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Antenatal shared care: are pregnant women being adequately informed about iodine and nutritional supplementation?

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Abstract

Objectives To assess nutrition-related knowledge and practices, including supplement use, of both pregnant women and healthcare providers that participate in antenatal shared care (ANSC). **Methods** Pregnant women enrolled in ANSC (n = 142) completed a knowledge and practices survey and a validated iodine-specific Food Frequency Questionnaire. General practitioners (GP) and nurses (N = 61) participating in the ANSC program completed a short survey which assessed their knowledge about nutrition for pregnancy, focussing on iodine. **Results** Both groups had poor knowledge about the importance and roles of iodine during pregnancy. Most women (82%) reported taking a supplement during their current pregnancy, and 70% were taking a supplement containing iodine. Only 26% of GPs discussed iodine supplementation with pregnant patients. The median (IQR) iodine intake of pregnant women was 189 (129-260) µg/day which meets the estimated average requirement (160 µg/day). Half (52%) of women's dietary iodine was provided by dairy foods, and only 7% came from fish and seafood. Most healthcare providers (74%) expressed interest in receiving ongoing professional education about iodine in pregnancy. **Conclusion and Implications** Ongoing nutrition education for ANSC health practitioners is required to ensure that women receive sufficient dietary advice for optimal pregnancy outcomes. Further research is required to address reasons behind dietary choices of Australian pregnant women.

Keywords

Antenatal shared care, diet, iodine, pregnancy, supplementation

Disciplines

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Antenatal Shared Care: Are pregnant women being adequately informed about iodine and nutritional supplementation?

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Abstract

Objectives: To assess nutrition-related knowledge and practices including supplement use, of both pregnant women and healthcare providers that participate in Antenatal Shared Care (ANSC).

Methods: Pregnant women enrolled in ANSC (n = 142) completed a knowledge and practices survey and a validated iodine-specific food frequency questionnaire. General practitioners (GPs) and nurses (N = 61) participating in the ANSC program completed a short survey which assessed their knowledge about nutrition for pregnancy, focusing on iodine.

Results: Both groups had poor knowledge about the importance and roles of iodine during pregnancy. Most women (82%) reported taking a supplement during their current pregnancy, and 70% were taking a supplement containing iodine. Only 26% of GPs discussed iodine supplementation with pregnant patients. The median (IQR) iodine intake of pregnant women was 189 (129-260) µg/day which meets the Estimated Average Requirement (160µg/day). Half (52%) of women's dietary iodine was provided by dairy foods, and only 7% came from fish and seafood. Most healthcare providers (74%) expressed interest in receiving ongoing professional education about iodine in pregnancy.

Conclusion and Implications: Ongoing nutrition education for ANSC health practitioners is required, to ensure that patients receive sufficient dietary advice for optimal pregnancy outcomes. Further research is required to address reasons behind dietary choices of Australian pregnant women.

Keywords: iodine, supplementation, pregnancy, antenatal shared care, diet

Introduction

Iodine is an essential trace element for human growth and development, as it is required by the thyroid gland to produce the hormones triiodothyronine (T₃) and thyroxine (T₄). Iodine deficiency during pregnancy can lead to neurologic defects in the foetus, ranging in severity from a mild reduction of intellect through childhood [1-3] to severe mental impairment and cretinism, as well as miscarriage and stillbirth [4-6].

The World Health Organization (WHO) has classified Australia as a mildly iodine deficient country [7]. Pregnant and breastfeeding women are most at risk of deficiency because of their higher requirements [8-10]. The iodine-deplete soil in Australia, together with low population level intakes of iodine-rich seafood are the key reasons for the existing iodine deficiency [11]. Additionally, Australia does not have universal salt iodisation, unlike most

other iodine deficient countries [7]. Although iodised salt is available, its uptake is low [12] and public health messages have targeted overall reductions in salt usage. Furthermore, the replacement of iodophors with other cleansing agents in the dairy industry has removed adventitious iodine from the Australian food supply [13].

Mandatory fortification of salt used in bread manufacture was introduced in Australia in 2009 [14]. In 2010 the National Health and Medical Research Council (NHMRC) released a position statement recommending iodine supplementation of 150µg/day for pregnant and breastfeeding women, in recognition that mandatory fortification of bread alone would not meet their increased needs [15]. Despite this, research has demonstrated that Australian pregnant women are not receiving adequate information regarding the importance and role of iodine, and receive less advice on iodine compared to other key nutrients for pregnancy such as folate, iron and calcium [16].

Antenatal Shared Care (ANSC) is described in Australia as a service delivery model where “several health professionals are involved in the care of a woman during her pregnancy, often in the context of a formal arrangement”[17]. A recent literature review has documented that alternative models of antenatal service delivery which offer continuity of care, such as ANSC, show improvements in women’s satisfaction and obstetric outcomes[18].

ANSC aims to provide pregnant women with flexibility, choice and continuity of care, whilst enhancing the skills of GPs working with pregnant women, and promoting better communication between GPs and the antenatal clinic [19]. The defined clinical pathway for the ANSC program states that information on nutritional supplementation should be provided by the GP between gestational weeks 8 and 12, however compliance with this guideline is yet to be investigated [19].

This study aims to assess nutrition-related knowledge and practices with a particular focus on iodine, of both pregnant women and healthcare providers that participate in ANSC in a regional area of New South Wales.

Materials and Methods

Pregnant women

A cross sectional survey of all pregnant women enrolled in the ANSC program in the Illawarra region of NSW as of December, 2012 was conducted (n=515). Enrolled women, who were identified using hospital records, received two mailed flyers requesting their participation in an online survey using the Survey Monkey program, of which 37 responded (7% response rate). Due to the low response rate, a second recruitment phase in August 2013 was undertaken, whereby women enrolled in ANSC were approached directly whilst awaiting their routine obstetrician appointments at the public antenatal clinic that services women in the catchment area. In 2013, a total of 716 women were enrolled in ANSC. Enrolled women were identified through their antenatal file and those that consented completed a self-administered, paper-based version of the questionnaire (n=105). The survey which has been used in previous surveys of pregnant women [16] assessed knowledge about the function and food sources of iodine, and identified dietary practices during pregnancy, including supplement use (See Appendix 1). Women were also asked to complete a 49 item validated iodine-specific Food Frequency Questionnaire (FFQ) about dietary intake over the past month [20]. The FFQ included dairy, eggs, cereal products, fish and seafood, meat, vegetables, fruit, mixed dishes, tap water and use of iodised salt. Salt intake was estimated assuming that a 'pinch' was 0.4g, up to a maximum of 1g per day if a participant reported consuming more than 1 teaspoon [21]. Women who had already given birth at the time of the survey were excluded from the dietary analyses, as their dietary requirements of iodine are different, and they may have changed their diet since being pregnant. The nutrient analysis was conducted using the computerised dietary assessment package FoodWorks (version 7, Xyris Software, Pty Ltd, Highgate Hill, Queensland, Australia) that included both the AUSNUT 2007 [22] and NUTTAB 2010 [23] food composition databases. Women were asked to report the brand name of supplements they were using. These brands were cross matched with the iodine content and dosage of pregnancy supplements identified in an online audit of 24 supplements targeted to pregnant women [24]. If women reported using a 'pregnancy supplement' without specifying a brand, it was assumed that the supplement contained iodine. In those cases (n = 23), an average of all supplements with the word "pregnancy" in the product name was assigned. This was calculated using the amounts from the 14 supplements available in Australia with the word pregnancy in the title, including the 2 brands which contain less than the recommended amount of iodine, as calculated from a 2013 online audit [24], namely 183µg/day.

Healthcare providers

General Practitioners (GPs) and nursing staff registered as providers of ANSC in the Illawarra were asked to complete a survey examining their knowledge and practices related to nutritional care of pregnant patients (See Appendix 2). Participants were recruited whilst they attended one of two biannual update sessions held at the Wollongong Hospital in either May or August 2013. A total of 254 GPs were registered providers of ANSC in 2013, 111 of which attended one of the two sessions with 45% consenting and completing the survey. An additional 33 nurses attended the sessions and were also invited to participate, response rate 33%. Results for knowledge and practices were analysed separately for GPs and nurses as supplementation advice is defined within the role of the GP in the ANSC pathway[19]; results for desire for further education were analysed together.

Data collected from both surveys was analysed using SPSS 17.0 (SPSS Inc Chicago, IL, USA) using descriptive statistics. Chi square tests were used to test if there were significant differences between the two recruitment batches of women for demographics, knowledge of food sources of iodine, knowledge of adverse outcomes of iodine deficiency, knowledge of populations at risk of iodine deficiency and proportion taking iodine containing supplements. Chi square tests were used to determine if there were significant differences in knowledge and practices, according to categorical variables of maternal age, (under 29 and 30+ years) completed post school education (Yes/No) (stratified by maternal age), first pregnancy (Yes/No), and reported use of iodised salt at the table and/or in cooking (Yes/No). Mann-Whitney tests were used to determine if the exclusion of women taking an unspecified brand of pregnancy supplement significantly altered the median total iodine intake. Approval to conduct the study was obtained from the Human Research Ethics Committee of the University of Wollongong and site-specific permission obtained from NSW Health.

Results

Women

There was no significant difference between the two recruitment batches, except with regard to knowledge that seafood is a good source of iodine, therefore all results are presented as one group. Mean age of the women was 29 ± 5.09 years (Range 18-46) and the majority (73%) were in their third trimester (Range = 13 – 43 weeks). Eighteen women who completed the online survey had already given birth secondary to the short delay between accessing the ANSC records and mailing the flyers, the mean age of their infants was 9 ± 5.09 weeks (Range = 1-20 weeks). It was the first pregnancy for 47% of participants. Most

women (63%) had received a post school qualification. Most pregnant women (93%) intended to breastfeed and 15 of the 18 women who had already given birth were currently breastfeeding (Table 1).

Knowledge

Knowledge about iodine was generally poor across all areas assessed and did not differ significantly according to age, education or parity. Approximately half of the women did not know if their diet provided adequate iodine for their own bodies' needs (53%) or for their unborn child's needs (58%).

Knowledge of iodine-rich food sources was lacking; 55% of women correctly identified seafood as a good source of iodine, while less than one third correctly identified bread (26%), milk (29%) and eggs (31%) (Table 1). Further, almost half (46%) incorrectly identified vegetables as a good source of iodine. Women recruited in the first batch were more likely to correctly identify seafood as being a good source of dietary iodine ($\chi^2=7.357$, $df=1$, $p=0.008$). Participants also had poor knowledge of potential outcomes related to iodine deficiency (Figure 1). Most women (66%) were unaware that iodine is a public health issue in Australia. However, participants correctly identified pregnant women (94%), breastfeeding women (62%) and young children (58%) as being most at risk of health problems associated with lack of iodine in the diet.

Practices

Half the women (51%) reported not making any changes to their diet during pregnancy to increase iodine intake, whilst 22% had made such changes. The most commonly reported dietary changes included commencing supplements (15%), switching to iodised salt (3%) and consuming more vegetables (1%). Eighty-two percent of women reported taking supplements during their pregnancy, 77% were taking supplements containing folic acid and 70% were taking supplements containing iodine. Women aged 30 and over were more likely to be taking some type of nutritional supplement during pregnancy ($\chi^2= 6.942$, $df=1$, $p= 0.008$) compared to younger women. There was no difference in supplementation use for women who had received a post school education when stratified by age. There was no significant association between age or education with taking supplements containing iodine. Just over one third of women (35%) reported taking supplements prior to becoming pregnant, and 27% reported taking supplements which contained folic acid.

Dietary Intake of Iodine

Women who had already given birth (n=18) were removed from dietary analysis, as were women with incomplete FFQ data (n=5), leaving n= 119 women. Median (IQR) of 189 (129-260) µg/day which exceeds the Estimated Average Requirement (EAR) for pregnancy (160 µg/day) [25] (Range: 15-662µg/day). Over one third (38%) did not meet the EAR. Half (52%) of total iodine intake was provided by dairy foods, 18% by breads and cereals, 7% by fish/seafood and 10% by iodised salt. Half of the women (50%) reported using iodised salt. When including iodine provided from supplements, the median (IQR) was 393 (249-471) µg/day. No women reached the upper limit of 1100 µg/day [25] (Range:15-863 µg/day). Eleven percent of women had intakes below the EAR, none of whom were taking iodine containing supplements. There was no difference in the total iodine intake of women who had reported taking an unspecified pregnancy supplement compared to those taking a known brand of supplement (p=0.100) therefore these women were not excluded from the analyses.

Thirty seven percent of women reported consuming 2 or more serves of fish/ seafood per week, but these women were not more likely (p = 0.69) to have dietary intakes that met the EAR than women who cons

Less than half (40%) of women were meeting the recommended 2.5 serves of dairy per day and these women were more likely to meet the EAR ($\chi^2=34.087$, df=1, p<0.05). Women who used iodised salt were more likely to meet the EAR from diet alone ($\chi^2=4.453$, df=1, p=0.035), as were women who consumed 2 or more slices of bread per day ($\chi^2=37.986$, df=1, p<0.05).

Healthcare Providers

Sixty one healthcare providers completed the survey, namely, 50 GPs and 11 nurses, including practice nurses (n=7) and family and child health nurses (n=4). Most participants (74%) had been working in their profession for over 10 years.

Knowledge and practice

Just over half the GPs surveyed (59 %) recognised iodine deficiency to be ‘moderately prevalent’ in Australia, whilst 26% did not know if it was an issue of public health concern. GPs had difficulty identifying the best sources of iodine in the diet (Figure 2). Most GPs (72%) rated their patient’s general knowledge of iodine as very low or ‘not at all

knowledgeable' while only 6% regarded their patients to be knowledgeable about iodine and its importance during pregnancy, compared to 62% and 80% for iron and folic acid, respectively. Most GPs (70%) did not know the NHMRC recommended dosage of iodine for pregnancy supplements [15]. Only 26% of GPs reported discussing iodine supplementation with their pregnant patients (42% "rarely or not at all"). Most (64%) reported that they did not prescribe iodine supplements to pregnant patients. A higher proportion of nurses (46%) reported discussing iodine supplements with pregnant patients; however the majority (82%) did not know the NHMRC recommended level of supplementation. Additionally, a higher proportion (55%) of nurses correctly identified seafood as the best source of dietary iodine.

Further Education

Most participants (74%) were interested in attending professional education sessions about iodine in pregnancy. Most participants expressed interest in all potential education topics listed with the most popular being impact of iodine deficiency on the foetus (87%) and the mother (84%).

Discussion

The main strength of this paper is that it investigates the knowledge and practices of both women and their general practice service providers in Australia. The low level of knowledge of iodine in pregnancy in practitioners participating in ANSC was reflected in the similarly poor knowledge of pregnant patients. Other studies from the same geographical region in women enrolled in all models of care have consistently reported poor knowledge of pregnant women [16, 26], however more women in the current study correctly identified that pregnant and breastfeeding women are at risk of iodine deficiency. There is currently no evidence examining differences in terms of nutritional advice across different models of antenatal care and research on the nutrition advice received by pregnant women in developed countries is sparse [27].

Despite the majority of General Practitioners (63%) not discussing iodine supplementation with their pregnant patients, 70% of women reported taking iodine-containing supplements. An explanation for this disconnect is that most major pregnancy multivitamin/mineral supplement brands have undergone formulation changes to include iodine in recent years [28], therefore women may not necessarily be selecting their choice of supplement because of

an awareness regarding iodine requirements. This is consistent with unpublished results from this study which show that 71% of women received written or verbal advice from a healthcare provider about nutritional supplements, but only 46% received information about iodine [29]. Women may be receiving supplementation advice from other sources including their midwife or pharmacist, however knowledge of nutrition has also been shown to be poor in these healthcare providers [24, 30]. This estimated use of pregnancy supplements is similar to other studies from the same geographical area [16, 26], but higher than reported from research in South Australia [31] and the United Kingdom [32]. The use of iodine supplements in this study is slightly lower than use of folic acid supplements reported in other Australian studies [26, 33, 34]. This may be related to the apparent higher knowledge of pregnant women about folic acid compared to iodine [26]. Older women were more likely to be taking supplements, regardless of educational status. This may indicate that there are additional socio-economic factors involved in a woman's decision to take supplements. Assessing income was outside the scope of this study, however research indicates that women with lower incomes are less likely to take supplements [34].

It is encouraging to note that over half (62%) of the women who completed the FFQ met the EAR for pregnancy, however this is inconsistent with recent biomedical data from the Australian Health Survey [35] which identified that nearly two thirds (62.2%) of women in the childbearing age group (16-44 years) had a UIC of less than 150µg/L. It is possible that the FFQ could have overestimated the iodine intake of pregnant women as it has only been validated in an older population [20]. The results support the NHMRC recommendation for iodine supplementation of pregnant women as over one third of women were not meeting the EAR for iodine from diet alone. Further, no women exceeded the upper limit for estimated intake from both diet and supplements.

Dairy foods were the greatest contributor of dietary iodine, as reported previously [16], and ongoing encouragement of the consumption of this important food group is warranted, particularly as only 40% were having the recommended serves of dairy per day and these women were more likely to meet the EAR. The findings also provide support for advocating the use of iodised salt in pregnancy and consuming at least 2 slices of bread per day, as women who were doing so were more likely to meet the EAR for iodine from diet alone. Despite ocean fish/seafood being the richest dietary sources of iodine, this food group continues to provide an insignificant amount of iodine in the diets of pregnant women due to infrequent intake, as reported by others [16].

This study had a number of limitations. This convenient, cross sectional sample of pregnant women cannot be considered representative of all pregnant women participating in ANSC. Non English-speaking women were excluded because of language barriers and this is a group that has previously been shown to be at higher risk of iodine deficiency than English-speaking Australians [9]. Recruiting women in two data collection periods which were 8 months apart is a further limitation, particularly as the new Antenatal Care Clinical Guidelines were released during this period [17]. However we found no significant differences in demographic characteristics nor nutrition knowledge or practices between the two groups, with the exception of a higher knowledge of seafood as a good source of iodine in the first recruitment wave. This difference may be attributable to those women who completed the online survey having a greater interest in nutrition than those who completed the written survey whilst waiting for their appointments in the clinic in the latter period. It is also possible that the strategy used to recruit GPs may have resulted in a biased sample as only those who attended one of two education sessions at the hospital were invited to participate. This sampling frame included 44% of all GPs registered as ANSC providers in the Illawarra region. It is mandatory component of the ANSC model that practitioners attend at least one education session within a 2-year period. Further the nurses that participated in our study are unlikely to be representative of nurses who provide care for pregnant women in ANSC, due to the small number that were included. Nevertheless, our data provides useful information that can guide the development of further educational resources and areas of improvement within the ANSC program. Regarding levels of knowledge about nutrition during pregnancy, our data probably provides a best-case scenario since both healthcare providers and pregnant women that agreed to participate in the study may have had a greater interest in health and diet, and may therefore have had an above average knowledge related to iodine. All data were self-reported and therefore subject to some degree of reporter bias. The lack of biomarkers of iodine status such as urinary iodine excretion further limits assessment of validity of the data although the purpose of the study was to assess knowledge and practices of both women and their healthcare providers, rather than assess iodine status per se. Lastly, the use of iodine-containing supplements may have been over reported, as 23 participants reported using a pregnancy supplement but did not specify the brand.

Our findings identify a need for providers of ANSC to receive adequate education regarding the roles and requirements of iodine in pregnancy, particularly with regard to

supplementation. Further research is required to address whether there are socio-economic barriers that are preventing pregnant women from taking supplements and which strategies are effective to overcome these barriers .

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Table 1: Socio-demographic characteristics of women including gestational age and intention to breastfeed (n = 142) (n (%))

Age	
Mean (SD)(years)	29.2 (5.1)
Range (years)	18 – 46
Aged 29 and under	74 (52%)
Aged 30 and over	68 (48%)
Highest Level of Education Attained	
Some High School	23 (16%)
Completed High School (Year 12)	30 (21%)
TAFE (or apprenticeship)	44 (31%)
University Degree (Undergraduate Level)	30 (21%)
University Degree (Postgraduate Level)	15 (11%)
Trimester	
1 (0–12 weeks)	—
2 (13–24 weeks)	20 (14%)
3 (>25 weeks)	104 (73%)
Already given birth	18 (13%)
First Pregnancy/Birth	67 (47%)
Intend to breastfeed (n=124)	115 (93%)
Currently breastfeeding (n=18)	15 (83%)
Previous Miscarriage	27 (19%)

Table 2: Women's responses to which everyday foods they believe are good sources of iodine in the Australian diet (n=140[†])

Food Source [‡]	Good Source	Not a Good Source	Do not know
Meat	39%	6%	55%
Milk [‡]	28%	11%	61%
Bread [‡]	26%	12%	62%
Seafood [‡]	55%	4%	41%
Fruit	25%	12%	63%
Vegetables	46%	5%	49%
Eggs [‡]	31%	11%	57%
Salt [§]	51%	10%	39%

[†] Incomplete data from n=2 participants

[‡]These food items provided as choices in a pre-defined list

[‡]Good sources of iodine

[§] Only a good source if iodised

Table 3: Knowledge and practices related to iodine nutrition of General Practitioners and Nurses

	General Practitioners (n= 50)	Nurses (n= 11)
Think iodine is moderately prevalent in the Australian population	54%	82%
Correctly identified seafood as the best source of iodine in the diet	20%	55%
Correctly identified bread as the vehicle for mandatory iodine fortification in Australia	24%	27%
Correctly identified that the NHMRC recommends 150µg of iodine should be included in pregnancy supplements	8%	9%
Did not know the NHMRC recommended amount of iodine for pregnancy supplements	70%	82%
Discuss the use of iodine supplements in the first visit/first trimester	18%	27%
Prescribe iodine supplements to all pregnant patients	22%	9%
Regarded their patients to be very knowledgeable or knowledgeable about iodine	6%	36%

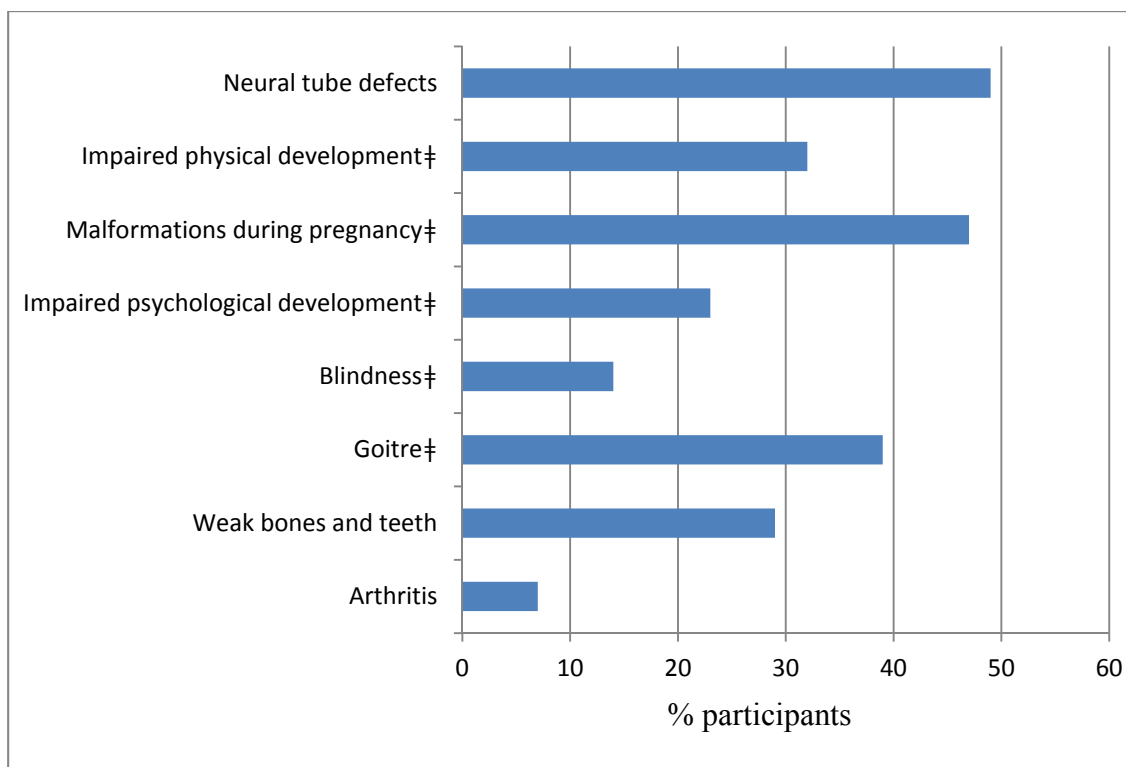


Figure 1. Proportion of participants who identified health conditions associated with insufficient iodine in the diet (closed question, multiple responses allowed) (N=142)

‡Potential adverse outcomes caused by iodine deficiency

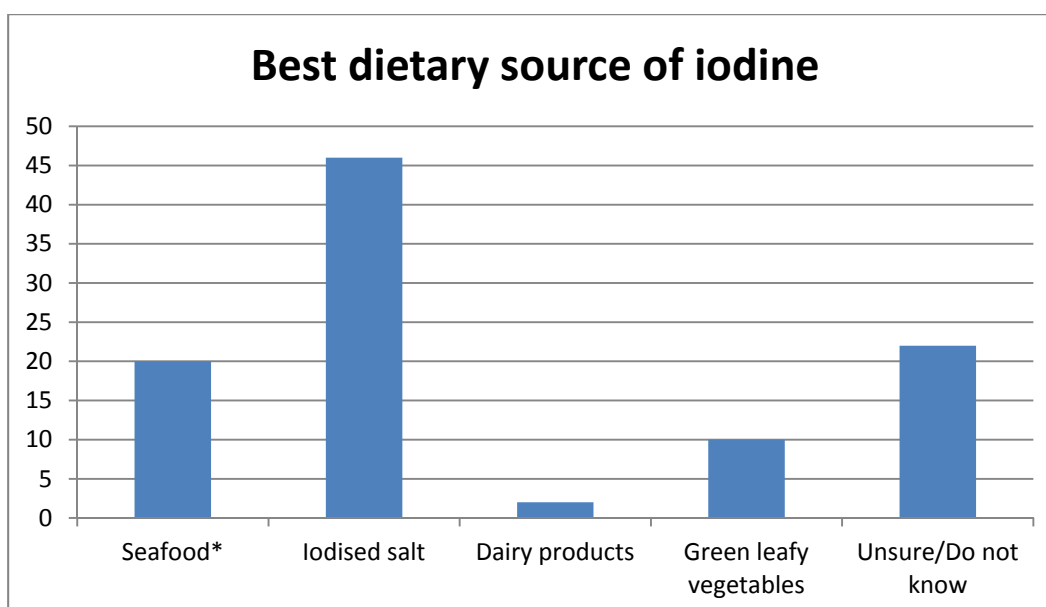


Figure 2: Percentage of General Practitioners sampled (n = 50) who identified everyday foods as being the best dietary source of iodine

* Correct answer