Micronutrients and urban life style: selected studies in Jakarta

Schultink W[2] PhD, Gross R[1] PhD, Sastroamidjojo S[1] MD, Karyadi D[1] MD,PhD

1. *Regional SEAMEO-TROPMED Center for Community Nutrition, Jakarta, Indonesia.*
2. *Deutsche Gesellschaft für Technische Zusammenarbeit, Germany.*

Urbanisation runs in parallel with economic growth. Urban areas are characterised by income inequality between population groups. Because of inequality in socioeconomic situation, Indonesian urban areas are confronted with problems of undernutrition and overnutrition. Selected studies conducted by the SEAMEO-TROPMED Regional Centre for Community Nutrition have demonstrated that food intake of the lower socioeconomic class households is deficient. Furthermore, intrahousehold food distribution among the lower economic class households is contributory to the determination of food intake. The prevalence of anaemia in urban Jakarta ranges from as low as 4.5% in female school children to as high as 63.2% in pregnant women. Zinc deficiency might also be prevalent among lactating mothers. Strategies for improvement of urban micronutrient status are required and may include food-based, nutrient supplementation of fortification methods.

Urban life, nutrition and health

In many South-East Asian countries, economic growth has been rapid during the past decade. In Indonesia, the annual average economic growth between 1970 and 1991 was 6.8% with an average population growth of about 2.2%. In association with economic growth, progressive urbanisation has occurred: more and more people have moved from rural to urban areas. In Jakarta, the population increased from 6,546,000 in 1971 to 7,750,000 in 1985. At the present time, people living in Jakarta are estimated to be around 10,000,000. By the year 2030, up to 50% of the Indonesian population may be living in urban areas. This rapid urbanisation process causes problems for housing facilities, transportation, job availability, food production and distribution, and general infrastructure.[1]

Typical of urban areas are the income inequality between population groups and the differences in ethnic background. The large differences in living conditions are especially clear when squatter areas are compared with high-income housing areas. However, urban life has its advantages. Jakarta has the highest life expectancy of Indonesia (64.3 for males and 68.2 for females), and the greater number of hospital beds available per person (1.6 per 1000).[2]

Irrespective of ethnicity or economic status, urbanites share certain commonalities with respect to food consumption. They are: dependency on income for food, no or limited amount of own food production, a high degree of exposure to new or unknown food products, a large variety of foods available for consumption, a high rate of consumption of street foods or restaurant foods.

Urban nutrition problems reflect food availability and difference in life style compared to rural areas. A large inequality in socio-economic situation, especially in urban areas, has caused Indonesia to face problems of both undernutrition and overnutrition. This situation has partially contributed to epidemiological shift, with changes in mortality patterns. In 1986, infectious diseases were the leading cause of death in Indonesia. Since 1992, cardiovascular diseases have become the leading cause of death as shown in Table 1.

Table 1. Causes of death in Indonesia

Cause of death	1986 (%)	1992 (%)
Cardiovascular diseases	9.2	15.3
Tuberculosis	6.5	11.1
Pneumonia/ARI	6.0	9.9
Diarrhoea	11.4	7.2
Other infections	13.5	6.6
Chronic obstructive lung disease	3.8	5.5
Injury, accidents	5.0	5.4
Neoplasm	4.2	4.9
Tetanus	4.9	1.3

Data from Soekirman et al.[2]

The prevalence of malnutrition among children, as assessed by growth retardation, is generally lower in urban areas than in rural areas. On the other hand, the nutritional status of poor urban populations may be as bad as or even worse than that of rural populations. In 1989, it was estimated that

This paper was presented at the International Workshop on 'Modern Lifestyles and Micronutrient Deficiency' in Nusa Dua, Bali on October 19-21, 1995.

Correspondence address: Dr Werner Schultink, Regional SEAMEO-TROPMED Centre for Community Nutrition, PO Box 3852, Jakarta 10038, Indonesia
Tel: +62-21-390 7695, Fax: +62-21-390 7695

about 45% of under-five children living in Jakarta were underweight.[2]

The presence of conventional deficiencies of vitamin A, iron, and iodine are more associated with populations in underdeveloped rural areas with lack of resources or infrastructure. In principle, selection of foods available in urban areas should be able to guarantee a sufficient intake of micronutrients. However, the actual micronutrient status of different parts of the urban population may be unsatisfactory. This may be due to factors such as insufficient purchasing power, inadequate knowledge about the importance of consumption of micronutrient rich foods, certain habits related to intra-household food distribution, and other priorities besides food.

This paper aims to present several studies carried out at the Regional SEAMEO-TROPMED Center for Community Nutrition which may be indicative of the micronutrient status of selected groups of the population in Jakarta. First, two studies will be presented in which food intake was assessed, then the micronutrient status of selected groups assessed biochemically will be discussed. The studies presented in this paper focus more on the problem of undernutrition rather than overnutrition, although the importance of the latter problem is certainly recognised.

Food intake studies

Adolescents

Food consumption was assessed among selected groups of adolescent girls. The subjects attended a public school or a private school in East-Jakarta. Girls attending the private school came from higher socio-economic class families than those from the public school. Food intake was assessed through a 1-day 24-h recall method. The girls were aged between 16-18 years, and their mean ± SD body weight was 46.8 ± 5.6 kg and 48.1 ± 4.9 kg, respectively, in the public and private schools. The energy and protein intakes were assessed as satisfactory. Iron and vitamin A intake were assessed as less sufficient, especially among the girls from the public school. The WHO recommends for these girls a daily intake of 500 µg retinol equivalents and 12.5 mg iron.[3] Many girls did not meet these requirements. In both groups 18% of the daily iron intake was provided by animal foods. About 20% of all girls reported use of vitamin/mineral supplements on a daily basis. These supplements consisted mostly of vitamin C and multivitamin tablets.

Table 2. Nutrient intake from food of adolescent girls from two different schools

	Public school (n= 63)	Private school (n= 50)
Energy (kcal)	2098.0 ±488.0	2286.0 ± 467.0
Energy (kcal/kg)	45.6 ± 12.5	48.3 ± 12.4
Protein (g)*	53.0 ± 13.0	60.0 ± 14.0
Protein (g/kg)	1.2 ± 0.3	1.3 ± 0.3
Fat (g)	54.0 ± 24.0	56 ± 22.0
Iron (mg)*	10.7 ± 4.0	14.0 ± 4.7
Vitamin A (µg RE)*	728.0 ± 970.0	1242.0 ± 1000.0

Values are in mean ± SD; *Difference between groups (P<0.01). Daily requirements are 500µg RE for vit A, and 12.5 mg Fe

Household consumption patterns

Another study aimed to assess intra-household food distribution in urban Jakarta. One group of households (n= 20) was selected with an income of less than US $17 per capita per month, and another group (n= 20) was selected with more than 30 US $ per capita per month. The selected households were living in the same area in East-Jakarta. In each household the food consumption was studied of a father, mother and a child between 2 to 5 years of age. Fathers worked as lower level office employees or on private basis. Food intake was assessed by a 3 day observed weighed intake combined with 24-hour recall for foods eaten outside the household. Nutritional status of the fathers (by BMI) and children (by W/A and H/A) of the greater income households was significantly better than nutritional status of the poorer households. All household members obtained 20-30% of their daily energy intake from pre-prepared foods bought from street vendors, small shops etc.

Table 3. Intake of selected nutrients by members from households from low and middle-low economic class.

	Father		Mother		Children	
	High	Low	High	Low	High	Low
Energy (kcal)	2386	2229	1748	1791	1390	1153
Adequacy (%)	97	81	89	88	105	99
Vitamin A (µg RE)	783	343	420	324	597	260
Requirement	600		500		400	
Iron (mg)	19	17	20	15	12	7
Requirement	9		12.5		5.5	
Calcium(mg)	2174	1665	1522	1213	1190	777
Requirement	700		700		400	

Requirements were obtained from reference 3.

Energy intake was quite well distributed among household members although mothers tended to have a lower intake. Fathers from the lower economic group had the lower energy intake (P<0.01). The micronutrient intake in the lower economic class households was not as good as in the higher economic class. Except for vitamin A intake, the requirements of the fathers was covered. Vitamin A intake of mothers from both household groups was too low. Vitamin A and iron intake of children of the lower economic class was assessed as being too low or marginal. It can be concluded that generally, the food intake of the lower economic class households was deficient. Furthermore, intra-household food distribution among the lower economic class households played a role in determining food intake.

Prevalence of anaemia among selected groups in Jakarta

A number of studies were carried out to investigate the problem of nutritional anaemia. In Table 4, an overview is given of the prevalence of anaemia among investigated groups in urban Jakarta.

From Table 4 it can be concluded that anaemia was present among all investigated groups. Although these subjects were not representative for the population of Jakarta, it can be assumed that anaemia is a nutritional problem of importance among the urban population.

Vulnerable groups are under-fives, adolescent girls, and women in the reproductive age group.

Table 4. Prevalence of anaemia among urban population groups.

Population	Prevalence	
Under-fives	Male	26.4%(n=292)
	Female	27.9%(n=283)
School children	Male	9.1% (n=62)
	Female	4.5% (n=61)
Adolescents	Male	2.5% (n=118)
	Female	21.1% (n=805)
Pregnant women		63.2% (n=209)
Lactating women		40.0% (n=85)
Factory women		50.0% (n=92)
Elderly	Male	8.9% (n=100)
	Female	13.1% (n=52)

Anaemia was defined as: Hb<110 g/L for under-fives, school children, and pregnant women; Hb<120 g/L for non-pregnant women and adolescent girls; and Hb<130 g/L for adult males and adolescent boys.

Micronutrient status of lactating mothers

Subjects in this study were 101 women in the first 6 months of lactation. The women were living in Kampung-Tengah in East Jakarta, which can be classified as a lower social-economic class area. The subjects were selected with the help of local health care staff. Samples consisted of the full milk content of one breast and 10mL venous blood, collected between 9.00 - 11.00 am. Only 10% of the women reported that they consumed vegetables on a daily basis; 40-70% of the women consumed different kinds of vegetables on a weekly basis. Fruits with a high vitamin A content were consumed several times per week by 39% of the women. Margarine, which is enriched with vitamin A in Europe, was consumed either daily or several times per week by 19% of the women. Almost 50% of the women consume noodles (Indomie) at least several times per week. The most frequently consumed animal product were eggs, which were consumed by 12% of the women on a daily basis.

Table 5. Indicators of micronutrient status of lactating mothers.

	Mean ± SD	N	Preferred concentration
Haemoglobin (g/L)	124 ± 18	85	
Haematocrit (%)	37.4 ± 3.3	86	
Serum Retinol (µg/dL)	38.5 ± 11.1	76	
Serum β-carotene (µg/L)	104.2 ± 71.1	76	
Serum Zinc (µg/dL)	85.5 ± 24.2	86	
Retinol in milk (µg/100 g)	52.3 ± 43.1	81	
β-carotene in milk (µg/100 g)	0.97 ± 0.85	80	
Zinc in milk (mg/L)	3.13 ± 2.15	91	

Of the studied women, 40% were anaemic with haemoglobin<120 g/L. Vitamin A deficiency did not occur since none had retinol concentrations below 10 µg/dL (0.35µmol/L). 4.1% of the women had a marginal status with retinol concentrations below 20 µg/dL (0.70µmol/L). Zinc deficiency may have occurred among these women since 18.6% had serum zinc concentrations below 65 µg/dL. As a comparison, anaemic lactating women from West-Java had breastmilk retinol concentrations of about 28 µg/dL, which was lower than the values in these women (Table 5). No significant relationship existed between serum retinol and haemoglobin concentration.

Zinc deficiency was reported to negatively influence vitamin A status. There was however no difference in serum retinol concentration (p=0.87) between women with low serum zinc (<65µg/dL) and women with sufficient serum zinc (>65µg/dL). Zinc concentrations in blood and milk were not correlated, and women with low serum zinc values did not have lower milk zinc values than women with higher serum zinc.

Vitamin A and zinc status of anaemic children

A study was carried out among anaemic stunted pre-school children. Subjects were selected among pre-schoolers in Tambora district of urban Jakarta than households of low social economic class. Of 370 eligible children, 42% were stunted and, among the stunted children, 47% were anaemic. Iron status, vitamin A and zinc status were determined in these children.

Table 6. Iron, vitamin A, and zinc status of anaemic undernourished pre-schoolers (n=67).

Variable	Mean ± SD	Preferred Concentration
Haemoglobin (g/L)	101 ± 12	
Serum ferritin (µg/L)	5.98 ± 3.32	
Serum zinc (µg/dL)	87 ± 12	
Vitamin A(µg/dL)	15 ± 5	

3.2% of the children were zinc deficient with values below 65 µg/dL. Vitamin A deficiency occurred in 15.2% of the children with serum retinol values below 10µg/dL (0.35 µmol/L), while 65.1% of the children had a marginal vitamin A status with retinol values between 10-20 µg/dL (0.35 - 0.70 µmol/L). These results reflect that among malnourished young children micronutrient deficiencies are prevalent, specifically iron and vitamin A deficiency. Among the investigated urban pre-school children no indication of zinc deficiency existed.

Conclusion

There is still much room for improvement of the micronutrient status of many urban population groups to Jakarta. This situation is probably not unique to Jakarta since a similar situation with respect to iron and vitamin A deficiency has been reported for Manila.[1]

Several options exist to improve the micronutrient situation. The most desirable option would be to improve micronutrient status through an improved food intake. As stated before, in urban areas a wide selection of foodstuffs is available, and, in principle, micronutrient requirements could be covered by food intake. This option is, however, dependant on factors which may be difficult to change on a short-term basis, such as the economics or food habits. Furthermore, the bioavailability of micronutrients from cheaper foods such as green leafy vegetables, may be suboptimal.[4]

Another way to improve micronutrient status may be through food fortification or enrichment. This option may be effective. However, in practice, it may not be easy to carry out for various reasons. It may be difficult to select a suitable food for fortification. The selected food should be consumed by the target population and the fortification should not influence taste or textural properties. Furthermore, the price of the fortified food should not be appreciably higher than that of the unfortified food.

Supplementation of target groups with tablets or syrups is probably the fastest way to improve micronutrient status. A disadvantage in this approach is that it often involves the already overburdened health sector. Recent investigation of the required frequency of iron supplementation shows, however, that the involvement of the health sector in supplementation schedules may be reduced.[5,6] Important considerations in supplementation are bioavailability, competition among micronutrients for absorption, price, taste, and compliance of target groups. The potential for micronutrient overdose (Fe, vitamin A) should also be considered.

The most favourable was to improve micronutrient status in urban areas would seem to be a combination of food fortification and supplementation. With respect to food fortification, novel foods may need to be identified which are more aimed at, and accepted by, specific target groups instead of fortifying only staple foods. Free market strategies, and alternative distribution methods for supplements can be developed. It is noteworthy that use of supplements is already accepted among vulnerable groups such as adolescent girls.

Micronutrients and urban life style: selected studies in Jakarta

Schultink W, Gross R, Sastroamidjojo S, Karyadi D

Asia Pacific Journal of Clinical Nutrition (1996) Volume 5, Number 3: 145-148

微量营养素与大都会化生活方式：亚加达选择行研究

都市化的过程与经济增长是平行的。都市按居民的收入不同而分 类。由于社会经济状况不同，印尼大城市同时存在营养不良和过度营养的问题。由SEAMEO－TROPMED营养学会进行的选择行研究证实，低经济收入阶层的食物摄取缺乏。在亚加达，女学童的贫血率为4.5％，而孕妇高达63.2%。锌缺乏在乳母中可能很普遍。这就需要由改善城市微量元素状况的策略，可包括基本食物及强化营养素等方法来实现。

Micronutrien dan pola hidup perkotaan: beberapa studi pilihan di Jakarta

Werner Schultink; Rainer Gross; Soemilah Sastroamidjojo, Darwin Karyadi

Urbanisasi berjalan seiring dengan pertumbuhan ekonomi. Daerah-daerah perkotaan ditandai dengan kesenjangan penghasilan di antara masyarakat. Oleh karena kesenjangan keadaan sosioekonomi, daerah perkotaan Indonesia dihadapkan pada masalah gizi kurang dan gizi lebih. Beberapa studi pilihan oleh SEAMEO-TROPMED Regional Centre for Community Nutrition menunjukkan bahwa keluarga dengan kelas sosioekonomi yang rendah memiliki asupan makanan yang kurang. Lagi pula, distribusi pangan dalam keluarga dengan kelas sosioekonomi yang rendah mempengaruhi asupan makan. Prevalensi anemia di perkotaan Jakarta berkisar antara 4.5% pada anak sekolah wanita hingga 63.2% pada ibu hamil. Defisiensi seng juga diduga prevalen di antara ibu menyusui. Jelas bahwa strategi untuk memperbaiki status mikronutrien pada masyarakat perkotaan sebaiknya dilaksanakan secara serius. Beberapa rekomendasi telah diajukan dalam makalah ini.

References

1 Pongpaew P, ed. Asian workshop on nutrition in the metropolitan area. Southeast Asian Journal of Tropical Medicine and Public Health 1992;23 (Suppl. 3).

2 Soekirman, Tarwotjo I, Jus'at I, Sumodiningrat G, Jalal F. Economic growth, equity and nutritional improvement in Indonesia. United Nations ACC/SCN, 1992.

3 FAO/WHO 1988 requirements for vitamin A, iron, folate and vitamin B12. Report of a joint FAO/WHO expert consultation. Rome: Food and Nutrition series FAO, 1988.

4 de Pee S, CE West, Muhilal, D Karyadi, JGAJ Hautvast. Lack of improvement in vitamin A status with increased consumption of dark-green leafy vegetables. Lancet 1995;346:75-81.

5 Schultink W, Gross R, Gliwitzki M, Karyadi D, Matulessi P. Effect of daily versus biweekly iron supplementation in Indonesian pre-school children with a low iron status. Am J Clin Nutr 1995; 61:111-5.

6 Gross R, Schultink W, Juliawati. Treatment of anaemia with weekly iron supplementation. Lancet 1994; 344:821.