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Iodine status as determined by urinary iodine excretion in Lesotho two years after introducing legislation on universal salt iodization

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Abstract

Objective: Mild to severe iodine deficiency has been documented in Lesotho since 1960. To eliminate the persisting iodine deficiency, legislation on universal salt iodization was introduced in 2000 as a long-term public health intervention strategy. We assessed the urinary iodine status of school children and women of child-bearing age in Lesotho 2 y after the introduction of legislation on universal salt iodization.

Methods: A 31-cluster national survey was conducted in 2002 by using the proportion to population size method. In each cluster, 30 women ages 15 to 30 y and 30 primary school children ages 8 to 12 y were randomly selected to provide urine samples for urinary iodine analysis. Data were interpreted according to criteria of the World Health Organization, United Nations Children's Fund, and International Council for Control of Iodine Deficiency Disorders (2001). Statistical analysis was performed using SAS.

Results: We analyzed 912 urine samples from children and 924 from women. The median urinary iodine concentrations were 214.7 μg/L for children and 280.1 μg/L for women, indicating more than adequate iodine intake. Median iodine concentration was higher in the lowlands (256.0 μg/L in children and 329.9 μg/L in women) than in the mountains (99.30 μg/L in children and 182.6 μg/L in women). Analysis of the distribution of the data showed values below 50 μg/L in 10.1% of children and in 9.8% of women. In addition, 21.5% of children and 17.9% of women had urinary iodine excretion values below 100 μg/L. In contrast, 36% of children and 47.2% of women had urinary iodine concentrations in excess of 300 μg/L.

Conclusion: Results of urinary iodine excretion measurements indicated that iodine deficiency has been eliminated as a public health problem in Lesotho. However, the high median urinary iodine concentration of women in the lowlands indicated the possibility of a risk of iodine-induced hyperthyroidism in vulnerable people.

Keywords: Urinary iodine; Women; School children; Population survey; Lesotho

Introduction

The broad range of disorders in a population caused by an inadequate dietary supply of iodine has been denoted as iodine deficiency disorders (IDDs), which include impaired mental and physical development, cretinism, reproductive failure, endemic goiter, hypothyroidism, and impaired school performance [1]. Despite the known effective control measures, IDDs constitute a public health problem in 130 of 191 countries worldwide [2]. In Africa alone, iodine deficiency affects about 150 million people in 40 countries. IDDs have also been identified as a problem of public health significance in all countries in eastern, central and southern Africa, with the

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exception of Mauritius and Seychelles [3]. These estimates have placed iodine deficiency among the most extensive nutritional problems in the world.

In Lesotho, goiter surveys, which indicated mild to severe IDD, were conducted as early as 1960. A national study conducted by Munoz and Anderson in 1960 [4] showed a total goiter rate (TGR) of 41% and a visible goiter rate (VGR) of 14% in school children ages 6 to 13 y. The multistage cluster survey conducted in the Mountain and Senqu river valley zones in 1987 indicated a TGR of 46.5% and a VGR of 22.5% in clinic attendants 12 y and older [5]. The second national study was conducted by Todd [6] in 1988 and indicated goiter prevalence rates of 42% in women of child-bearing age and 21% in school children ages 6 to 13 y. At that time, the median urinary iodine concentrations in the mountains and lowlands were within the deficient range at 35 μg/L and 55 μg/L, respectively.

The 1993 National Micronutrient Survey indicated a TGR of 39.4% and a VGR of 14.6% in women of child-bearing age [7]. The TGR in school children ages 6 to 16 y was 42.5% and the VGR was 15.3%. Goiter was more prevalent in the mountain zone than in the other zones. A study conducted at Mohale Dam catchment area in 1995 indicated a goiter prevalence of 17.5% in children ages 10 to 14 y and a severely deficient median urinary iodine excretion of 13 μg/L [8]. In 1999 the median urinary iodine concentration in children was 26.3 μg/L in a countrywide study, indicating moderate iodine deficiency [9].

All the frightening consequences of IDD can be prevented by ensuring that everyone consumes an adequate amount of iodine, especially women of child-bearing age and young children [1]. The correction of iodine deficiency can be done by periodic supplementation of deficient populations with iodized oil capsules or other preparations or by fortifying commonly eaten food with iodine. Although both strategies are effective, universal iodization of salt is the common, long-term, and sustainable solution that will ensure that iodine reaches the entire population.

Lesotho does not produce salt and almost all of the salt entering the country is imported from South Africa. Mandatory iodization of table salt (but not of animal salt) at a concentration of 40 to 60 ppm was introduced in South Africa in 1995. However, the iodized salt legislation in South Africa appeared to have little or no effect on the deficient iodine status of children in Lesotho, because iodine deficiency was still prevalent in a national survey conducted in 1999, 4 y after introducing mandatory iodization in South Africa [9]. Legislation on universal salt iodization in Lesotho, promulgated in March 2000, states that food-grade salt and other salt intended for human and animal consumption, which is imported into Lesotho, must be iodized with potassium iodate (KIO_3) and contain not less than 40 ppm and not more than 60 ppm of iodine on entering the country. In view of the improved iodine status of children in other African countries after the introduction of salt iodization program [3], it was important to investigate the effectiveness of introducing mandatory iodization of human and animal salt in Lesotho. Iodine has a rapid turnover in the body, and 2 y of exposure to iodized salt is sufficient to assess the effectiveness of salt exposure [10]. Therefore, we assessed the iodine status of children and women in Lesotho as determined by urinary iodine excretion 2 y after the introduction of the universal salt iodization legislation.

Table 1
Ecologic zones in each district

Districts	Lowlands	Foothills	Mountains	Senqu River Valley
Butha-Buthe	✓	✓	✓	
Leribe	✓	✓	✓	
Berea	✓	✓	✓	
Maseru	✓	✓	✓	
Mafeteng	✓	✓		
Mohaleshoek	✓	✓	✓	✓
Quachas'neck			✓	✓
Mokhotlong			✓	
Thaba-Tseka			✓	✓
Quthing			✓	✓

Material and methods

Sample selection

Lesotho is divided into 10 administrative districts and ecologically divided into four zones, mainly on the basis of altitude: mountains, foothills, Senqu River Valley, and lowlands. The multistage proportional to population size cluster sampling method was applied to conduct a study in 2002 based on recommendations by the World Health Organization, United Nations Children's Fund, and International Council for Control of Iodine Deficiency Disorders (WHO/UNICEF/ICCIDD) [11]. A total of 31 clusters (villages) were proportionally selected from the ecologic zones in all 10 districts of Lesotho based on the total number of households in each district and ecologic zone, as listed in Table 1. Based on WHO/UNICEF/ICCIDD recommendations [11], school children ages 8 to 12 y and women of child-bearing age (15 to 30 y) were included as the target study population. In each of the 31 selected clusters, 30 children were randomly selected from one government school and 30 women were randomly selected at the household level to provide urine samples. This resulted in a national sample of 930 children and 930 women. Information on the overlap between the selected children and households was not collected during the study.

The ethics committee of the Faculty of Health Sciences at the University of Free State gave its approval for conducting this study (ETOVS NR 32/02). Written approval was also obtained from the ministry of education, the ministry of local government, and from the chiefs and the headmasters of the selected villages and schools, respectively. An informed consent form written in Sesotho and