SPECIAL ARTICLE

Anthropometric, vitamin A, iron and immunisation coverage status in children aged 6 - 71 months in South Africa, 1994

South African Vitamin A Consultative Group (SAVACG)

Objective and design. To establish the anthropometric, vitamin A, iron and immunisation coverage status of children 6 - 71 months of age in South Africa by means of a national survey.

Setting. South Africa.

Participants. The study population consisted of all children in the country aged 6 - 71 months. A total of 18 219 households (19 003 families) was selected on the basis of a national probability sample with disproportionate stratification by province.

Outcome measures. Serum retinol, serum ferritin, haemoglobin, mean corpuscular volume, weight, height and immunisation status.

Results. According to international criteria, the national prevalence of marginal vitamin A status found in the survey identifies the country as having a *serious* public health problem of vitamin A deficiency. Stunting is a *major* problem in the country and is more prevalent in rural than in urban communities. In terms of anaemia and poor iron status, children in the 6 - 23-month age group were the most severely affected. A trend for increased immunisation coverage over the past 5 years was evident in every dose and in the percentage of fully immunised children.

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Protein energy malnutrition (PEM) in South Africa is known primarily to affect children of underprivileged rural and peri-urban communities; in 1989, the prevalence of chronic PEM was reported to range from 10% to 67% among black children younger than 14 years of age.[1] Poverty, landlessness, food insecurity, high birth rate, lack of political commitment, migrant labour, lack of breast-feeding, poor maternal nutrition education and absence of a national nutrition policy, as well as lack of trained personnel, have contributed to the problem.[2,3] PEM is also known to be associated with micronutrient deficiencies, and in children in developing countries three micronutrient deficiencies, namely vitamin A, iodine and iron, are considered to be major public health problems and are currently receiving high priority worldwide. Collectively, these micronutrient deficiencies contribute to growth retardation, brain damage and diminished cognitive function, as well as increased susceptibility to and severity of infections, and mortality.[4]

In Africa, vitamin A deficiency is reported[4] to affect 1.3 million children younger than 5 years of age and iodine deficiency to affect 39 million people, whereas iron deficiency anaemia affects 59.4 million women 15 - 49 years of age. In South Africa, clinical iodine deficiency (estimated from sub-national data and total goitre rate (TGR) prevalence in border regions of neighbouring countries) is not commonly seen;[5] deficiency (both on biochemical and clinical grounds) may, however, be present in some specific areas (Western Cape, Northern Cape, KwaZulu-Natal, Northern Province and Eastern Transvaal) of the country.[6] The prevalence of xerophthalmia is reported to be low countrywide (< 0.06%),[7,8] most cases occurring only in certain areas of the Northern Province, where vitamin A supplementation, among other measures, has already been implemented to reduce clinical vitamin A deficiency.[9] The prevalence of marginal vitamin A status, however, is largely undefined.[10] A considerable number of fragmented small-scale studies on iron status have consistently identified pregnant women, infants and primary school children as being the most susceptible populations likely to have iron deficiency of varying severity.[11,12] Significantly, however, previous and recent studies also indicate a high prevalence of iron overload, especially in men.[13,14]

At the end of the 1970s, fewer than 10% of the world's children were being immunised.[15] The nutritional status of the majority of children was therefore being further compromised by infectious diseases, which are known to impact adversely on growth and development.

The available evidence regarding the significant adverse effects of malnutrition as well as micronutrient malnutrition on the health and development of children was highlighted at the World Summit for Children, held in New York in December 1990, in which political leaders from around the world endorsed the World Declaration on Children,[16] subsequently also signed by President Mandela and Deputy President De Klerk. The Declaration specifically targets the year 2000 for the virtual elimination of vitamin A and iodine deficiency, and a one-third reduction in the number of women with iron deficiency anaemia; in addition, the goal is to achieve 90% immunisation coverage among under-1-year-old children, eradication of poliomyelitis, elimination of neonatal tetanus, a 90% reduction in measles cases, and a 95% reduction in measles deaths compared with pre-immunisation levels. Furthermore, the rights and needs as well as the growth and development of children are clearly identified priorities in the government's Reconstruction and Development Programme, which emphasises that the 'needs of children must be paramount throughout all programmes aimed at meeting basic human needs and socio-economic upliftment'.[17]

Given the paucity of national data on growth and micronutrient status of children younger than 6 years of age, the South African Vitamin A Consultative Group (SAVACG)

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was formed in 1993, initially with the aim of determining the growth and micronutrient status of South African children with a view to assisting decision-making on the development of comprehensive preventive and intervention programmes. Following discussions with the Department of Health and UNICEF, the mandate of the Group was extended to include the assessment of immunisation coverage and visible goitre.

This report provides the results of the first ever national survey of children under the age of 6 years in respect of vitamin A, iodine, iron, anthropometric and immunisation coverage status. The report also makes certain recommendations on these issues which will, it is hoped, be considered for implementation by the Department of Health.

Objectives of the study

The main objectives of the study were to establish the vitamin A, iron, anthropometric and immunisation coverage status of children aged 6 - 71 months in South Africa by socio-economic status and geographical and age distribution, as well as degree of urbanisation; further, the subsidiary objectives of the study were to establish, in the same population, the prevalence of visible goitre and the prevalence of breast-feeding.

Survey methodology

The study population consisted of all children aged 6 - 71 months in South Africa. A national probability sample was drawn with disproportionate stratification by province. Provincial weighting factors were therefore used in the analysis of the data. Most of the fieldwork was conducted between July and October 1994. A total of 360 clusters were studied, of which 358 were available for analysis. Of these, 163 were rural and 195 were urban. A total of 18 219 households (19 003 families) were selected for the study. The age distribution of the children sampled (N = 11 430) was fairly consistent across all provinces and across age groups. Approximately half of the sample of children were girls. A total of 4 788 blood samples were drawn for the determination of serum vitamin A and serum ferritin concentrations as well as a full blood count; a similar number of blood samples was drawn from rural and urban areas.

Key findings

One in 3 children had a marginal vitamin A status (serum vitamin A concentration < 20 µg/dl). Children living in the rural areas and whose mothers were poorly educated were the most disadvantaged. According to international criteria, the national prevalence (33%) of marginal vitamin A status found in this study identifies South Africa as having a *serious* public health problem of vitamin A deficiency. Also of importance is the finding that a small proportion (1%) of children had serum vitamin A concentrations higher than 50 µg/dl.

One in 5 children in the country was anaemic, 1 in 15 moderately anaemic and 1 in 500 severely anaemic. In terms of iron status, 1 in 10 children was iron-depleted or deficient, 1 in 20 was severely iron-depleted or deficient, and 1 in 20 had iron deficiency anaemia. Anaemia and poor iron status were more prevalent in urban areas. Children in the 6 - 23-month age group were the most severely affected.

As a group, children with marginal vitamin A status were at a significantly higher risk of also being anaemic and of having iron deficiency anaemia; children with vitamin A deficiency (serum vitamin A concentration < 10 µg/dl) were at even higher risk of being anaemic. Three out of 20 children would appear to have had an underlying infection or inflammation, or alternatively might have had an underlying folate or vitamin B_{12} deficiency.

Almost 1 in 4 children was stunted and 1 in 10 underweight. This translates into approximately 660 000 preschool children being identifiably malnourished and 1 520 000 being stunted because of long-term malnutrition. The prevalence of stunting peaked (23%) in the 12 - 23-month age group and remained fairly constant across age groups thereafter. According to international criteria, stunting is a *major* problem in this country, especially in some provinces, and, in general, it was more prevalent in rural than in urban communities, in children living in traditional or informal housing, and in those whose mothers were less well educated.

Nine out of 10 1-year-old children had an immunisation card and 6 out of 10 had a visible BCG scar; 7 out of 10 were considered to be fully immunised, although only 6 out of 10 were fully immunised by their 1st birthday. Children in the rural areas were less likely to be fully immunised, to possess an immunisation card or to have a visible BCG scar. Children living in traditional houses were more likely not to be immunised at all, and those of less educated mothers had lower coverage. The average drop-out rate between BCG and the first measles dose was 11%. A trend for increased immunisation coverage over the past 5 years was evident in every dose and in the percentage of fully immunised children; the measles dose showed consistently higher coverage in younger age groups, whereas a slight reduction in coverage of DTP3 and OPV3 was noted in the 3-year-old age group. Only a small percentage of OPV and DTP doses (2 - 3%) were given within too short an interval (thus making their effectiveness doubtful), compared with the much higher percentage (29 - 35%) of doses that were given with too long an interval between doses (even though that does not impede the effectiveness of the vaccine). The later doses (i.e. those not given at birth) were mostly given in fixed or mobile clinics and in hospitals; private immunisers played a minor role.

One out of 100 children was seen to have visible goitre. These findings should, however, be interpreted with caution, since the assessment of visible goitre, on its own, is subjective and may underestimate the prevalence of iodine deficiency disorders.

Almost 9 out of 10 children 3 years of age had been breast-fed for a varying length of time. A greater proportion of rural children (91%) than urban children (83%) were breast-fed; in general, a greater percentage of rural children were also breast-fed for longer periods. Over the last 5 years, a tendency for young children who were breast-fed at all to be breast-fed for less than 3 months, was apparent; this trend was particularly prominent in urban communities. Employment at the time of the survey did not appear to affect the prevalence of breast-feeding practices, but a higher percentage of children of well-educated mothers were breast-fed for less than 3 months.

There were interprovincial differences in the findings of the study; in general, however, the three most seriously disadvantaged provinces were the Northern Cape, the Eastern Cape and the Northern Province.

Key recommendations

A national programme to distribute high-dose vitamin A

capsules should be instituted, starting with the provinces at highest risk, for a period of 3 years for all children 6 - 71 months of age. No child should receive more than 2 doses per annum, unless this is prescribed by a paediatrician. The immunisation services and the 'well-baby clinic' programme should be used to implement distribution of the vitamin A capsules every 6 months. Alternatively, the capsules should be administered through primary health care clinics (fixed or mobile) or by community health workers during predetermined 1-day campaigns. The dose should be recorded on the 'Road to Health' card. High-dose vitamin A supplements should also be administered to all children who present to health centres with malnutrition, measles or diarrhoea. The administration of the supplements should also be recorded on the 'Road to Health' card. Lactating mothers should receive a *single* high-dose vitamin A supplement within the 1st month postpartum during one of the postnatal visits, for an initial period of 3 years. Continuation of this practice in children and lactating mothers will depend on the assessment of vitamin A status after that period. The feasibility of fortifying food(s) consumed in adequate amounts by children at risk should be investigated by the Department of Health with a view to implementation.

An iron sulphate syrup supplement distribution programme should be instituted for a period of 3 years primarily for all children in the 6 - 23-month age group. For children at risk and aged 24 - 71 months, a screening system, using haemoglobin concentration, should be introduced and iron supplements administered as necessary. Iron supplements should also be dispensed to children who have been ill, but *only* during the period of convalescence. The feasibility of fortifying baby and toddler foods with iron should be investigated by the Department of Health with a view to implementation.

The preschool child, especially the very young child (< 2 years of age), should be the prime target group for nutritional intervention, and the mother for nutrition education. At present, both these aims should be achieved concurrently within the existing health facility-based and community-based nutrition programmes. All children with anthropometric measurements that fall two standard deviations below the reference median should be targeted. The supplementary foods that are provided currently, or may be provided in the future, should not simply concentrate on energy content but also on dietary quality and micronutrient composition. Due consideration should be given to creating crèche/rehabilitation facilities within the community and at the workplace, especially in provinces with a high prevalence of stunting and in disadvantaged communities within provinces which have a high prevalence. Similarly, health facility-based rehabilitation centres should be established for the intensive treatment, supervision and follow-up of severely malnourished children. Income-generating activities could be linked to these structures.

A surveillance-driven programme should be developed using disease surveillance data to guide management decisions; such a system should allow for the rapid reporting and for the control of outbreaks with targeted immunisation responses. A functional referral system should be established for immunisations that cannot be given immediately in non-immunisation health facilities; opportunities for immunisation should also be created by offering evening or weekend clinics. 'Mopping-up' campaigns should be introduced to eliminate pockets of low coverage. Provincial managers should be encouraged to eliminate low coverage with limited 'mopping-up' or 'raking' strategies in these areas. A lifetime health record for each person should be established by devising a 'self-retained health record', which will contain information on birth history, immunisation, growth monitoring, serious diseases such as tuberculosis, allergies, and any chronic treatment.

Within the limitations of the methodology employed and the age of the population studied, iodine deficiency may occur in selected parts of the country. The need for better definition of iodine status at the national level in school-going children should be seen within the framework of other national health priorities.

The prevalence of exclusive breast-feeding for 4 - 6 months in South Africa is largely unknown and should be defined. Within the framework of health care services, and primary health care in particular, exclusive breast-feeding for 4 months, where possible, should be promoted and implemented according to international goals, in order to maintain the high prevalence of breast-feeding recorded in most provinces in the study. The factors responsible for the documented tendency for younger children to be breast-fed for periods shorter than 3 months, especially in urban areas, should be identified. A 'warm-chain' for breast-feeding should be established which should include the alleviation of the everyday constraints with which a lactating mother may be faced both at home and at the workplace. In South Africa, these goals should be achieved in close partnership with all relevant role players and with due consideration to and respect for the choice of an informed mother regarding the feeding of her child.

Encompassing recommendations

The prevalence of vitamin A deficiency, iron deficiency and anthropometric status of children under the age of 5 years as well breast-feeding practices should be incorporated in the national health information system as an indicator of the success of national, regional and local health programmes. Effective management is fundamentally crucial to the success of all of the proposed recommendations, and it should incorporate training on all the aspects on which recommendations are made as well as on the monitoring and evaluation of the proposed intervention programmes.
At the end of the proposed 3-year period a repeat survey should be conducted to evaluate the impact of the proposed recommendations. The Directorate of Nutrition should establish consultative groups, such as SAVACG, mandated to monitor the anthropometric and micronutrient status of children. The decision to implement the interventions recommended should be accompanied by a multifaceted evaluation programme and strategies to: (*i*) increase consumer awareness of adequate micronutrient intake; (*ii*) increase awareness of the importance of immunisation; (*iii*) increase awareness of the importance of breast-feeding; (*iv*) improve health worker training in respect of stunting, micronutrients, breast-feeding and immunisation; (*v*) evaluate, and adapt as necessary, the currently dispensed micronutrient supplements in health care facilities; and (*vi*) regulate or legislate for food fortification programmes.

The long-term improvement of the nutritional and micronutrient status of children should be addressed within the proposed framework of the Nutrition Committee regarding an integrated nutrition strategy for South Africa,

which must be compatible with the ethos and principles of the government's Reconstruction and Development Programme for socio-economic upliftment.

General recommendations

The Department of Health should investigate the feasibility of establishing and maintaining a nationally valid sampling frame for children. It could achieve this goal in collaboration with research institutions and universities. Both the Department of Health and the Medical Research Council, with or without the assistance of the private sector, should develop appropriate mechanisms to initiate multi-institutional and multisectoral research allowing South Africa to develop its own health research capacity through national co-operation. The Department of Health at national, regional and local level, as well as the Medical Research Council and the universities, should develop strategies, with appropriate financial support, to respond to health research problems of major national, regional or local importance in relatively short periods of time. The need for expert assistance to the three most disadvantaged (within the framework of this study) provinces should be assessed and, when assistance is required, strategies should be developed to make such expertise available. SAVACG agreed and recommended unanimously that should the Department of Health continue with food supplementation of children, such supplementation should be given to young children, i.e. up to the age of 5 years, or even only up to 2 years, rather than to children of school-going age. A more specific study should be conducted regarding access to television services by South Africa's children and their caretakers, and a strategy should be developed for the optimal use of television for health education and promotion in both rural and urban populations.

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Copies of the full report can be obtained from SAVACG, PO Box 182, Isando, 1600.