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Strategies to address iodine deficiency in Australia require ongoing monitoring and surveillance

Heather Yeatman
University of Wollongong, hyeatman@uow.edu.au

Karen E. Charlton
University of Wollongong, karenc@uow.edu.au

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Round Table

Strategies to address iodine deficiency in Australia require ongoing monitoring and surveillance

Karen E Charlton and Heather Yeatman

School of Health Sciences, University of Wollongong, New South Wales, Australia

Email: karenc@uow.edu.au

Introduction

National dietary and nutrition policies have increasingly focused on chronic illness prevention and overlooked the importance of micronutrients to support the health of populations. Australia is now classified by World Health Organization (WHO) criteria as having mild iodine deficiency,[1] a situation normally associated with poor and developing countries.

Iodine is a trace element that is essential for human growth and development. A diet deficient in iodine can lead to a number of iodine deficiency disorders (IDD) which include a wide range of mental and physical disorders,[2] the most deleterious effect of which is severe mental retardation (cretinism). Of concern in Australia is the potential loss of intelligence quotient (IQ) and auditory function in children born to women who have experienced even mild iodine deficiency during pregnancy.[3] Meta-analyses indicate that iodine deficiency without supplementation may result in a population-level loss of intelligence in children of around 12.5 IQ points.[4,5]

Australia has lacked a mandatory salt iodisation programme. World-wide, approximately 70% of the world's population is estimated to use iodised salt in a total of 130 countries[6] and it has been estimated that close to 79 million infants are born with some degree of protection from the adverse consequences of iodine deficiency. Mild-to-moderate iodine deficiency has re-emerged in the Australian population, particularly following the cessation in the use of iodophors as sanitisers in the dairy industry.[1] Groups investigated include schoolchildren[7,8,9,10] pregnant and postpartum women,[11,12] neonates[12] as well as adult volunteers.[13,14] Poor iodine intake has only recently been addressed with the mandatory inclusion of iodised salt in bread making.[15]

Case Study: Illawarra region, NSW

Researchers at the University of Wollongong have recently conducted a number of studies investigating the iodine status of various groups in the Illawarra region of New South Wales (NSW), namely adult women,[16] pregnant women[17] and older adults[18] (Table 1). In all groups studied, urinary iodine concentrations are indicative of mild to moderate iodine deficiency. This information on iodine status was collected just prior to the introduction of Australia's mandatory iodisation programme and will provide useful baseline measures on which to assess the impact of fortification. Our studies also identified unexpected gaps in consumer knowledge about iodine and general perceptions related to fortification and expectations regarding Government's role in protecting public health. Findings from our iodine work are highlighted below, with some discussion regarding implications for on-going monitoring and surveillance.

Strategies to address iodine deficiency in Australia

Fortification

Food Standards Australia and New Zealand (FSANZ) recently implemented (September/October 2009) a mandatory fortification programme to use iodised salt in bread in these two countries, with the exception of organic bread.[15] The programme is expected to increase population dietary iodine intake by 46 µg per day, if three slices (100 g) of bread are consumed, provided that the salt used in baking is fortified to regulated levels (i.e. 25–65 mg/kg salt). However, the increased iodine requirements of pregnancy and lactation will not be met through fortification alone.

Fortification programmes in Australia have been strongly resisted, often on the grounds of self or business interests.[19] Australia does not have a strong history of mandatory fortification programmes. The most recent was thiamine fortification of bread, implemented in 1991. Hence it could be expected that consumers' knowledge related to fortification would be low. We have confirmed this in both quantitative[16] and qualitative[20] research in women of child-bearing age in Wollongong, NSW. The added complication in relation to iodised salt was adherence to public health messages that advised reducing salt intake for chronic disease prevention.

Women in the focus groups had considered views on appropriate public health strategies to address nutrient deficiencies and felt this was an important role for government. Nutrition education activities, provided either by heath professionals or the media, were considered the best strategy for improving low iodine levels, followed by supplementation, and lastly fortification, either mandatory or voluntary. The women perceived it was important to have a supporting educational campaign to accompany a mandatory fortification programme, in order to increase understanding of the purpose and benefits of the intervention, thereby increasing the likelihood of its acceptance.[21] However, Australia's simultaneous implementation of both folate and

iodine fortification in bread has the potential to cause confusion among consumers. Importantly, ongoing monitoring and evaluation of the iodine fortification programme and associated activities will be required.

Supplementation

Iodine fortification of bread will not meet the needs of all, in particular, pregnant and lactating women will require additional sources of iodine. The WHO's daily recommended nutrient intake (RNI) for iodine in pregnancy and lactation is 250 µg/day, with an upper level of intake of 500 µg/day.[21] In areas where iodine intakes are generally insufficient to meet these iodine requirements, the WHO recommends that women who are pregnant or lactating take a daily oral iodine supplement to aim for total daily intake of 250 µg/day or take a single annual oral dose of 400 mg of iodine as iodised oil.

In Australia, few nutritional supplements targeted for pregnancy and lactation contain iodine. This situation has received the attention of the National Health and Medical Research Council and a draft public statement has recently been released on this topic. Clear guidelines on iodine supplementation in pregnancy and lactation, including information on brands, are urgently required in order to equip health professionals involved in ante- and post-natal services, including general practitioners, to provide accurate advice to patients under their care. Indeed, our data found that, despite a higher urinary iodide concentration (UIC) in pregnant women who reported taking iodine-containing supplements compared to their counterparts who were not supplementing their diet with iodine, the supplemented women still had a median UIC below optimal levels (<150 µg/L).[17]

Nutrition education and dietary diversification

We have conducted two studies related to women's knowledge about iodine.[16,17] Less than half of non-pregnant healthy women were able to identify adverse pregnancy outcomes as a consequence of low iodine status, while the figure was even lower (27%) in surveyed pregnant women attending public ante-natal services. Women generally had little knowledge about the role of iodine in the diet and were unaware that iodine deficiency was a public health issue in Australia. In both pregnant and non-pregnant women, with the exception of fish and seafood, a high level of confusion regarding food sources of iodine was evident. The Australian Thyroid Foundation and FSANZ websites provide information on iodine to the public, however unlike information regarding other nutrition concerns during pregnancy (e.g. healthy eating, food safety, mercury in fish and folic acid), this is not routinely made available at the health provider interface. Important next steps will be to investigate health care providers' knowledge of the importance of iodine and their perceptions of their role in nutrition education.

Monitoring and surveillance

Low iodine has been a known public health issue in Australia for many decades and yet regular monitoring and surveillance has not been undertaken. The small scale studies reported here are no substitutes for population level monitoring. Even so, sub-population variations were identified. Casual (spot) urine samples collected in groups of individuals is the method accepted by the International Committee for the Control of Iodine Deficiency Disorders for use in epidemiological studies[22] and UIC is expressed as a median value for a population. In non-pregnant populations, daily urinary excretion of iodine closely reflects iodine intake and a recent meta-analysis confirmed urinary iodine to be an effective biomarker. For national estimates of iodine nutrition, it is recommended that median UIC is measured from about 1200 primary school-aged children (30 sampling clusters containing 40 children each).[24] Although single urinary iodine excretion values are associated with large variations, both between and within individuals, we found little variability in both UIC and reported dietary intake, measured over three days of recording, at least in older adults.[18] This may reflect a repetitive week-to-week food intake pattern in older individuals.

It is also important to determine which foods are important contributors to total intake for the targeting of nutrition education activities. We developed a short 49-item iodine specific Food Frequency Questionnaire (FFQ) to assess habitual dietary iodine intake in older Australians, using data obtained from the 22nd Total Diet Survey.[25] Relative validity was demonstrated, compared to three repeated 24-hour dietary recalls and the newly developed FFQ identified that the major source of dietary iodine in this age group was dairy products, particularly milk.[18]

A future consideration for monitoring and surveillance will be compliance with iodine fortification levels in bread. State and territory food regulation enforcement agencies will need to agree and instigate a national monitoring strategy of compliance by salt producers and bakers to ensure population level intakes of iodine improves.

Conclusions

It is evident that a very low level of public awareness exists in Australia regarding the role of iodine in the prevention of IDD. Health professionals have also not promoted the importance of iodine intakes, especially during pregnancy. 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.[26] Our data support the need for a national approach to address iodine intake in Australia, which includes an accompanying consumer education campaign and on-going monitoring strategies.

Table 1: Urinary iodine concentrations of groups in the Illawarra region, NSW

	Pregnant women (n=110)[17]		Non-pregnant women (n=75)[16]		Older men and women (n=84)[18]	
Age (years; Mean (SD)) **Range** (Min – Max)	28 (6) 16 – 45		38 (11) 19 – 56		74 (8) 60 – 95	
Median µg/L (IQR)†	87.5 (62 – 123.5)		56.0 (43 – 69)		71 (55 – 102)	
Male/Female (n)	0/110		0/75		25/59	
Urine iodine concentration category	**n**	**%**	**n**	**%**	**n**	**%**
• **Inadequate** (<100 µg/L)‡	94	85.5	69	92.0	63	75.0
• **Mild deficiency** (50 – 99 µg/L)	–	–	31	41.3	47	55.9
• **Moderate deficiency** (20 – 49 µg/L)	–	–	38	50.7	15	7.9
• **Severe deficiency** (<20µg/L)	–	–	0	–	1	1.2
• **Adequate** (100 – 199 µg/L)§	12	10.9	5	6.7	19	22.6
• **More than adequate** (200–299 µg/L)¶	4	3.6	–	–	2	2.4
• **Excessive** (≥300 µg/L)~	0	0	1	1.3	0	–

† 25th – 75th percentile

‡ 150 µg/L for pregnant women (categories of deficiency not specified for pregnancy)[21]

§ 150 – 249 µg/L for pregnant women[21]

¶ >250 µg/L for pregnant women[21]

~ >500 µg/L for pregnant women[21]

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