Severe iodine deficiency in Sudan

Aggravated by armed conflict, IDD remains a major public health problem in Sudan. More than 20% of school-age children are goitrous, and the prevalence reaches 40% in the Darfur region of western Sudan. Only 1% of the population has access to adequately iodized salt.

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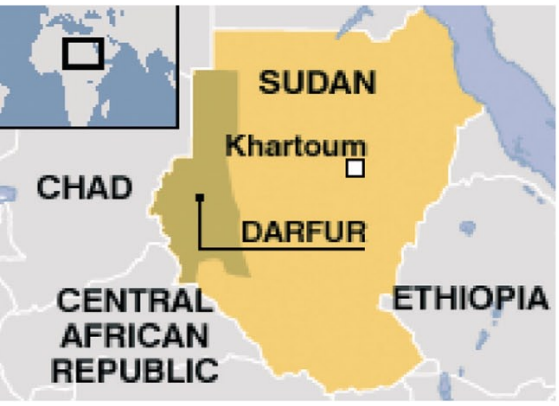

The southern and western regions of Sudan are currently facing a severe humanitarian crisis, with greater than a million people displaced from their homes and numbers rising daily. Despite a ceasefire signed in early 2005, the armed conflict has continued, and half the displaced population remains inaccessible for humanitarian relief. Many of Sudan's 15 million children are malnourished and iodine deficient, and the situation of many children and women in the Darfur region is critical.

Sudan has a population of 32 million, with six million living in the capital, Khartoum. Over 5 million are infants and children less than 5 years old. Endemic goiter in Sudan was first reported in 1952 in south and southwest Sudan near the Zaire border, as well as in the Northern Province and in Darfur in western

Sudan. An extensive survey in Darfur province in 1967 of over 17,000 individuals reported a total goiter rate of 57.5%, with 18.5% having large, visible goiters. An investigation into the cause of endemic goitre in Sudan was done in 1971, and plasma iodine concentration was measured in Khartoum and Darfour provinces. The study concluded that the major cause of endemic goiter in Sudan was iodine deficiency.
Several interventions were subsequently introduced in the 1970s in an effort to control IDD, including distribution of potassium iodide tablets to school children in the Darfur area. Also, in selected regions, iodine was added to well water, sugar was fortified with iodine, and supplements of iodized oil were given. In 1989, the Government of Sudan initiated the IDD Control Program using Lipiodol capsules and administration of iodized oil injections for a target population of 1.5 million in the Darfur region.

The National Nutrition Directorate under the Federal Ministry of Health is the focal point and responsible for the IDD control program in Sudan. A comprehensive national survey in 1997 of nearly 41,000 primary school children reported a total goiter rate of 22% (see Table).

The special needs of the Darfur Region

Up to June 2006, 3.6 million people have been affected by the ongoing crisis in Darfur, with 1.8 million of them children, many of whom have been displaced multiple times through repeated violence. Most communities lack basic medical and nutrition services, and iodine deficiency is endemic. The impact of severe iodine deficiency, together with violence, disease, and malnutrition is debilitating a generation of Sudanese children in this region.

Because of political instability and armed conflict, the production and supply of iodized salt has been deteriorating. The World Food Program (WFP), in association with US Centers for Disease Control and Prevention, the FAO, UNICEF, Save the Children, and the Government of Sudan, conducted an Emergency Food Security and Nutrition Assessment Survey in September 2004 in the Darfur region. The prevalence of visible goiter among women was as high as 25.5%. Iodized salt is currently supplied to the Darfur area and Southern Sudan under the WFP. In southern Sudan, with population of about 5 million, salt requirements are ca. 10,000 tons per year, and the WFP has been supplying iodized salt to about 2.7 million people in Darfur region.

Salt production in Sudan

A federal government decree in 1994 required all edible salt to be iodized at a level of 50 ppm using potassium iodate. The salt fortification level was later reduced to 25-35 ppm. However, despite this important legislation, there has been little progress in salt iodization. Sudan produces ca. 140,000 metric tons of salt annually. However, only about 3000 tons are iodized. UNICEF estimates that currently only 1% of households have access to adequately iodized salt.

In Sudan, the main source of salt is a 56 km long coastal region of the Red Sea. Smaller amounts are produced in the northern coastal regions, but these are not considered major production sites. The Sudanese requirement for iodized salt is in the range of 100,000 to 112,000 tons yearly, based on an estimated per capita intake of 4 g/day. Salt sold in the informal markets is commonly packed by shopkeepers in bags of 200 and 500 g. The price in Khartoum

Prevalence of goiter among school children in Sudan

Region	n	Goiter rate (%)
Northern	5773	38
Eastern	7937	8
Khartoum	8165	5
Central	7865	23
Darfur	4835	28
Kordofan	4503	39
Upper Nile	1874	42
Total	**40,922**	**22**

for a 500 g portion is $0.25. From the production sites, 70-85 kg bags are distributed mainly by road to Khartoum and other regional centers. Distribution to rural areas, and particularly to mountainous regions, is limited, in part by the high costs of transport. In 1993, UNICEF supplied the two major producers with iodization equipment, generators and laboratory equipment.

density brine and non-elimination of bitterns and recharging the bittern into the sea.

Salt produced in Port Sudan is transported by road, and the additional transportation cost increases the price of salt in Khartoum by approximately 10-fold. The raw salt is distributed in crystal form, packed in jute bags, and supplied by the traders. It is crushed

per salt producing and processing techniques, and they are profit-oriented rather than quality-oriented. There is no legislation that compels them to produce and sell iodized salt. Secondly, there is no system in place to monitor production and distribution, and no authority delegated to a Ministry or Department for oversight. As a result, the unrefined crystal salt usually sold by salt producers

In a 2005 status report, it was estimated that Sudan's annual salt needs are about 140,000 tons for edible use, including livestock requirements, a further 20,000 tons for caustic lye production and 5,000 tons for canning. The total domestic demand of 165,000 tons/year is currently met by indigenous salt sources. No salt is imported and small amounts are exported to Ethiopia, Chad, and Central Africa. Raw salt in Sudan is produced by solar evaporation, and most of the production units are owned by the private sector. However, salt quality is generally low, due to the lack of proper techniques of salt manufacturing and trained personnel. Although not operational in all cases, iodization plants exist with equipment in Obeit city in the Red Sea region, and Nyala in the Darfur region. All the salt works along the Red Sea coast use sea brine taken directly from the sea or creeks. The quality of salt suffers due to charging of crystallizers with low

by millers in several towns. The crushed salt is then packed in second-hand high-density polyethylene bags, and sold to retailers. The retailers sell the crushed salt at prices varying from 50 SD to 100 SD per kilo, either loose or packed in unmarked plastic pouches. Refined salt is also retailed at 77 SD/ kg. A number of Government levies on salt seem to be one of the reasons responsible for the high cost of salt to the consumer in Sudan: the levies and taxes amount to 100% to 137% of the cost of salt.

Challenges to IDD control

Major challenges stand in the way of universal salt iodization in Sudan. More than a decade after adopting USI as the strategy for combating IDD, Sudan has not been able to produce sufficient quantities of iodized salt. There are many potential reasons for this lack of progress. A major one is that the salt producers are not trained and not aware of pro-

ends up with millers, where the crystals are crushed and sold un-iodized to retailers.