Community and International Nutrition

Iron and Vitamin A Deficiency in Long-Term African Refugees[1,2]

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ABSTRACT   Five cross-sectional surveys were conducted in African refugee camps to assess the level of iron deficiency anemia and vitamin A deficiency in populations dependent on long-term international food aid and humanitarian assistance. The prevalence of anemia in children [hemoglobin (Hb) <110 g/L] was high, with >60% affected in 3 of 5 camps. Iron deficiency [serum transferrin receptor (sTfR) >8.5 mg/L] was also high, ranging from 23 to 75%; there was also a strong ecological correlation between the prevalence of iron deficiency and anemia among different camps. Within camps, sTfR predicted the concentration of Hb with adjusted R^2 values ranging from 0.19 to 0.51. Although children were more affected, anemia was also a public health problem in adolescents and women. The effect of recent recommendations on Hb cutoff values for African populations was assessed and found to produce decreases in the prevalence of anemia of between 5 and 21%; this did not affect the public health categorization of the anemia problem within the most affected camps. Mean serum retinol in children, after adjustment for infection status, ranged from 0.72 ± 0.2 to 0.88 ± 0.2 μmol/L in the 4 camps assessed and vitamin A deficiency (<0.7 μmol/L) was present at levels ranging from 20.5 to 61.7%. In areas in which vitamin A capsule distribution programs were in effect, coverage ranged from 3.5 up to 66.2%. The high level of micronutrient deficiencies seen in long-term refugees argues in favor of further enhancements in food aid fortification and the strengthening of nutrition and public health programs.   J. Nutr. 135: 808–813, 2005.

KEY WORDS: • micronutrient malnutrition • refugee • anemia • vitamin A deficiency

In recent years, many refugee operations in Africa and elsewhere have become protracted, and people have ended up living in camp environments for extended periods of several years. Here, they have a heavy dependence on international food aid and other forms of assistance. The United Nations World Food Programme (WFP)[4] and the United Nations High Commissioner for Refugees (UNHCR) play key roles, in conjunction with national governments, in meeting the needs of these populations. A number of international and national nongovernmental organizations also play crucial roles in providing health, water, sanitation, and community services, while at the same time, refugee populations often work hard to achieve as much self-reliance as they can within the constraints of the natural and political environment in which they find themselves.

Micronutrient deficiency diseases have been regularly reported in food aid–dependent populations, including rarely seen conditions such as pellagra, scurvy, ariboflavinosis, and beriberi (1,2). Outbreaks of such diseases continue to be documented (3,4).

Relatively little information has been published on the prevalence of the more widely prevalent deficiencies of iron, vitamin A, and iodine. Public health nutrition practices of vitamin A capsule distribution, iron and folate tablet supplementation for pregnant women, and the supply of a balanced food aid ration, including fortified blended foods and iodized salt, are well established. It is generally considered that if properly implemented, these should result in a low prevalence of chronic micronutrient deficiencies in postemergency, well-established refugee camps.

To investigate this assumption we undertook a number of surveys in long-term African refugee camps in 2000–2002 with the aim of assessing the effectiveness of the international aid response in preventing micronutrient deficiencies. Here, we report data on anemia, iron deficiency, and vitamin A status from 5 refugee camps in East and North Africa. Data on the iodine status of the same populations will be reported separately.

SUBJECTS AND METHODS

Survey sites in North and East Africa were selected on the bases that they were established long-term camps with large populations

dependent on international food aid and humanitarian service provision, and little information available regarding the micronutrient status of the population. In addition, they were sites in which UN, Government authorities and implementing agencies expressed interest and agreement for the proposed assessment. They were also required to have reasonable levels of access and security.

Sampling method. Sample sizes were calculated for each survey parameter in the individual camps using EpiInfo 6.04 based on estimates of the expected prevalence and assuming a design effect of 2. A 2-stage cluster sampling methodology was used, and subject selection for micronutrient assessments was performed in conjunction with the routine anthropometric measurement of children 6–59 mo old. The target population for the micronutrient assessment was defined as: children (6–59 mo), adolescents (10–19 y), and women (20–55 y) who were resident in the refugee camps at the time of the survey. Cluster and household selection was performed using standard WHO procedures (5). Within each household, all eligible subjects were selected for inclusion. A household was defined as a group of people who shared resources such as shelter, water, food, and income. The working definition for each survey site was decided after discussions with local staff. Biochemical and parasitological samples were collected, typically, from the first 7 individuals sampled in each age group from 30 clusters. Absentees were traced by revisiting the household on 2 separate occasions. If any subjects refused, they were not replaced. Collection of age data was based, where possible, on vaccination or health record cards, or subject or parental recall. For children whose age could not be determined, a height range of 65–110 cm was used to identify children aged 6–59 mo (5).

Staff training and data collection. Typically, 4 separate survey teams were used consisting of 3–4 local medical and nutrition staff. All team members attended 2–3 d of training on the selection of individuals to be sampled, collection of biochemical samples including the importance of universal safety precautions, collection of parasitological samples, and detection of clinical signs of micronutrient deficiency diseases.

Ethical approval. The surveys were conducted in compliance with the Declaration of Helsinki as revised in 1983. Ethical approval for the surveys was obtained in each country from the relevant government and UN authorities responsible for refugee health and nutrition. Before survey initiation, community leaders were consulted to discuss any questions and reservations that they had on the process of surveying the population. Individual informed consent was obtained from all participants before samples were taken; because of the particular situation of these populations, it was emphasized that refusal to participate in the surveys would have no negative effect on their entitlements to food aid or other services. No material benefits, other than feedback on their nutritional and health situation were offered to encourage participation. Any subjects found to be suffering from malnutrition or infections were referred to the camp health facilities using local referral criteria.

Blood collection and measurement of hemoglobin (Hb). All blood samples were peripheral and collected from a finger prick made using a safety lancet (HemoCue® AB). One drop was taken for Hb measurement and further samples from the same finger stick were taken for the biochemical and parasitological analysis described below. Blood taken for the preparation of serum was collected into Microtainer™ serum separator tubes (BD, Franklin Lakes) and stored at 4–8°C until centrifugation ($1000 \times g$ for 5 min) at the end of each day. Serum samples were stored frozen at approximately −20°C until transportation on wet ice from the field survey sites to the laboratories of the Institute of Child Health in London for biochemical analysis. Anemia was assessed using the HemoCue B-hemoglobin Photometer, utilizing the azide methemoglobin principle. Cutoff values for defining anemia were taken from WHO recommendations (6).

Detection and measurement of malaria. Infection with *Plasmodium falciparum* was detected in peripheral blood using a rapid diagnostic test (Amrad ICT), in Kakuma, or by conventional thin film slide microscopy using Field stain in Acholpii, or thin and thick film Giemsa stain in Fugnido. These analyses were performed in field laboratories set up at the survey sites.

Measurement of serum transferrin receptor (sTfR). Analysis of sTfR was performed on serum using a sandwich ELISA kit purchased from Ramco Laboratories (catalog number TF-94). Survey samples were analyzed in 4 separate batches, and the intrabatch CV for the assay ranged from 3.5 to 6.5%. Concentrations >8.5 mg/L were used to define iron deficiency. Iron deficiency anemia (IDA) was defined as subjects with both an abnormal sTfR and Hb concentration.

Measurement of C-reactive protein (CRP). A sandwich ELISA methodology, similar to that used to measure sTfR, was applied in the analysis of peripheral blood samples (7). Survey samples were analyzed in 3 separate batches and the intrabatch CV for the assay ranged from 5.0 to 20.7%. A cutoff value of >10 mg/L was used to classify subjects with a concurrent acute phase response.

Measurement of serum retinol. Serum retinol was measured by HPLC. Serum samples were thawed and methanol added to disrupt the binding of retinol to retinol binding protein. The retinol in the sample was then extracted using hexane. The hexane in the extract was evaporated to leave a residue containing the retinol. The residue was dissolved in methanol and analyzed using a reversed-phase column and a mixture of methanol and water as the mobile phase. Retinol was detected by monitoring the absorption at 325 nm. Retinol acetate was used as the internal standard. Survey samples were analyzed in 3 separate batches and the intrabatch CV for the assay ranged from 3.3 to 8.2%. Subjects with serum retinol concentrations of 0.7–0.35 μmol/L were classified as being at medium risk and those with concentrations <0.35 μmol/L at high risk for adverse effects.

Vitamin A capsule program coverage. Program coverage was assessed by a recall questionnaire asking mothers or caregivers whether their child had received a capsule within the 6 mo before the survey. Capsules were described to the mothers or caregivers but example capsules were not shown.

Data collection entry and analysis. Data were entered and analyzed using EpiInfo 6.04d, Excel 2000, and SPSS version 11. Confidence intervals for proportions were calculated using the C-Sample program within EpiInfo, which allows for the design effect of cluster sampling. Ecological correlations and relations between continuous variables were tested using regression. The Mann-Whitney test was used for testing for differences in the mean of nonnormally distributed continuous variables. The χ^2 test was used to test for differences in proportions, and risk ratios were used as a measure of relative risk. Significance was taken at the $P < 0.05$ level.

RESULTS

The 5 surveys described in this paper were conducted between March 2001 and September 2002 (**Table 1**). Population size is based on camp statistics collated by UNHCR around the time of the surveys. At the time of the surveys, the camps had been open from 8 to 27 y. Although some population movements into and out of these camps have occurred during this period, the sites fulfilled the criteria of providing populations that have had a long-term reliance on international food aid and humanitarian service provision. The origin of most refugees was from East Africa and the Horn including Sudan, whereas in Algeria they originated from Western Sahara. Acute malnutrition (wasting), measured in 6- to 59-mo-old children, was present at levels considered to indicate a worrisome or serious nutritional situation at the time of the surveys (8).

Anemia and iron deficiency. The prevalence of anemia in children was generally high, ranging from 12.8 up to 72.9% among different camps (**Table 2**), whereas mean Hb values ranged from 98 to 129 g/L. Severe anemia ranged from 0 up to 9.4%. In camps in which it was possible to collect reliable age data (Kakuma, Acholpii, and Tindouf), a significant positive correlation was seen between Hb and age. In Acholpii (81.7 vs. 68.8%) and Tindouf (52.1 vs. 26.3%), but not Kakuma, the prevalence of anemia in the 6- to 23-mo-old age group was higher than in the 24- to 59-mo-old age group (χ^2; $P < 0.05$). No significant difference was seen in the mean age between camps. Recently, it was suggested that an adjustment of 10 g/L should be made for populations of African origin when setting

TABLE 1

Summary of surveys undertaken

Camp name	Country	Survey date	Date camp established	Population size	Main country of refugee origin	Acute child malnutrition[1]
				n		%
Kakuma	Kenya	March 2001	1992	72,459	Various (East Africa and the Horn)	17.2
Acholpii	Uganda	June 2001	1993	21,500	Sudan	9.3[2]
Fugnido	Ethiopia	Oct. 2001	1993	28,088	Sudan	20.7[3]
Kebribeya	Ethiopia	Nov. 2001	1991	11,634	Somalia	NA[4]
Tindouf	Algeria	Sept. 2002	1975	155,430	Western Sahara	10.6

[1] Wasting defined as a weight-for-height Z-score less than −2 of the National Center for Health Statistics/WHO median.
[2] Results reported from a survey conducted by the International Rescue Committee, June 2001.
[3] UNHCR/WFP/Administration for Refugee and Returnee Affairs, May 2001.
[4] NA, not assessed.

cutoff levels for defining anemia (6,9). Decreases of between 5 and 21% in the prevalence of total anemia occurred when the revised cutoff was applied, whereas IDA declined by a smaller amount, i.e., between 1 and 13%. However, application of the revised cutoff did not affect the public health categorization of anemia within the worst-affected camps.

Iron deficiency in children was assessed by the measurement of sTfR using a cutoff value of >8.5 mg/L. The prevalence of iron deficiency was high, ranging from 22.6 up to 75.0%. The data shows a strong ecological correlation between the prevalence of iron deficiency and anemia in a comparison among camps (**Fig. 1**). Within camps, sTfR predicted the concentration of Hb with adjusted R^2 values ranging from 0.19 to 0.51 ($P < 0.001$), and iron deficiency was a significant relative risk for anemia in all camps except Acholpii (data not shown).[5] A negative ecological correlation between the mean concentrations of sTfR and serum retinol was also significant (adjusted $R^2 = 0.88$; $P = 0.042$), suggesting the coexistence of risks for multiple deficiencies within populations.

The prevalence of malaria infection was estimated from subsamples in 3 camps (Kakuma, Acholpii, and Fugnido). The assessment was omitted in Tindouf, which has no malaria because of the very dry Saharan desert environment, and was not performed in Kebribeya (North Eastern Ethiopia) due to security and logistic constraints. Slide-positive malaria infection had a prevalence of 6.7% (95% CI, 1.5, 21.0) in Kakuma,

42.0% (22.0, 64.4) in Fugnido, and 60.0% (48.9, 70.2) in Acholpii (northern Uganda). In Fugnido, all 4 species of *Plasmodium* were detected with *P. falciparum* being the most common, whereas only *P. falciparum* was detected in the other 2 sites. In Acholpii, we examined the relation between slide-positive malaria and anemia at an individual level and found that, as expected, current infection with malaria was a significant risk factor for anemia in children ($n = 163$; risk ratio 1.29; 95% CI, 1.05, 1.58). In this camp, slide-positive malaria infection in anemic subjects was also associated with a decrease in mean sTfR (12.4 vs. 16.2 mg/L; $n = 86$, Mann-Whitney $P = 0.012$). This was presumably due to the effect of malaria infection on erythropoiesis and the iron recycling that occurs after parasite-induced hemolysis.

To investigate the distribution of anemia among the different age groups, adolescents and women were also included in some surveys. A comparison of the prevalence of anemia among age groups in Acholpii and Fugnido camps (**Fig. 2**) shows both the relative vulnerability of children and the levels of anemia that are indicative of a public health problem in adolescents and nonpregnant women.

Vitamin A deficiency. Vitamin A deficiency was present at high levels ranging from 20.5 to 61.7% in the 4 camps that were assessed (**Table 3**). The prevalence was calculated after exclusion of subjects with an active acute phase response because this may lead to a decrease in circulating concentrations of retinol and the identification of false positives. An active acute phase response was defined as a C-reactive protein concentration >10 mg/L. Reporting of unadjusted values

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[5] This analysis was not possible for Kakuma due to theft of survey data files before analysis.

TABLE 2

Anemia and iron deficiency in 6- to 59-mo-old children from different camps[1]

Camp	*n*	Mean Hb[1]	Total anemia (Hb < 110 g/L)	Severe anemia (Hb < 70 g/L)	*n*	Mean sTfR	Iron deficiency (sTfR > 8.5 mg/L)
		g/L	%			mg/L	%
Kakuma	194	100 ± 20	61.3 (50.4, 72.3)	6.2 (2.2, 10.2)	107	11.3	59.8 (45.5, 72.7)[2]
Acholpii	225	98 ± 17	72.9 (66.1, 79.7)	5.3 (2.6, 8.1)	144	12.5	75.0 (68.5, 81.5)
Fugnido	202	101 ± 18	62.9 (54.9, 70.9)	9.4 (5.2, 13.6)	83	11.9	65.1 (52.6, 77.6)
Kebribeyah	210	129 ± 19	12.8 (7.0, 18.6)	1.0 (0.0, 2.3)	93	7.4	22.6 (11.6, 33.6)
Tindouf	204	115 ± 16	35.3 (26.7, 43.9)	0.0	182	8.8	34.1 (27.4, 40.7)

[1] Values are means ± 1 SD; the prevalences of anemia and iron deficiency are given with 95% CI in parentheses.
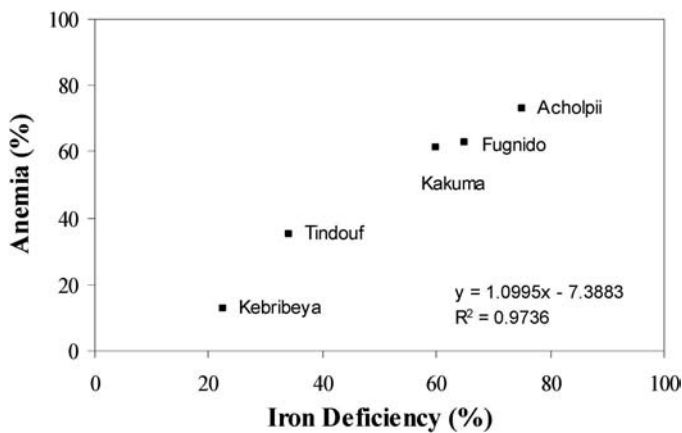[2] Calculated assuming a design effect of 2.

FIGURE 1 Correlation between the prevalence of iron deficiency and anemia in 5 different refugee camps. Hb and sTfR were determined in children 6–59 mo old.

would give higher prevalence estimates ranging from 26–74% for total deficiency and substantially increase the proportion of the high-risk deficiency group. The number of subjects excluded due to elevated C-reactive protein was 10 in Kakuma, 58 in Acholpii, 31 in Fugnido, and 23 in Kebribeya. In these data sets, there was no correlation between age and retinol concentration.

Coverage of vitamin A distribution programs was assessed by a recall question on the receipt of a capsule within the last 6 mo and varied greatly from 3.5 to 66.2%. At the time of the survey in Tindouf, there was no active routine distribution program; thus, coverage was not assessed at this site. The generally low level of coverage contrasts with current recommendations for vitamin A capsule supplementation of young children every 4–6 mo (5).

DISCUSSION

The data presented above provide the first systematic investigation of micronutrient deficiencies in long-term African refugee camps and reveal serious concerns regarding micronutrient malnutrition. Survey implementation often took place in challenging conditions in remote locations and a guiding principle in design was that the survey should be integrated within standard anthropometric nutrition surveys so as to minimize disruption to ongoing operations and maximize use of scarce resources.

Accurate determination of age is extremely difficult in many emergency or refugee nutrition surveys and a height cutoff value is routinely used when age is not known. During the surveys reported here, when age was unknown, a height range of 65–110 cm was used to identify children aged 6–59 mo. When age could be determined reliably (Kakuma, Tindouf, and Acholpii), no significant difference existed among the camps in the mean age of subjects. In the assessment of vitamin A status, we used the 6- to 59-mo-old age group rather than 6- to 71-mo-old group as recommended (10). However, because there was no correlation between age and retinol concentration, it is unlikely that the choice of surveyed age group affected the validity of the results. However, problems in age assessment may have led to bias for other variables due to their age dependence. Concentrations of Hb and sTfR are often age dependent in population data, leading to the possibility of confounding when comparing results among surveys.

Assessment of pregnancy in adolescents was not always possible due to cultural concerns; consequently, the data presented here do not distinguish between pregnant and nonpregnant adolescents. Some difference between the prevalence of anemia in populations may therefore be attributable to the mean age of first pregnancy. Risk factors for noniron-deficient anemia, such as hemoglobinopathies, were not assessed during these surveys due to resource constraints.

The levels of anemia reported here show a wide range of variation according to survey site. The worst affected camps compare with prevalences of 72% found recently in refugee Burmese children, and 67% found in 6- to 35-mo-old children in Palestinian refugee camps (11,12). An even higher anemia prevalence range of 59–90% was reported in Somali refugees in 1987 (1). Very high levels may also be found in nonrefugee populations in east Africa and elsewhere. For example, a community survey of nonrefugees in southeastern Tanzania found that 87% of children <5 y old had an Hb <110 g/L (13). The prevalences of childhood anemia reported here are therefore not unusual but nevertheless constitute a serious public health issue. Our data show that the problem was not confined to children in these surveyed populations, and women and children were also affected. In populations in which there is a high prevalence of anemia, protocols for iron supplementation of children and adults are established but were not used in the surveyed camps and are rarely found in refugee or emergency situations in which compliance, logistics, and cost may be limiting factors (5).

In these surveys, we used sTfR as a measure of iron deficiency because it is relatively unaffected by the acute phase response associated with inflammation and infection. This makes it particularly useful in populations suffering from a high level of infections including malaria (14,15). The clear ecological association between iron deficiency and anemia points to this deficiency as a probable risk factor for anemia in such populations, and argues in favor of enhancing intake through diet or supplementation as a matter of urgency.

Previously reported data led to the assumption that 50% iron deficiency may be expected when 20% IDA is present and that virtually the whole population will be iron deficient when IDA reaches 50% (6). However, the data presented here show that the prevalence of iron deficiency in these populations, assessed using sTfR, was substantially lower with a top prevalence of only 75%, when IDA was at 57% in Acholpii camp. This may be due to differences in
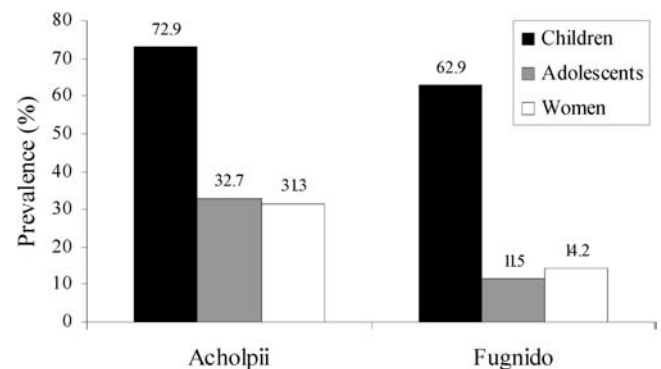

FIGURE 2 Comparison of anemia prevalence (%) in different population groups: children 6–59 mo; adolescents 10–19 y; and nonpregnant women 20–55 y, in 2 refugee camps. In Acholpii, $n = 225$, 223, and 192 and in Fugnido, $n = 202$, 157 and 98, respectively.

TABLE 3

Vitamin A status of 6- to 59-mo-old children and vitamin A capsule distribution coverage in different camps

Camp	n	Mean retinol[1]	Total <0.7 μmol/L	Medium risk 0.7–0.35 μmol/L	High risk <0.35 μmol/L	n	Coverage
			Prevalence of deficiency			Capsule distribution	
		μmol/L		%			%
Kakuma	110	0.72 ± 0.2	47.2 (33.9, 61.1)	46.4 (33.0, 60.2)	0.9 (0.0, 9.6)	846	55.2 (45.4, 65.1)
Acholpii	81	0.66 ± 0.2	61.7 (50.2, 72.1)	53.1 (41.2, 65.0)	8.6 (1.9, 15.4)	761	60.3 (53.7, 66.9)
Fugnido	124	0.74 ± 0.2	43.6 (34.7, 52.4)	40.3 (33.5, 47.2)	3.2 (0.3, 6.1)	202	3.5 (0.8, 6.1)
Kebribeyah	151	0.88 ± 0.2	20.5 (12.1, 29.0)	19.9 (11.5, 28.3)	0.7 (0.0, 2.0)	210	66.2 (51.1, 81.2)

[1] Values are means ± 1 SD; the prevalences of vitamin A deficiency and capsule distribution coverage are given with 95% CI in parentheses.

the method of iron status assessment and/or differences in the population characteristics and prevalence of other risk factors. Another recent study of anemia in Asian refugee children found a similar relation in which an IDA prevalence of 64.9% was associated with iron deficiency of only 85.4% (11). These data suggest that assumptions concerning the relation between the prevalence of IDA and iron deficiency should be revisited.

In the current series of surveys, total anemia, rather than IDA, closely reflected the prevalence of iron deficiency, even when comparing across populations with varying risk factors such as malaria prevalence. This finding has potentially important implications for the conduct of future population surveys in which resources are limited because it suggests that the prevalence of total anemia may be useful as a proxy measure for iron deficiency. However, despite the significant linear correlation between iron deficiency and anemia shown, it would be expected that interventions to reduce iron deficiency would have different effects on the prevalence of anemia depending on the particular risk factors present in each camp and the population attributable risk of iron deficiency in the causation of anemia.

To our knowledge, this is the first report of a biochemical population survey of vitamin A deficiency in refugee children. Recent national vitamin A deficiency prevalence estimates give a level for eastern and southern Africa of 20.0–37.1% depending on the calculation method (16). The prevalences found in these surveys lie above the upper estimate for 3 of the 4 camps, indicating that these refugee populations are probably more vulnerable to this deficiency in spite of the established policy of vitamin A capsule supplementation (5). Although the possibility of recall bias must be considered, the coverage of vitamin A capsule distribution was highly variable, and the data raise concerns about the effectiveness of these programs. However, in these surveys, there was no correlation between the extent of coverage and the prevalence of vitamin A deficiency.

In the assessment of vitamin A deficiency, identification of false positives may occur due to the transient depression of serum vitamin levels during inflammation (17). The use of CRP to identify and exclude subjects with a current acute phase response and prevent the identification of false positives was reported previously (18). It was also shown recently that adjustment in individual retinol levels, using the concentration of acute phase proteins, can be made, and that this has a similar effect on prevalence estimates (19). However, the adjustment approach has the disadvantage that more than one acute phase protein has to be measured

to calculate the required correction. Subject exclusion, based on a single CRP measurement, was adopted in the surveys reported here. The prevalence levels described in these surveys can therefore be confidently ascribed to a physiologic deficiency. Failure to correct the retinol measurements for inflammation in these surveys would have led to a substantial increase in the observed prevalence of vitamin A deficiency. Caution in comparing results between this and other surveys is necessary because corrections for inflammation are not always used.

The WHO classification of micronutrient deficiency prevalence states that a prevalence of 40% anemia or 20% vitamin A deficiency comprises a substantial public health problem (5). All of the assessed camps exhibited prevalence rates of vitamin A deficiency above the threshold for such a public health problem. In the case of anemia in children, 3 of the 5 camps fell into the highly problematic category, whereas none had levels <5%. In the 2 camps in which anemia was assessed in adolescents and adult women, the prevalence indicated public health problems in both population groups but these were of a medium or low level. Overall, the data presented here illustrate the high level of micronutrient malnutrition that these long-term refugees were suffering in addition to the moderate-to-high levels of protein energy malnutrition that were seen in several of these camps. The data demonstrate the inadequacies of current policies and practice in addressing micronutrient malnutrition in populations largely dependent on food aid. The persistence of these public health problems also contravenes agreed minimum standards in disaster relief (20).

Food aid rations received by the inhabitants of the surveyed camps vary over time but typically consist of a cereal, pulses, oil, and salt. The micronutrient composition of rations for food aid–dependent populations has been subject to criticism for some years and has been implicated as a major factor in frequent micronutrient deficiency outbreaks (2,21). Efforts to tackle the problems identified in this paper are currently ongoing with the recent publication of new policy papers on emergency food aid and fortification by WFP and its active revision of food aid specifications (22). Further work should adopt a holistic public health nutrition approach including effective fortification of food aid commodities, combined with supplementation of high-risk groups where feasible and acceptable promotion of recommended infant and young child feeding practices, pursuit of opportunities to facilitate refugee income generation and diet diversification, and ensuring effective vector and parasite control.

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