Assessment of the Iodine status of Women of reproductive age (15-49 Years) in Rivers State, Nigeria

***Orisa, Catherine Achese[1], Amadi, Allbright Ovuchimeru[2], Oguzor, Gift Buduzhi[3]**

[1]Department of Home Science and Management, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria
[2]Department of Food Science and Technology, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria
[3]Community Health Services Department, Rivers State Primary Health Care Management Board, Port Harcourt, Rivers State, Nigeria

***Corresponding author:** *cjorisa@yahoo.com*

ABSTRACT

Background: *Iodine intake remains an issue for women of childbearing age. While it is essential for women to consume adequate levels of iodine during pregnancy, it is equally important that women of childbearing age consume sufficient amounts of iodine, especially those who are planning pregnancy.*

Objective: *This study assessed the iodine status of women of reproductive age (15-49 years) in Rivers State, Nigeria.*

Methods: *The population for the study comprised all female senior secondary students and teachers between 15-49 years in the three senatorial zones of Rivers State. The minimum sample size required for the study was 320 women estimated using the Cochrane formula. A cross sectional study design was used in which both qualitative and quantitative data collection methods were employed.*

Results: *The median urinary iodine concentration of the study population (129.06 μg/L) indicated that the women had optimal iodine nutrition. The percentage of urinary iodine concentration (UIC) below 50 μg/L in the women indicated that iodine deficiency among childbearing-age women has not yet been eliminated. A greater percentage of the women (44.16%) had more than the adequate iodine nutrition, while 6.49% were excessive.*

Conclusion: *The iodine status of the women showed that none of the women were deficient. However, half of the respondents have high intake (200 μg/L) and are at risk of iodine induced hyperthyroidism. Public awareness regarding the rate of iodine deficiency in women of reproductive age is therefore recommended.*

Keyword: *Women, Reproductive age, Urinary Iodine Concentration, Iodine Deficiency*

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INTRODUCTION:

Iodine deficiency disorders (IDD) is a global public health problem. It is one of the oldest and most insidious of human health problem. Globally, nearly 2 billion people suffer from IDD with around 50 million having clinical manifestations [1]. Iodine deficiency not only causes goiters, but may also result in irreversible brain damage and retard psychomotor development in children. Deficiency of essential micronutrients, including iodine, has substantial impacts on the health and development of growing children. According to recent studies, a better thyroid profile has been

observed among pregnant women who had regular adequate iodine intake before they became pregnant than women who began iodine supplementation upon becoming pregnant [2]. Since the first trimester is a critical period for sufficient thyroid hormone levels and most pregnancies are unplanned, it is important for women of childbearing age to consume an adequate amount of iodine, corresponding to the recommended iodine intake of 150 μg/day [3]. Iodine is a mineral nutrient essential for the regulation of a variety of key physiological functions including metabolism and brain development and function in children and adults. As such, iodine intake and status within populations is an area of concern and research focus. Iodine Deficiency (ID) is considered as the most common preventable cause of mental retardation [4], and it results in decreased resistance against infections, poor school performance, and lack of physical strength of the child [3]. Previous reports claimed that ID causes 25 % of the Disability Adjusted Life Years (DALY's) occurring in Africa [4]. As a result, it is found to significantly affect the socio-economic development of the nation at large [5]. Compared to other population segments, pregnant mothers and school children are the most vulnerable groups for ID [6]. Inadequate iodine intake can lead to various health issues, including goiter, and adverse pregnancy outcomes. According to Zimmerman [7], ID during early fetal life can adversely affect neurological development causing impaired cognitive functions or learning disabilities of varying degrees, hearing deficits, diverse illness and even death.

ID is a global public health problem which is endemic in the mountainous regions of Europe, Asia, South and Central America and Eastern Africa [4]. In Africa, in spite of its public health importance, the high burden of communicable diseases, socio-economic crisis, and political instabilities in the past have made the elimination of ID more challenging [8]. A study by Egbi *et al*. [9] indicated high prevalence of iodine deficiency among school children in Nigeria. ID is mainly caused by low iodine content in the diet, arising from low iodine levels in the soil, water, or crops [10]. In addition, the consumption of goitrogenic substance containing food items, like cassava and millet [11], and co-existing micronutrient deficiencies (iron, selenium and vitamin A deficiency), poor household socio-economic status, low maternal education, the unavailability of latrine, advanced age and sex of the child [12] are some of the factors associated with ID.

This study assessed the iodine status of women of reproductive age (15-49 years) in Rivers State. A better understanding about the iodine status in the targeted population could enlighten the health authorities and policymakers regarding the magnitude of iodine deficiency and may possibly support the development of appropriate policies regarding the screening and prevention of iodine inadequacy during pregnancy.

MATERIALS AND METHODS

A cross sectional study design was used for the study. The area of this study is Rivers State, Nigeria. Rivers State is one of the 36 states of Nigeria, located in the heart of the Niger Delta region of the country. The population for the study comprised of all female senior secondary students and teachers within 15-49 years in the three senatorial zones of Rivers State. The minimum sample size required for the study was 320 women estimated using the Cochrane formula.

$$No=\frac{Z^2pq}{d^2}$$

Where No = Minimum sample size

Z= Standard normal deviation (1.96 which corresponds to 95% confidence level)

p= Prevalence from previous study excretion. Nwamarah *et al*. [23] reported a prevalence of iodine deficiency of 31.20% in Nigeria at a Tolerable margin of error of 5% (P=0.312%).

d= desired precision level or probability level for the study [d=0.05(5%)].

q= 1-P (1-0.312)= 0.688 (q is a constant, a design effect for research that has not been conducted on the target population in sampled area).

A multistage sampling technique was used in the study. One community was randomly selected from each of the three senatorial zones in Rivers

State. Two senior secondary schools were also randomly selected from each community. The total sample size of 320 females were recruited for the study.

A semi-structured questionnaire was used to obtain relevant history and socio-demographic information from the participants. Ten millilitres (10 ml) of Spot urine samples were collected from the women in duplicate into clean universal bottles with the lid tightly screwed and transported in ice-packs to the Chemical Pathology Laboratory of the Department of Medical Laboratory Science, Rivers State University where they were kept in the refrigerator at 2-8 °C till analysis. Samples were pooled and analysed in batches. Urinary iodine was tested using the Sandell-Kolt-koff method as described by [3]. Ethical clearance was obtained from the Rivers State Ministry of Education. Approval was sought from Head Teachers of the selected schools. The data from the study were coded and then analysed using the Statistical Package for the Social Sciences (SPSS), version 12 computer software.

RESULTS

Demographic characteristics of child-bearing age women (15-49 years)

Table 1 shows the demographic characteristics of child-bearing age women (15-49 years). The result showed that 49.06% were aged 15-20 years, 26.87% were aged 21-25 years, 17.50% were of 26-30 years of age, 6.56% aged 31-40 years while none were within 41-45 and 45-49 years. The results of the study also showed that 19.06% had primary education, 24.38% had secondary while 56.56% had tertiary education status. In terms of occupation, 26.89% were non-academic staff, 44.06% were students, 29.37% were teachers. The result also showed that 55.94% indicated they did not have children, 24.69% had 1-2 children, 6.88% had 3-4 children while 12.50% had 5 and above children. In terms of household iodized salt, 41.46% of the women were non-users while 54.43% were users of iodized salt.

Mean Urinary iodine levels of sampled women of child-bearing age in Rivers State

Table 2 shows the result of mean urinary iodine levels of women of child-bearing age in Rivers State. The result showed that the mean urinary iodine levels ranged from 176.22-293.33 μg/L. The mean urinary iodine levels for women aged 15-18 years were 176.22 μg/L, 19-22 years had 209.86 μg/L, 23-26 years was 225.45 μg/L, 27-30 years was 293.33 μg/L while women who were aged 31-33 had 262.00 μg/L.

Iodine nutrition status among women of child bearing age women in Rivers State

Table 3 shows the iodine nutrition status of women of child bearing age women in Rivers State, Nigeria. The result showed that none of the women had severe iodine deficiency, 2.60% had moderate iodine deficiency, 15.58% had mild iodine deficiency, 31.17% had optimal iodine nutrition, 44.16% were at risk of iodine induced hyperthyroidism while 6.49% were at the risk of adverse health consequences.

DISCUSSION

Results from the urinary iodine levels of sampled women of child bearing age (15-49 years) in Rivers State, Nigeria showed that women who were within the age of 27-30 years had the highest iodine concentration (293.33 μg/L). This result further indicated that iodine concentration increased as the age range increased. The median urinary iodine concentration of the study population (129.06 μg/L) showed that the women had optimal iodine nutrition. Oguizu and Alozie [24] had reported 106.56 μg/L and 107.94 μg/L for iodine levels of male and female students between 6-12 years in Umuahia South LGA of Abia State, Nigeria. It is known that insufficient supply of thyroid hormone to the developing brain results in neurocognitive impairment [13, 14, 15]. Children of iodine-deficient mothers are at higher risk of diminished cognition [16]. Thus, ensuring optimal and adequate iodine intake from the moment a woman plans to become pregnant is particularly important for preventing adverse effects in their offspring, because even slightly low maternal thyroid hormone levels during pregnancy can cause cognitive delays in their

offspring [17].

The results from this study showed that the iodine nutrition status among women of child bearing age in Rivers State, Nigeria recorded urinary iodine concentration (UIC) below 50 μg/L, indicating insufficient iodine intake in 2.60% of the sampled women. This indicates that iodine deficiency among childbearing women in Rivers State has not yet been eliminated. Results also revealed that a higher proportion of women (44.16%) had more than the adequate amount of iodine concentration, while 6.49% had excessive iodine concentration. Globally, the iodine status of women of childbearing age varies. For instance, in non-pregnant, non-lactating women in Sierra Leone aged 15 to 49 years old, all subgroups had a median substantially above the threshold of 100 μg/L [18]. Similarly, Indonesian and Australian women were found to have sufficient iodine intake, based on median UIC values of 189.0 and 117.0 μg/L, respectively [19, 20]. In contrast, mild ID was observed among women of childbearing age in Samoa and New Zealand [21]. In non-pregnant women, median UIC between 100 and 299 μg/L defines a population which has no iodine deficiency, and not more than 20% of samples recorded here, showed UIC below 50 μg/L. This UIC of 100-199 μg/L corresponds approximately to a daily iodine intake of 150 μg/day for adults, which includes non-pregnant women [22].

Table 1: Demographic characteristics of child-bearing age women (15-49 years)

Variables	Frequency (N=320)	Percentage (%)
Age (years)		
15-20	157	49.06
21-25	86	26.87
26-30	56	17.50
31-40	21	6.56
41-45	-	-
45-49	-	-
Total	**320**	**100**
Educational status		
Primary	61	19.06
Secondary	78	24.38
Tertiary	181	56.56
Total	**320**	**100**
Occupation of women		
Non-academic staff	85	26.89
Student	141	44.06
Teacher	94	29.37
Total	**320**	**100**
Number of children		
None	179	55.94
1-2	79	24.69
2-4	22	6.88
5 and above	40	12.50
Total		
Household iodized salt		
Non-users	133	41.56
Users	187	58.43
Total	**320**	**100**

Table 2: Urinary iodine levels of sampled women of child-bearing age in Rivers State (n=320)

Age	Urinary iodine levels (μg/L)
15-18	176.22±69.38
19-22	209.86±111.90
23-26	225.45±81.65
27-30	293.33±111.65
31-33	262.00±0.00
34 and above	-
	129.06±59.48

Table 3: Iodine nutrition status among women of child bearing age women (15-49 years)

Urinary Iodine Concentrations (μg/L)	Iodine Intake	Iodine nutrition	Frequency (N)	Percentage (%)
<20	Insufficient	Severe iodine deficiency	0	0
20-49	Insufficient	Moderate iodine deficiency	8	2.60
50-99	Insufficient	Mild iodine deficiency	50	15.58
100-99	Adequate	Optimal	100	31.17
200-199	More than adequate	Risk of iodine induced by hyperthyroidism iodine deficiency	141	44.16
>300	Excessive	Risk of adverse health consequences	21	6.49
			N=320	**100**

CONCLUSION AND RECOMMENDATIONS

The iodine status of the women showed that none of the women were deficient. However, half of the respondents have high intake (200 μg/L) and are at risk of iodine induced hyperthyroidism. Public awareness regarding the rate of iodine deficiency in women of reproductive age is therefore recommended.

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