

Original Article

Health knowledge and iodine intake in pregnancy

Julie C. MARTIN,^{1,3} Gayle S. SAVIGE^{2,3} and Eleanor K. L. MITCHELL^{3,4}¹Remedy Healthcare, South Melbourne, ²Department of Epidemiology and Preventive Medicine, Monash University, The Alfred Centre, Melbourne, ³Department of Rural and Indigenous Health, School of Rural Health, Monash University, Moe, Victoria, Australia, and⁴School of Rural Health – East Gippsland, Monash University, Bairnsdale, Victoria, Australia

Background: Pregnant women have much higher iodine requirements as compared to all other population groups. The National Health and Medical Research Council (NHMRC) recommends pregnant women take a daily iodine supplement of 150 µg to meet their high iodine requirements.

Aim: To investigate iodine supplement use and health knowledge among pregnant women.

Method: A cross-sectional sample of 200 pregnant women aged 18 years or older, in their third trimester based in Gippsland (Victoria, Australia) undertook a self-administered questionnaire from August 2011–May 2012. The women were recruited from antenatal classes and clinics from all birthing hospitals across Gippsland. Data were analysed using descriptive statistics and logistic regression.

Results: A total of 46% of participants did not follow the NHMRC recommendation of 150 µg/day iodine supplement. The participants lacked knowledge about iodine and the need for supplementation. Only 18.5% of pregnant women believed they needed an iodine supplement. The majority of participants (83.5%) indicated their medical practitioners were the main source of health information, yet only 34.5% indicated being made aware of the importance of increasing iodine intake during pregnancy by their medical practitioner. The predictors of iodine supplementation are general supplementation use and knowledge of the importance of iodine.

Conclusions: Despite NHMRC guidelines for iodine supplementation during pregnancy, many women were not taking a sufficient iodine supplement. Pregnant women may be inclined to take an iodine supplement if they had greater knowledge of their increased iodine needs during pregnancy. Medical practitioners are best placed to provide this information to pregnant women.

Key words: diet, dietary supplements, health, iodine, knowledge, pregnancy.

Introduction

Iodine is required to produce the thyroid hormones, triiodothyronine (T3) and thyroxine (T4).¹ These hormones are essential in promoting growth and development, especially brain development starting from the first few weeks of embryonic life.¹ The effects of iodine deficiency can occur in all life stages, however, even mild iodine deficiency in a pregnant mother may diminish intelligence in the child.^{2–4} The effect on the neonate is permanent and irreversible, but preventable with adequate iodine during pregnancy.^{2–4}

Numerous studies have shown that pregnant women are at particular risk of iodine deficiency due to their higher iodine requirements.^{5–10} Pregnant women must transfer

thyroid hormones to their fetus, and later in pregnancy, iodine is transferred so the fetus can produce thyroid hormones.¹¹ An increased maternal renal filtration rate also increases iodine clearance by the mother, especially in the third trimester.¹¹

The World Health Organization (WHO) has classified Australia as a mildly iodine deficient country¹² based on studies, showing mild to moderate iodine deficiency in the South Eastern states.^{13,14} Factors which have contributed to Australia's iodine deficiency include the dairy industry changing from iodine-containing sanitisers to chlorine-based sanitisers^{7,15} and a decline in household salt use (including iodised salt). The consumption of marine fish and seafood (excellent sources of iodine) is generally low across the Australian population^{7,16} but especially among pregnant women, due to potential listeriosis and mercury contamination.

Food Standards Australia and New Zealand (FSANZ) responded to the widespread iodine deficiency by introducing mandatory bread fortification in 2009¹⁷. This strategy was insufficient to meet the increased iodine requirements of pregnant and lactating women. In 2010,

Correspondence: Dr Eleanor K. L. Mitchell, School of Rural Health - East Gippsland, Monash University, PO Box 1497, Bairnsdale, Victoria 3875, Australia.
Email: eleanor.mitchell@monash.edu

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the National Health and Medical Research Council (NHMRC) released a public statement recommending that all pregnant and breastfeeding women take a daily iodine supplement of 150 µg to achieve the recommended dietary intake (RDI) of 220 and 270 µg of iodine, respectively.^{18,19}

The aim of this research project was to investigate iodine supplement consumption, health knowledge about iodine and pregnancy, and the women's sources of health information for pregnancy and supplementation. The predictors of iodine supplement use were also investigated.

Material and Methods

This cross-sectional study included pregnant women from all birthing hospitals across Gippsland, Victoria, Australia. The women were recruited through the hospital where they planned to give birth, via antenatal clinics and antenatal education classes. The questionnaire was pre-tested on five women (who were or had been pregnant) and modified to ensure no ambiguity in the questions.

Researchers developed the 27-item questionnaire including demographics, which was administered from 16 August 2011 to 1 May 2012.

Participants were asked why they took (did not take) multivitamins, vitamins, minerals, herbs or food supplements such as Sustagen® (Société des Produits Nestlé S.A., Vevey, Switzerland) during their pregnancy. Women who reported taking a supplement were asked to identify the supplement/s (from a detailed list of commonly used supplements) and to indicate the dosage and frequency of use (eg two tablets, once daily). Women were also able to record the names of any supplements not on the list. Supplement use was also verified in women who were willing to be followed up via a phone call. Study participants were also asked to specify the period (before pregnancy or the trimester) that they commenced the supplement/s, who advised them to take the supplement/s, and what their intentions were for supplemental use during the remainder of their pregnancy, as well as after, pregnancy if they were intending to breastfeed. The amount of iodine consumed through their chosen supplement/s was calculated and compared to the NHMRC recommendations.

Questions relating to participants dietary food patterns around iodine, smoking habits, alcohol consumption were included. The questionnaire items used to estimate the intake of bread and dairy foods were drawn from the document 'monitoring food habits in the Australian population using short questions'.²⁰ The questionnaire was not designed to estimate the intake of iodine from foods.

The women's knowledge of iodine was investigated by asking them to select which foods were good sources of iodine (ie meat, fruit eggs, poultry, vegetables, breads, seafood, dairy foods, breakfast cereals, nuts & legumes/dried peas, beans or lentils, butter/margarine, pasta, regular table salt, sea or rock salt, iodised salt). The women were also asked to indicate whether or not they thought they needed 'more', 'less' or 'same amount' of iodine compared to other stages in life (ie newborn, children, teenagers,

non-pregnant adults, breastfeeding women or the elderly). We were also interested in exploring women's awareness about the adequacy of a 'healthy diet' in meeting their iodine requirements and whether they were aware that most commercial non-organic breads in Australia had been fortified with iodised salt.

Approval to conduct the study was granted by the Monash University Human Research Ethics Committee, Latrobe Regional Hospital Ethics Committee and the West Gippsland Healthcare Group Ethics Committee.

To be eligible for the study, participants must reside in Gippsland, be 18 years of age or older and be in their third trimester of pregnancy (≥28 weeks gestation).

All data were analysed using SPSS statistical package (v.20; IBM Corp., Armonk, NY, USA) with $P \leq 0.05$ taken as statistically significant. Logistic regression was used to determine predictors of iodine supplementation with iodine supplement intake used as the binary outcome variable. Predictor variables included age of mother, any supplement use, education level (beyond year 12), employment status (>15 h/week), number of cars per household, cigarette smoking status, need for additional iodine supplement, awareness of the importance of iodine during pregnancy and awareness of bread fortification.

Results

A total of 204 participants were recruited to the study. At least 401 surveys were distributed to the participating hospitals and clinics; however, additional surveys were circulated at one antenatal facility without adequate tracking, although we are confident of a minimum response rate of 45%. Four participant questionnaires were excluded from the study, three due to incompleteness (mostly blank) and one was completed by a participant whose gestation period was less than 28 weeks. The mean age of the 200 participants was 28.7 ± 5.5 years (age range 18–43 years). Nearly all of the participants were not of Aboriginal or Torres Strait Islander descent (97.5%) and English was the main language (91.5%). Additional participant characteristics are listed in Table 1.

Most participants came from the larger regional centres of Warragul (39.5%) and Traralgon (32%). The smallest contribution of participants was from Bairnsdale (2%) and Orbost (1.5%).

Current smokers comprised 9.5% of the women, and additional 32% were ex-smokers. Of those who indicated they were ex-smokers, 3% had quit smoking in the last eight months. Over half of the participants (60%) indicated they had stopped drinking alcohol since becoming pregnant. Of the participants who indicated they consumed alcohol during their pregnancy, two had ≥2 glasses per day and eight consumed <1 glass per day.

Supplement intake

The majority of study participants (79%) indicated they took some form of supplement, of which 62% contained

Table 1 Characteristics of the participants ($n = 200$)

Demographics	Frequencies <i>n</i>	Frequencies %
Previous pregnancies		
First pregnancy	115	57.5
Previous pregnancy	83	41.5
Age groups		
20 years and under	20	10.5
21–29 years	90	47.1
30 years and over	70	36.7
Employment		
Full-time	77	38.5
Part-time	45	22.5
Relationship status		
Married	117	58.5
Defacto relationship	67	33.5
Education - highest level of attainment		
Some high school	45	22.5
Completed high school	52	26.0
Technical & further education or apprenticeship	45	22.5
University degree, bachelor level	44	22.0
University degree, post graduate or higher	14	7.0

iodine. The supplements varied from multivitamins, to herbs and food supplements. Over a third (38%) of women surveyed either did not use supplements or took supplements not containing iodine. A further 8% of women took supplements containing only half the NHMRC recommended iodine dose. Those taking a supplement containing 150 µg of iodine or more comprised 54% of the women surveyed.

The majority of women (93%) indicated they intended to breastfeed with 47.5% reporting they would continue with the same amount of supplements. However, 23.5% indicated they would cut back or cease their current supplementation when breastfeeding, suggesting only 29% of these mothers would meet the NHMRC supplement recommendations when breastfeeding.

Dietary intake of iodine rich foods

Milk, cheese, yoghurt, and commercial bread were the most commonly consumed food sources containing good sources of iodine, with 83% of women consuming these foods daily. On average, 2.5 (range 0–7) slices of bread were consumed daily by participants. Around 10% of participants consumed fish on a weekly basis and 3% ate fish 2–3 times per week. Consumption of other seafood products was negligible, and 19% of pregnant women indicated limiting or avoiding seafood due to listeriosis or mercury contamination. In our sample, 26% of women reported consuming regular table salt daily compared to 19.5% who reported consuming iodised table salt daily.

Knowledge about iodine in pregnancy

The participants generally lacked knowledge regarding the importance of iodine in pregnancy. Only 18.5% of the women indicated they thought they needed an iodine supplement, in addition to a healthy diet, to meet their iodine requirements. Most participants believed iodine supplementation was not necessary (40.5%), and a further 37% indicated they were unsure about the need for iodine supplements.

Around half (50.5%) of women surveyed identified iodised salt as a good dietary source of iodine. Only 26.5% of the women selected seafood as a good dietary source of iodine. However, many foods were incorrectly identified as good sources of iodine, including meat (30%), nuts and legumes (23%), fruit (15%) and most vegetables (29%). Around one third of participants (32.5%) indicated they did not know what foods (from the list) were good sources of iodine. Only 15.5% of the women were aware of the national bread fortification program. Of those, 9% indicated that the media were their source of information. Just over half (54.5%) of the participants had heard about the importance of increasing iodine during pregnancy, although most did not consider iodine supplements as necessary if they had a healthy diet. The majority of women (88.5%) had heard about the importance of folate.

Predictors of iodine supplementation

The only predictors of iodine supplementation were knowledge and general supplementation intake. Women who thought they did not get enough iodine from their diet, even if it was healthy, were more likely to take an iodine supplement than those who thought a healthy diet alone was sufficient or those who indicated they did not know. Women who were taking a supplement during their pregnancy were more likely to take supplements containing iodine than those not taking any form of supplementation.

Sources of information

Pregnant women indicated receiving health information about their pregnancy from a variety of sources (Fig. 1). The majority of women (83.5%) reported medical practitioners (defined as general practitioner, doctor or obstetrician) as their main source of information for pregnancy and health. Medical practitioners were also most frequently selected (57% of responses) as advisors of supplements and the importance of folate and iodine (71.6% and 34.3% of responses, respectively). The most common sources of information (after medical practitioners) for both folate and iodine included the media, midwives, family/friends and other pregnant women (Fig. 1). However, twice as many women chose these options as sources for folate information as compared to iodine. The Internet/Website was a source of general health information about pregnancy for 41% of participants;

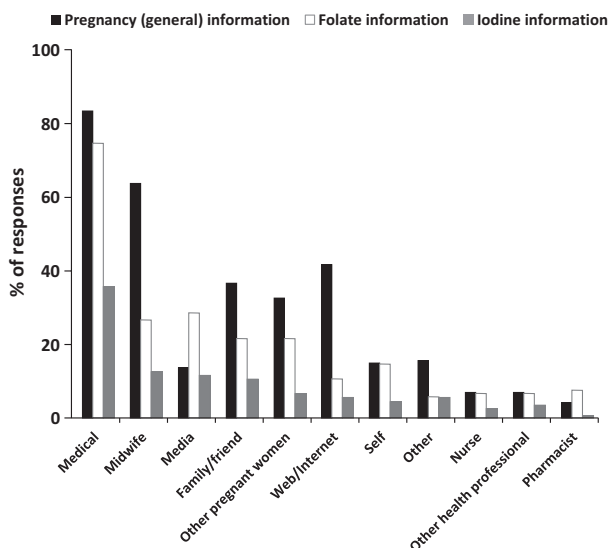


Figure 1 Sources of information for general health information, folate and iodine ($n = 200$).

however, less than 5% of women indicated its use as a source of information about supplements and iodine.

Discussion

The NHMRC recommends all pregnant and breastfeeding women take a 150 μg iodine supplement daily; this study found just under half were either taking a supplement with insufficient iodine (75 μg iodine per day) or not taking any iodine supplementation. These results suggest that a large proportion of these pregnant women remained at risk for iodine deficiency and the effects a suboptimal iodine status can have on the fetus.²⁻⁴

Inadequate iodine supplementation has also been found in other Australian studies of pregnant and breastfeeding women.^{5,8,9,21-23} Similarly, poor knowledge about iodine in pregnancy and dietary sources of iodine has been previously demonstrated in Australian pregnant and lactating women.^{5,8,9,22,24} This study showed that most pregnant women were aware of the importance of folate compared with iodine. The cohort of Gippsland pregnant women surveyed by Rahman *et al.*⁹ found similar results with all participants aware of the importance of folate, but only one third were aware of iodine. A review by Charlton *et al.*²¹ also found that pregnant and lactating women were better informed about folate and other dietary issues related to pregnancy than iodine.^{21,22} Previous studies indicate that many Australian pregnant and lactating women feel that they had not received sufficient information regarding iodine for their pregnancy.^{21,22}

In this study, general supplement consumption and iodine knowledge were found to be the only predictors of iodine supplementation, which is unlike other Australian and overseas studies which found socioeconomic status to be a predictor for supplement consumption among pregnant women.^{5,21,22,25-30} Where in general, pregnant

women who take supplements tended to be older, more educated, married, non-smokers, of a normal body weight (before pregnancy), with first and planned pregnancies.^{5,21,22,25-30}

The medical practitioner was selected as the main source of information for general health information and for providing advice regarding supplementation. This finding is consistent with other Australian studies involving pregnant women.^{5,9,21} As medical practitioners are the main source of health information, it is important that medical practitioners are providing pregnant women with information about iodine supplementation.

Limitations

The findings of this study cannot be extrapolated to the rest of Victoria or Australia since the sample may not be representative of pregnant women elsewhere. This sample was slightly older, slightly more educated and more were employed when compared to statistics of Latrobe, the largest local Government Area in Gippsland. The majority of participants in our study were from antenatal clinics and antenatal education classes, which are representative of pregnant women as a whole, and even though not all pregnant women attend antenatal education classes, most will attend antenatal clinics.

We did not measure iodine intake from food sources, so we cannot estimate the quantity of iodine from dietary sources. However, most pregnant women are unlikely to receive adequate iodine from food sources alone because good sources of iodine are essentially limited to commercial bread, marine foods, dairy foods and iodised salt, and our findings indicated the vast majority of women were not regular consumers of fish or iodised salt.

There was no verification of the information provided to pregnant women during their antenatal care.

The inclusion of urinary iodine concentrations could have been used to estimate the risk of iodine deficiency in the cross-sectional sample of women being surveyed. However, we were interested in gauging the effectiveness of the NHMRC recommendations regarding iodine supplementation in pregnant women and, the potential factors influencing these supplementation practices.

Conclusion

At least 18 months after NHMRC recommendations on iodine supplementation were released, this study found large proportions (46%) of pregnant women were not following the recommendations. Furthermore, a similar proportion of women were not aware of the importance of increasing their iodine intake during pregnancy, yet most were aware of the importance of folate. Women mainly relied on their medical practitioners for general health advice during pregnancy and advice regarding supplementation. For these reasons, medical practitioners are well positioned to be providing advice about iodine supplementation as part of their antenatal care. Women

need to understand the importance of iodine supplementation in pregnancy and need to be informed to take 150 µg iodine supplements daily. Providing this information preferably preconception or in the early stages of pregnancy could reduce the risk of iodine deficiency in the mother and neurological damage to the developing baby.

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