

Knowledge of iodine nutrition in the South African adult population

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Abstract

Objectives: To determine the level of knowledge regarding iodine nutrition and its relationship with socio-economic status in the South African population.

Design: A cross-sectional population survey collecting questionnaire information on knowledge of iodine nutrition and sociodemographic variables in a multistage, stratified, cluster study sample, representative of the adult South African population.

Setting: Home visits and personal interviews in the language of the respondent.

Subjects: Data were collected from one adult in each of the selected 2164 households, and the participation rate was 98%.

Results: Only 15.4% of respondents correctly identified iodised salt as the primary dietary source of iodine, 16.2% knew the thyroid gland needs iodine for its functioning, and a mere 3.9% considered brain damage, and 0.8% considered cretinism, as the most important health consequence of iodine deficiency. Compared with respondents from high socio-economic households, respondents from low socio-economic households were considerably less informed about aspects of iodine nutrition covered in this study.

Conclusions: The knowledge level of iodine nutrition is low among South Africans, particularly among the low socio-economic groups. These data suggest that the international emphasis on brain damage resulting from iodine deficiency has not been conveyed successfully to the consumer level in this country.

Keywords
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Given the public health importance of eliminating iodine deficiency, and the health consequences of its deficiency, it could theoretically be expected that consumers are informed and educated about iodine nutrition and iodine-deficiency disorders (IDD) such as impaired mental function, goitre, hypothyroidism, cretinism, retarded physical development and even child mortality. Despite widespread international efforts to implement effective IDD programmes, there is evidence from two studies in India that a very low level of public awareness exists regarding the role of iodine in the prevention of IDD^{1,2}.

Furthermore, it has long been recognised that failure to inform and educate the public on IDD and how to address it is one of the reasons why many intervention programmes have been unsuccessful^{3,4}. Low public awareness of IDD and lack of appreciation of the severity of the problem were also identified as constraints in control programmes at a conference held in the Harare in 1996⁵. An increased public awareness of the scope of the problem and solutions related to the prevention of IDD are key to empower consumers to increase demand for iodised salt. Evaluation of the level of knowledge about

iodine nutrition in populations affected by iodine deficiency is essential to the optimal functioning and implementation of national iodisation programmes¹.

Studies assessing public awareness of IDD and iodine nutrition in South Africa are limited. A study in six towns of the Northern Cape Province in South Africa showed that only 2% of mothers correctly knew the health benefit of iodine in iodised salt⁶. Another study, conducted before introduction of mandatory iodisation in the country, showed that despite the price of iodised and non-iodised salt being identical, a low proportion of low socio-economic households (between 4.3 and 25%) used iodised salt⁷. These data indirectly revealed the low level of awareness of the health benefit of iodised salt in the study area.

Two-and-a-half years following the introduction of mandatory iodisation of salt in South Africa in 1995, the proportion of households using iodised salt had increased to 86.4%, and the proportion using adequately (> 15 ppm) iodised salt was 62.4%⁸. To sustain and further increase the use of iodised salt, the public needs to be appropriately informed and educated about the causes, consequences

and prevention of iodine deficiency, in conjunction with periodic monitoring of the adherence of salt producers to iodisation legislation³. The current study was undertaken to assess the level of knowledge of the South African population regarding iodine nutrition and the consequences of iodine deficiency, and to relate IDD knowledge to socio-economic status.

Methods

A cross-sectional survey of the adult South African population was conducted by personal interview during home visits, to assess the knowledge of iodine nutrition in the country. Questionnaire data were collected by an experienced market research organisation as part of a regular countrywide household survey. The visiting points were drawn by means of a multistage, cluster, probability sample design of 2208 households, based on the 1996 South African national population census figures. The households and respondents were selected by listing all eligible respondents in a household and then using a random grid to choose the participating respondent. Only one respondent per selected household, aged 16 years or above, was included in the study. Substitution of the visiting point was allowed in the following cases: refusal, empty premises, nobody on the stand qualifying for the study, if the designated respondent could not be found after three visits, inability to communicate due to foreign home languages, or due to physical or mental limitations.

The study sample was selected proportional to the population size in each of the nine provinces, stratified according to nine residential categories representing the full range of types of residential categories existing in the country. These residential areas included traditional tribal rural areas and, in both metropolitan and non-metropolitan areas, informal settlements, hostels, townships, towns and cities. Exceptions to proportional sampling were required to achieve a predetermined minimum of 100 households per province and a minimum of 100 Asian households in order to generate sufficiently stable estimates for the provincial and overall national study sample. Census enumerator areas ($n = 295$) were used to form clusters, with either eight or four respondents drawn per enumerator area. The census enumerator area is the smallest geographical demarcation for census purposes and usually includes 150 to 200 households. All clusters were drawn with probability proportional to size, while respondents were drawn from the final enumerator areas with equal probability.

Fieldworkers collected the data by means of a structured questionnaire during March and April 2002. Information was obtained on sociodemographic characteristics of the respondent. To assess the knowledge of respondents concerning iodine nutrition, respondents were asked three questions, each eliciting a single response. These questions were: (1) 'What is the main source of dietary

iodine of South Africans?' (2) 'Which part of the body (which gland in the body) needs iodine to produce hormones?' and (3) 'What is the most important harmful effect on the health of children if their iodine intake is insufficient?' Participants' responses were checked, without showing them the answer options, on a record sheet containing all possible responses determined during the piloting phases of the study.

Fieldworkers had at least 12 years of schooling and were bilingual or multilingual to be able to conduct the interview in the preferred language of the respondent. All fieldwork co-ordinators and fieldworkers were thoroughly trained and each was provided with a fieldworker's guide on how to conduct the interview and interpret responses. Co-ordinators checked at least 20% of questionnaires for correct completion during the fieldwork, and the office contacted a further 15% of respondents to ensure that correct fieldwork procedures were followed during data collection (i.e. back-checks).

Approval for this study was obtained from the Ethics Committee of the University of Cape Town. In addition, it was explicitly stated at commencement of the interview that respondents were not obliged to answer any of the questions, that their participation was voluntary, and that all personal information would be confidential.

Data analysis

To correct for over-sampling, which was introduced to generate stable estimates, provincial and national data were adjusted in a weighted analysis using the 1996 census distributions to achieve representative population profiles. Summary statistics were generated, including frequencies, proportions and means. A multivariate index, which reflects socio-economic status on a 10-point scale, the Living Standards Measure (LSM), was calculated using 29 biographical variables obtained by questionnaire. Low LSM values indicated low socio-economic status and high values, high socio-economic status. Biographical data used for this purpose included the availability of household appliances (e.g. fridge, freezer, washing machine, tumble dryer, dishwasher, sewing machine, vacuum cleaner, microwave oven, electric stove, television, hi-fi, radio, cell phone, home computer, motor vehicle), household facilities (e.g. electricity, domestic servant, home security, piped water, hot running water, flush toilet), geographical area, and whether or not the respondent lived in a hut. This scale has been validated previously⁹, and similar methodology was used in developing an LSM scale for Europe¹⁰. The LSM index was then graphically related to the percentage of respondents who identified iodised salt as the primary dietary source of iodine, and to the percentage of respondents who did not know what iodine is, and the significance of these associations determined by means of the Spearman correlation.

Results

Overall, 2164 respondents, representing a national response rate of 98%, participated in the study (Table 1). In terms of biographic data, the weighted study sample consisted of 74.7% black, 9.1% coloured (mixed race), 2.9% Asian and 13.3% white people, while 47.1% of the sample were male and 52.9% female, reflecting the ethnic and gender profiles of the country. The age distribution of respondents was 28.1% in the 16 to 24 years category, 25.2% aged 25 to 34 years, 18.5% aged 35 to 44 years, 11.4% aged 45 to 54 years, and 16.9% were 55 years and older. Between 6.0 and 16.1% of respondents belonged to the 10 different LSM categories, while 35.0% fell in the lowest three LSM categories, 46.4% in the middle four categories and 18.6% in the three highest categories.

The frequencies of respondents' answers to the iodine-related questions are summarised in Table 2. Fifteen per cent of people in the country, ranging from 3.1 to 24.9% in the various provinces, knew that iodised salt is the most important or main source of iodine in the diet of South Africans. Lower percentages, between 4.9 and 5.8%,

of respondents believed that seafood, vegetables or meat was the most important dietary source of iodine. Only a few people considered dairy products, drinking water or other sources to be the primary source of iodine. Moreover, 65.7% of respondents were unable to answer the question, 43.2% of whom did not know what iodine is.

When asked which part of the body ('gland in the body') needs iodine to produce hormones, 16.2% of respondents correctly identified the thyroid gland (Table 2), while 5.7% gave an incorrect answer. The remaining 78.1% of respondents replied either that they did not know or they did not know what iodine is.

Respondents' perceptions of the most important harmful effect of inadequate iodine intake on the health of children are also summarised in Table 2. The data show that, nationally, 9.4% of respondents considered impaired growth as the most important health consequence of iodine deficiency, while 5.5% considered goitre, 3.9% considered brain damage and 0.8% considered cretinism as the most important consequence. Low percentages of respondents mentioned hypothyroidism, death or other consequences. About three-quarters, 75.2% of

Table 1 Provincial and national sample sizes and response rates

Characteristic	Province									National sample
	Western Cape	Eastern Cape	Northern Cape	Free State	KwaZulu-Natal	Mpuma-Langa	Limpopo	Gauteng	North West	
Enumerator areas (number)	35	35	17	25	52	22	21	59	29	295
Sample size	264	240	125	176	383	167	166	436	207	2164
Weighted sample size	230	307	46	147	435	144	226	450	180	2164
Response rate (%)	100	96.8	100.8	100	95.8	97.1	101.2	96.5	99.5	98.0

Table 2 Frequency (%) of responses to iodine-related knowledge questions, by province and nationally

Responses to knowledge questions	Province									National sample
	Western Cape	Eastern Cape	Northern Cape	Free State	KwaZulu-Natal	Mpuma-Langa	Limpopo	Gauteng	North West	
Perceptions of the main dietary source of iodine										
Iodised salt	18.2	15.4	3.1	24.9	16.7	20.7	6.1	17.1	6.5	15.4
Seafood	11.1	3.6	6.0	5.4	2.6	5.0	2.5	11.6	1.0	5.8
Vegetables	5.8	4.9	7.2	1.0	7.7	3.9	2.7	5.6	1.6	4.9
Meat	3.0	2.4	3.1	0	8.8	3.2	8.3	5.9	2.4	5.0
Dairy products	0.1	1.0	0.5	0	1.8	1.6	0	1.1	1.5	1.0
Other	1.0	4.4	1.1	0	1.2	1.1	1.3	3.6	3.9	2.2
Do not know	60.8	68.3	79.0	68.7	61.2	64.5	79.2	55.1	83.0	65.7
Proportion knowing that the thyroid gland needs iodine	21.8	7.4	11.4	22.5	21.7	9.4	6.3	24	5.1	16.2
Perceptions of the most important harmful effect of iodine deficiency										
Impaired growth	11.4	9.3	10.4	10.4	12.2	1.0	3.9	13.7	2.3	9.4
Goitre	4.5	2.1	0.9	5.0	9.1	6.6	3.9	7.2	1.9	5.5
Brain damage	2.8	3.2	2.7	5.4	2.9	2.5	0.6	8.5	1.9	3.9
Cretinism	0.2	0	0	0	4.0	0	0	0	0.1	0.8
Hypothyroidism	1.1	4.9	0	1.3	0.4	0.6	0.5	1.9	0.2	1.5
Death	0.4	2.2	0	0	0.5	0.7	0.5	3.4	1.3	1.4
Other	1.5	4.7	2.0	0	2.0	5.7	0.8	2.5	1.2	2.4
Do not know	78.1	73.6	84.2	77.9	68.9	82.9	89.8	62.7	91.2	75.2

respondents, either did not know any of the abnormalities resulting from iodine deficiency or did not know what iodine is. When the frequencies of correct responses to the three questions were ranked and totalled by province, Limpopo and North West provinces had the lowest scores, reflecting the lowest levels of iodine nutrition knowledge.

Figure 1 illustrates the relationship between increasing LSM scores (i.e. higher socio-economic status) and the percentage of respondents who correctly identified iodised salt as the main source of dietary iodine ($r = 0.95, P < 0.01$). Only 2.3% of subjects in the lowest LSM category, representing the lowest socio-economic group in the population, knew that iodised salt is the main source of dietary iodine, compared with 38.7% in the highest LSM category. A substantial proportion of all respondents, 43.2%, did not know what iodine is. Figure 2 shows that 78.6% of people in the lowest LSM category did not know what iodine is, and that this percentage decreased with increasing LSM scores to 8.4% in people in the highest LSM category ($r = -0.98, P < 0.01$).

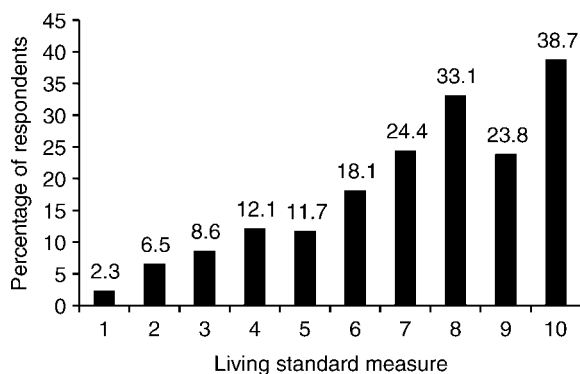


Fig. 1 Percentage of respondents identifying iodised salt as the primary dietary source of iodine in the various categories of the living standard measure as a composite index of socio-economic status, where 1 represents a low and 10 a high socio-economic status

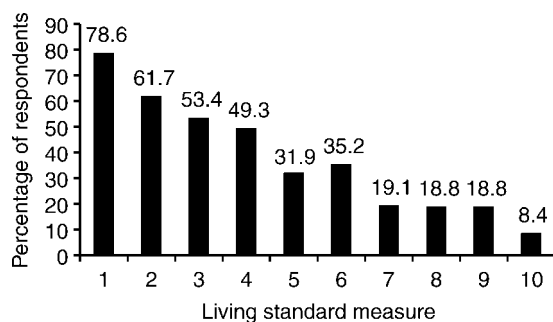


Fig. 2 Percentage of respondents who did not know what iodine is in the various categories of the living standard measure as a composite index of socio-economic status, where 1 represents a low and 10 a high socio-economic status

Discussion

Despite huge international efforts to eliminate IDD worldwide and remarkable progress towards this goal in many countries, it appears from limited information that these efforts have not resulted in a concomitant growth in knowledge regarding iodine nutrition. Data from the present national survey of IDD knowledge in South Africa have yielded similar information to studies from the Bargarh District¹ and the Kashmir Valley¹¹ of India and from the Andaman and Nicobar Islands². In all these studies uniformly low levels of IDD awareness in the general public have been demonstrated. The discrepancy between progress in eliminating IDD and IDD knowledge of the population is particularly evident in South Africa, where we have shown that only 15.4% of people correctly identified iodised salt as the main source of dietary iodine, 16.2% knew which part of the body requires iodine for the production of hormones, and less than 5% were aware of the neurological consequences of iodine deficiency. Even if 'seafood' is also accepted as a correct response to the question on the main source of dietary iodine, still 80% of the respondents were uninformed.

Against the background of the international emphasis on brain damage¹², a surprisingly small percentage of respondents were aware that mental impairment might result from iodine deficiency. To close this IDD communication gap, which appears to inhibit the transfer of this message to the consumer level, both educational and public health communication strategies are required. In Turkey, the percentage of women using iodised salt increased significantly during a 3-month regional educational mass media campaign¹³, indicating that improved IDD knowledge may lead to a more widespread consumption of iodised salt.

Following the introduction of mandatory iodisation of table salt in South Africa at the end of 1995, at a higher iodine concentration than before, excellent progress has been reported on the iodine status of children^{14,15}. However, indications of continued IDD in some areas of the country have been reported¹⁴ and a considerable proportion of households (37.6%) was still using inadequately or non-iodised salt some 2.5 years following the revision of legislation⁸. Usually it is this last fraction of the population that is most difficult to reach with sufficiently iodised salt. While the impressive improvement in iodine status of the population in a relatively short period of time is undoubtedly attributable to the mandatory iodisation of salt, some other factors appear to have prevented the country from achieving the international goal of the virtual elimination of IDD.

Such factors have been shown to include under- or non-iodisation (< 20 ppm) of about one-third of table salt at the production level, particularly in the case of coarse salt¹⁶, the use of non-iodised agricultural salt in 6.5% of households, informal repackaging and selling of

non-iodised salt for household use, and the vulnerability of low socio-economic subsets of the population to these shortcomings in the national salt iodisation programme⁸. It is important to note that a lack of IDD knowledge may well be a common denominator in all of these factors, further limiting progress in the salt iodisation programme. Therefore, overcoming the limiting factors mentioned above through increased IDD knowledge of the relevant role players, including the general public, may boost the chances of achieving and sustaining the elimination of IDD permanently.

These findings seem to suggest that while South Africa has indeed made good progress towards IDD elimination, as far as implementation of salt iodisation and coverage of iodised salt are concerned, the education and promotion aspects of the iodised salt intervention are seriously lacking. Reasons for the poor iodine nutrition knowledge might be inadequate inclusion of the topic in the school curriculum, little media reporting on the role of iodine in human health, the false notion that iodised salt will automatically solve the entire iodine deficiency problem, the fact that IDD is generally not a 'visible' condition, and the extensive public health focus on infectious diseases such as HIV/AIDS, tuberculosis and malaria. Against this background, it appears unlikely that the public will generate a demand for sufficiently iodised salt until their level of IDD knowledge has improved. In a situation like this, health authorities, together with the salt-producing industry itself, have an even greater social responsibility to ensure the effective implementation of salt iodisation.

It has previously been shown that low socio-economic groups in the South African population are the most vulnerable sector to exposure of insufficiently or non-iodised household salt⁸. The present study has again underlined the vulnerability of these groups to iodine deficiency by demonstrating their particularly low level of awareness regarding the role of iodine nutrition, compared with people of higher socio-economic status. Strategies to strengthen the salt iodisation programme should target these groups, with the aim of improving knowledge about the prevention of IDD. An educational campaign of this nature would need to include a multi-pronged approach, whereby adequately iodised salt is widely marketed to poor communities as being superior to other sources of salt, and ensuring that the monitoring of the salt iodisation legislation takes place at points of sale in such communities.

In conclusion, this study has demonstrated that knowledge regarding iodine nutrition and the health consequences of iodine deficiency is unacceptably low in a representative sample of the South African population. Of particular concern is the finding that the international educational strategies to increase public awareness that iodine deficiency is a preventable cause of brain damage appear to have had very limited or no impact in the general population in South Africa. The lower level of

knowledge about iodine nutrition in the lowest socio-economic groups requires targeting of health education information about iodine nutrition.

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