspects of nutrition in the primary and secondary school curriculum.

Nutrition and food preparation demonstrations are part of the home economics classes of the Ministry of Agriculture.

Professional bodies including the Nutrition Society of Malaysia and Malaysian Dietitians' Association have been active in disseminating information to the public on food and nutrition.

Conclusion

It is shown that, in Malaysia, the nutritional situation in general and the micronutrient deficiency status in particular can be deemed to be less serious than that in several South-East Asian countries. Nonetheless, it remains a matter of much concern to note the persistence of problems of undernutrition in the midst of challenges from overnutrition. These 'old' problems include (i) underweight and stunting among young children in rural areas; (ii) anaemia in young children, female subjects of reproductive age and the elderly; and (iii) endemic goitre particularly in Sarawak and Sabah and among Orang Asli women.

Intervention efforts need to be intensified especially among the poor in rural and urban areas. In times of an economic crisis, such as that which occurred during 1997–1998 and from which many countries in the region are still struggling to recover from, there is a need for a safety net programme in order that the marginally malnourished do not suffer further. In this context, existing food supplement programmes should be evaluated periodically for their efficacy and efficiency, toward rendering these programmes more cost-effective and helping them to reach the deserving target subjects.

While the use of micronutrient supplements serves as an important approach toward the alleviation of malnutrition in specific conditions and cases, such as pregnancy, lactation, the malnourished and sick, the long-term solution of micronutrient deficiency lies in food-based intervention programmes. There are many locally available foods including legumes, tubers, nuts, fruits and vegetables that should be more widely utilized for their specific nutrients.

Finally, there is a need to carry out national assessment on the prevalence of deficiency of important micronutrients including zinc and folic acid, toward developing a sound dataset on the micronutrient status of Malaysians.

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