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KNOWLEDGE AND AWARENESS OF IODINE DEFICIENCY, RISKS, AND COMPLICATIONS DURING PREGNANCY AMONG WOMEN IN THE SAUDI POPULATION

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Abstract

Background: It's important to include iodine for thyroid hormones to help you synthesize that needed for metabolism, brain development, and overall health. Iodine deficiency is a severe problem, especially in pregnant women, who have increased iodine requirements. It is important, but the knowledge of iodine deficiency and its consequences during pregnancy is very minimal in most of the populations which despite this fact this Saudi Arabia is no different. The objective of this study was to evaluate the knowledge and awareness on iodine deficiency, its risks, causes, complications during the reproductive or pregnancy period among women in Saudi Arabia.

Methods: A descriptive cross-sectional survey was carried out from July to November 2024 among 1020 women aged 18 and above. A questionnaire including demographic and knowledge and practice on iodine consumption was completed by participants. The data were analyzed using Microsoft Excel and statistical significance by using SPSS.

Results: Most participants (78.4%) identified iodine as essential micronutrient but 68.2% perceived their overall knowledge of iodine to be low. Although 60.4% were aware of iodine's teratogenic effects, misconceptions remained: 55.7% were of the opinion that adequate seafood consumption would replace iodized salt. In addition, more than half of participants (54.3%) did not list seafood as a key primary prevention against iodine deficiency. The association with age, education and gravidity but not with thyroid dysfunction history or current supplement use was significantly associated with awareness levels.

Conclusion: Recognition of importance of iodine deficiency was a general, whilst these findings of the present study showed a gap in knowledge and awareness among women in Saudi Arabia. This emphasizes the need to address such an urgency in targeted educational interventions to enhance

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understanding of the role of iodine in maternal and fetal health and to subsequently minimize the risk of iodine deficiency during pregnancy. In future research, broader recruitment methods and longitudinal designs, for example, are explored so that knowledge mapping helps more clearly understand the link between knowledge and iodine status.

Keywords: Iodine, Deficiency, Hypothyroidism, Saudi Arabia.

Introduction:

Iodine is an essential element that assists in the creation of thyroxine (T4) and triiodothyronine (T3), two thyroid hormones [1]. Along with controlling neuronal activity and development of the brain, these hormones also control metabolism and protein production [2]. Iodine-deficiency diseases, such as spontaneous abortions, increased mortality among infants, cretinism, goiter, and mental retardation, are caused by inadequate levels of iodine [3]. Many meals contain iodine. Fish and dairy products are the best sources. Dairy products and milk are often the primary sources of dietary iodine in Ireland and the UK [4]. Iodine deficiency diseases are silent epidemics affecting over 2 billion people globally [5]. Pregnant women are the most vulnerable population to Iodine deficiency diseases since they have an increased need for iodine compared to nonpregnant women [6]. Pregnant women are thought to be affected by clinically overt hypothyroidism in 0.5% of cases. However, 2% and 4 % of the cases are subclinical, Levothyroxine treatment is absolutely necessary for both types [7]. The first study conducted by Khamsingnork et al. (2016) at Srinagarind Hospital in Thailand sought to evaluate pregnant women's knowledge, attitudes, and practices about iodine consumption. It was discovered that only 35.26 percent of the pregnant women in the study had a positive attitude regarding iodine intake [8]. Another stud found that nearly two-thirds of adolescent girls had an unsatisfactory level of total knowledge regarding iodine deficiency [9]. THEN this study Discovered that 64% of the mothers had never received information about iodine, and only 11% had heard about iodine from a healthcare professional [10]. Finally, this study revealed that the majority of the studied sample (78.1%) hadn't heard about iodine or didn't have previous knowledge about iodine [11].Nearly five hundred million people in the world complain of thyroid disease, 6% of fmales (in age from 20-45), 3% of men, and about 1% of children per all people. 3% of pregnant women are suffering from hypothyroidism [12] , and part of them don’t have enough information about preventive ways to decrease the risk by increasing the consumption of iodine in food. Most of the previous studies focus on the prevalence of iodine insufficiency and relation between the iodine deficiency and hypothyroidism in pregnancy. However, there are not many studies that assess women's awareness of iodine deficiency during pregnancy

Objective**:**

The aimed to assess the level of knowledge and awareness about iodine deficiency, risks, causes, and complications during pregnancy and the reproductive period among women in Saudi Arabia.

Methodology**:**

Study Design and Setting:

This is a descriptive cross-sectional survey carried out in the Kingdom of Saudi Arabia from July to November 2024.The study population consists of Saudi women. The study plans to recruit participants through social media platforms like X, Snapchat, WhatsApp, and Facebook.

Sample size:

The sample size was estimated to be at least 38 participants, using the Raosoft calculator with a

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confidence level of 95% and margin error determined as 5%. The Sample size was appraised by the formula: n= P (1-P) * Zα 2 / d 2 with a confidence level of 95%.
n: Calculated sample size
Z: The z-value for the selected level of confidence (1- a) = 1.96.
P: An estimated prevalence of knowledge
Q: (1 – 0.50) = 50%, i.e., 0.50
D: The maximum acceptable error = 0.05.
So, the calculated minimum sample size was:
n = (1.96)2 X 0.50 X 0.50/ (0.05) 2 = 384.

Inclusion and Exclusion Criteria:

The inclusion criteria include female aged 18 and above while exclusions criteria include male, female aged below 18 years old and female outside Saudi Arabia.

Method for data collection, instrument, and score system:

The study used a Questionnaire on Iodine-related Knowledge and Practice among Pregnant Women. This questionnaire was developed after reviewing relevant studies conducted in Saudi Arabia. Data was collected through the participants' responses to the questions. The questionnaire included the following: demographic information, iodine-related practices and iodine-related knowledge
and does iodine deficiency have adverse effects on fetal growth during pregnancy?
The questionnaire consisted of 21 general questions, 11 of which were specifically focused on the participants' knowledge about iodine, also the participants were asked about their basic demographic characteristics and their iodine intake practices [13].

Knowledge and awareness level:

A questionnaire with a total of 11 statements was used to evaluate the knowledge and awareness level of the participants along with personal questions. The total knowledge score ranged from 0-14. Correct responses receive (one point), while erroneous answers or "I don't know" receive (zero points).11 statements (14 Points); the overall level of knowledge was calculated using Bloom's cut-off point. Based on this cut-off point, scores between 80–100% (12–14 points) meant good knowledge, 60–79% (9–11 points) meant moderate knowledge, and scores less than 59% (8 or low) were an indicator of poor knowledge.

Pilot test:

20 individuals were asked to complete the questionnaire. Through this, the simplicity and feasibility of the study of the questionnaire is tested. Data collected from the pilot study was not included in the final data of the study.

Analyzes and entry method:

Microsoft Excel (2016) for Windows was used on a computer to enter the collected data. After that, the data was moved to version 25 of the Statistical Package for Social Science Software (SPSS). for statistical analyses

Results:

The sociodemographic structure of 1020 participants are mainly females (100%). Of them, the greater

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proportion (60.6%) are in the 18-29 age group which show that the subjects are relatively young. Education also stands out especially if accompanied by a Bachelor's degree, of which 66.9% possess. Sex: The majority of participants are single which is unobtrusively low married percentage 31.7 % and very few participants are widowed 1.6%. Regional distribution shows a significantly high number from the southern region with participants contributing at 63.9%. The gravidity data presents a reveal that a large number of the respondents have never been pregnant (59.4%) and only a few (18.6%) are on the fifth pregnancy and above. Having history of thyroid dysfunction was noted in 9.2% participants, while history of chronic disease was noted in 14.5% participants. Also, 25.5% are using vitamins or iodine containing supplements at the moment. These data may help to define the state of health condition of the participants (Table 1).

Table (1): Sociodemographic characteristics of participants (n=1020)

Parameter		No.	Percent
Age group	18-29 years old	618	60.6
	30-49 years old	284	27.8
	50-70 years old	118	11.6
Gender	Female	1020	100.0
Educational Qualification	Secondary school or less	178	17.5
	Bachelor	682	66.9
	Diploma	108	10.6
	Post-graduate	52	5.1
Marital status	Widowed	16	1.6
	Single	574	56.3
	Married	404	39.6
	Divorced	26	2.5
Residential area	Southern region	652	63.9
	Eastern region	42	4.1
	Northern region	12	1.2
	Western region	170	16.7
	Center region	144	14.1
Gravidity	First pregnancy	34	3.3
	Second pregnancy	40	3.9
	Third pregnancy	64	6.3
	Fourth pregnancy	86	8.4
	Fifth pregnancy or more	190	18.6
	Never been pregnant	606	59.4
Did you have a history of thyroid dysfunction or disease?	No	926	90.8
	Yes	94	9.2
Gestation period	12-1 weeks	14	1.4
	27-13 weeks	50	4.9

ISSN:1624-1940
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	42-28 weeks	374	36.7
	Never been pregnant	582	57.1
Did you have any history of chronic disease?	No	872	85.5
	Yes	148	14.5
Are you taking any vitamins or iodine-containing supplements at present?_____	No	760	74.5
	Yes	260	25.5

As shown in figure 1, Responses from 1020 people who were asked if they think the iodine an essential micronutrient for humans. Of the total, 800 respondents (78%) said yes, and 18 respondents (2%) said no.

Figure (1): Shows what participants think if iodine an essential micronutrient for humans (n=1020)

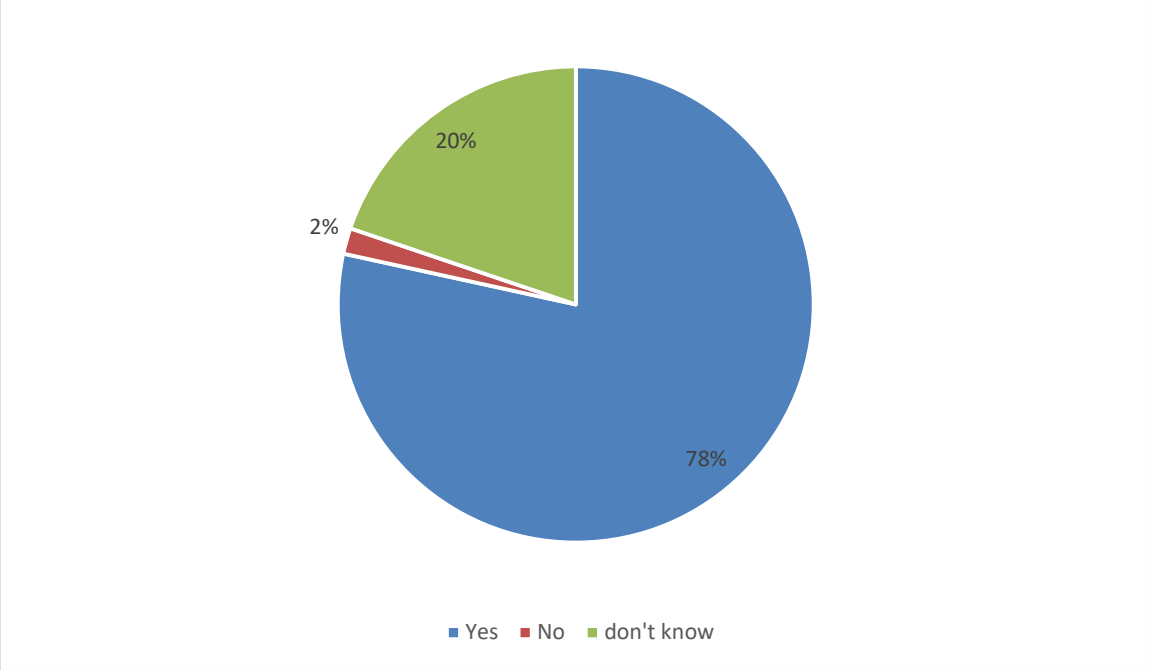

Table (2) also shows the level of awareness of the Saudi women in the sampled area about the iodine deficiency and its effects during pregnancy. Importantly, a vast majority (78.4%) perceived iodine as a micronutrient, and 60.4% demonstrated knowledge of its teratogenic impacts on the growing fetal brain. But as much as 19.8% of the respondents could not determine if it was critical, and large percentages (36.3% and 35.3%) could not confirm that iodine had adverse effects on fetal growth. Most of the respondents, 80.2% say that they think that they can prevent iodine deficiency, and 49.4% specify that the best way to prevent it is through taking seafood Contrary to this nearly 39.4% of the respondents remained non too sure on whether or not they need to take iodized salt. As for the needed dietary iodine,

ISSN:1624-1940
http://magellanes.com/

there is a lot of confusion; in regard to the legit sources, people know seafood and iodized salt, but 55.7% of those questioned think that enough seafood can replace iodized salt.

Table (2): Parameters related to knowledge and awareness regarding iodine deficiency, risks, and complications during pregnancy among women in the Saudi population (n=1020).

Parameter		No.	Percent
Is iodine an essential micronutrient for humans?	no	18	1.8
	Don't know	202	19.8
	Yes	800	78.4
Which gland in the body depends on iodine as a crucial nutrient for producing essential hormones?	Thyroid gland	658	64.5
	Adrenal gland	60	5.9
	Other	14	1.4
	Don't know	288	28.2
Does iodine deficiency in pregnancy have adverse effects on fetal brain development?	No	34	3.3
	Don't know	370	36.3
	Yes	616	60.4
Does iodine deficiency in pregnancy have adverse effects on fetal growth and development?	No	40	3.9
	Don't know	360	35.3
	Yes	620	60.8
Can iodine deficiency be preventable?	No	14	1.4
	Don't know	188	18.4
	Yes	818	80.2
What is the most efficient method to prevent iodine deficiency?	Seafood	504	49.4
	Iodized salt	310	30.4
	Don't know	206	20.2
Do you need to consume iodized salt?	No	198	19.4
	Don't know	402	39.4
	Yes	420	41.2
Can using iodized salt be replaced with having enough seafood?	No	92	9.0
	Don't know	360	35.3
	Yes	568	55.7
Do women need more iodine in pregnancy than non-pregnancy?	No	78	7.6
	Don't know	384	37.6
	Yes	558	54.7
Is the current iodine nutrition in KSA pregnant women excessive?	No	316	31.0
	Don't know	570	55.9
	Yes	134	13.1
Which foods are considered good sources for iodine? *	Dairy	224	22.0
	Seafood	832	81.6
	Fruit	126	12.4
	Meat	280	27.5

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	Egg	300	29.4
	Iodized salt	672	65.9

*Results may overlap. 'Multichoice question'

In table 3, the participants' knowledge and awareness scores are represented in 1020 subjects. From the data, the response reveals that low level of knowledge has higher rating of 68.2% of the participants. A moderate level of awareness is felt in 27.5 % of participants while 4.3% only showed high level of awareness. Such outcomes indicate a lack of awareness among participants, thus indicating a need for talents' informational Literacy improvement interventions.

Table (3): Illustrates knowledge and awareness score results among the participants. (n=1020).

	Frequency	**Percent**
High level	44	4.3
Low level	696	68.2
Moderate level	280	27.5
Total	1020	100.0

The data presented in the table (4) reveals participants' knowledge level was significantly related to age group, residential area, gravidity, marital status, Educational Qualification, Gestation period. While it showed statistically insignificant relation with did you have a history of thyroid dysfunction or disease, did you have any history of chronic disease, are you taking any vitamins or iodine-containing supplements at present?_____

Table (4): Illuminates the relation between sociodemographic parameters of the participants and their knowledge score results (n=1020).

		Low	**High or moderate**	**Total (N=)**	**P value**
Gender	**Female**	696	324	1020	
		100.0%	100.0%	100.0%	
Age group	**18-29 years old**	394	224	618	**0.0001**
		56.6%	69.1%	60.6%	

ISSN:1624-1940
http://magellanes.com/

	30-49 years old	210	74	284	
		30.2%	22.8%	27.8%	
	50-70 years old	92	26	118	
		13.2%	8.0%	11.6%	
Residential area	**Southern region**	420	232	652	**0.0001**
		60.3%	71.6%	63.9%	
	Eastern region	32	10	42	
		4.6%	3.1%	4.1%	
	Northern region	8	4	12	
		1.1%	1.2%	1.2%	
	Western region	114	56	170	
		16.4%	17.3%	16.7%	
	Center region	122	22	144	
		17.5%	6.8%	14.1%	
Gravidity	**First pregnancy**	32	2	34	**0.0001**
		4.6%	0.6%	3.3%	
	Third pregnancy	44	20	64	
		6.3%	6.2%	6.3%	
	Second pregnancy	32	8	40	
		4.6%	2.5%	3.9%	
	Fifth pregnancy or more	136	54	190	
		19.5%	16.7%	18.6%	
	Fourth pregnancy	66	20	86	
		9.5%	6.2%	8.4%	
	Never been pregnant	386	220	606	
		55.5%	67.9%	59.4%	
Marital status	**Widowed**	12	4	16	**0.002**
		1.7%	1.2%	1.6%	
	Single	364	210	574	
		52.3%	64.8%	56.3%	
	Married	300	104	404	
		43.1%	32.1%	39.6%	
	Divorced	20	6	26	
		2.9%	1.9%	2.5%	
Educational Qualification	**Bachelor**	454	228	682	**0.025**
		65.2%	70.4%	66.9%	
	Secondary school or less	118	60	178	
		17.0%	18.5%	17.5%	

ISSN:1624-1940
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	Diploma	80	28	108	
		11.5%	8.6%	10.6%	
	Post-graduate	44	8	52	
		6.3%	2.5%	5.1%	
Gestation period	**12-1 weeks**	10	4	14	**0.006**
		1.4%	1.2%	1.4%	
	27-13 weeks	40	10	50	
		5.7%	3.1%	4.9%	
	42-28 weeks	274	100	374	
		39.4%	30.9%	36.7%	
	Never been pregnant	372	210	582	
		53.4%	64.8%	57.1%	
Did you have a history of thyroid dysfunction or disease?	**No**	638	288	926	**0.096**
		91.7%	88.9%	90.8%	
	Yes	58	36	94	
		8.3%	11.1%	9.2%	
Did you have any history of chronic disease?	**No**	598	274	872	**0.315**
		85.9%	84.6%	85.5%	
	Yes	98	50	148	
		14.1%	15.4%	14.5%	
Are you taking any vitamins or iodine-containing supplements at present?_____	**No**	516	244	760	**0.375**
		74.1%	75.3%	74.5%	
	Yes	180	80	260	
		25.9%	24.7%	25.5%	

Discussion

As a critical micronutrient, Iodine is essential for the production of thyroid hormones, and important for fetal development and maternal health during pregnancy. Aims of the present study include the assessment of the knowledge and awareness of iodine deficiency, its associated risks and complications among women in the Saudi population. Findings reveal disturbing gap in awareness and understanding of iodine, consistent with previous data on awareness and understanding of iodine in different world contexts.

This study revealed that although an important proportion (78.4%) of women identified iodine as an important micronutrient, a large proportion (68.2%) also rated their total knowledge as ‘low’. This is in agreement with the work of Henjum et al. who conducted research in Norway and found that young women had poor knowledge about iodine and its sources in the diet [15]. Another study in Ghana, reported that pregnant woman had extremely poor awareness of iodine deficiency, with 42.5% being iodine deficient; implying a clear need for educational interventions [18]. Parallel to that, this highlights a more general problem of insufficient information about iodine in various sectors of the population as a reason to implement targeted public health interventions.

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In addition, the current study observed that a mere 49.4 percent of the participants named seafood as the number one weapon in the prevention of iodine deficiency. These findings are consistent with a UK study where there was a large proportion of women who did not know what foods were good in iodine, even if we know iodine is important during pregnancy [14]. Also highlighted by 55.7% of this study's participants is that the belief that consuming sufficient enough seafood would be enough to replace it entirely with iodized salt. Studies of Combet et al have also documented such misconceptions and they found that knowledge in nutrition is strongly related to the use of supplements during pregnancy [14]. It is of particular concern that there was little awareness amongst the public about the teratogenic effects of iodine deficiency on fetal development. Only 60.4 percent of women were aware of these risks, less than is reported in other studies. For a somewhat extreme example: A study conducted in Madagascar reported that 81.6% of pregnant women got insufficient iodine particularly important to the development of fetuses [17]. Additionally, according to Zimmermann, even modest maternal iodine deficiency was shown to negatively affect offspring cognitive development [19], underlining the importance of maternal iodine awareness during pregnant women.

Even though the percentage of respondents who feel they can actively prevent iodine deficiency is very high (80.2%), the low overall knowledge levels demonstrate that perception and knowledge are not the same. This finding is clearly reflected in Australia research, where women have high folate awareness but minimal iodine awareness [16]. Such results indicate that women do understand the importance of micronutrients during pregnancy, but do not know as much about iodine.

However, the present study is also limited. It may bias self reported data if participants over report their knowledge or awareness of iodine. Moreover, the cross sectional design makes it impossible to ascertain whether the awareness created a causal relationship with the true iodine status. Additionally, it is possible that recruitment through social media in Saudi may not fully reach the diversity of the Saudi women demographic and therefore the resulting data could also be skewed. Future research might consider longitudinal designs in which recruitment arises more broadly.

Conclusion:

Consequently, this study shows a large knowledge and awareness gap in Saudi women in terms of iodine deficiency. The international studies parallels it shows, serves as a global issue that needs urgent action. For maternal and fetal health outcomes, our studies demonstrate that enhanced educational interventions on the importance of iodine during pregnancy are critical. This knowledge gap should be addressed to mitigate other risks of iodine deficiency as well as guarantee optimum health of mothers and their children.

Acknowledgement:

We thank the participants who all contributed samples to this study.

Ethical approval:

An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only.

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ISSN:1624-1940
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Conflict of interests:

The authors declare no conflict of interest.

Informed consent:

Written informed consent was acquired from each individual study participant.

Data and materials availability:

All data associated with this study are present in the paper.

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