Available online at: www.ijmrhs.com DOI:10.5958/2319-5886.2015.00148.4
Research article Open Access

IODINE STATUS OF FEMALE STUDENTS IN UNIVERSITY OF MAIDUGURI BORNO STATE

***AH Musa[1], DS Mshelia[2], RM Gali[1], SK Adamu[1], A Ahmed[1]**

ARTICLE INFO

Received: 11th May 2015
Revised: 15th July 2015
Accepted: 9th Sep 2015

Authors details: [1]Department of Medical Laboratory Science, College of Medical Sciences, University of Maiduguri, Nigeria
[2]Chemical Pathology, College of Medical Sciences, University of Maiduguri, Nigeria

Corresponding author: AH Musa
[1]Department of Medical Laboratory Science, College of Medical Sciences, University of Maiduguri, Nigeria
Email: alharu2u@yahoo.com

Keywords: *Urinary iodine, Females*

ABSTRACT

Background: Urinary iodine concentration is a sensitive marker of current iodine intake and can reflect recent changes in iodine status. Although an individual urinary iodine concentration varies daily, or even within the same day, however, these variations tend to even out within populations and provide a useful measure of the iodine status of populations. **Objective:** This study intends to estimate the urinary iodine status of female students in this environment as a pilot study. **Methods:** This study investigated the random urinary iodine concentration of 158 female students' in University of Maiduguri between the ages of 20-41 years. The random urinary iodine concentration was estimated using the Sandell-Kolthoff method. **Results:** The median urinary concentration of this study is 95µg/L and the Mean Urinary Iodine Concentration of 101.42µg/L ±29.01 also the mean age of the female students was 21±0.06. Following the WHO/UNICEF/ICCIDD recommendations, this study revealed that 4.43% (7) had moderate iodine deficiency, 46.84% (74) had mild iodine deficiency, and 48.73% (77) was in iodine sufficient group. **Conclusion:** This study showed a median Urinary Iodine Concentration that is mildly deficient, hence the need for more awareness on the importance of consumption of iodine in this environment. This is a pilot study, more research is necessary to establish the iodine status of this environment.

INTRODUCTION

Iodine is an essential nutrient needed by the body in small quantity but necessary for normal growth, development and metabolism throughout a person's lifetime [1-3]. Iodine is necessary for thyroid hormone synthesis. Thyroid hormone influences general body metabolism, therefore, iodine deficiency poses a threat throughout the lifecycle of humans[4]. Severe and mild iodine deficiency causes harmful effects on brain and nervous system dsevelopment in children and decrease ability to work and think clearly in adults [5,6]. Iodine deficiency has been associated with mental impairment, goiter, and some complications in pregnancy, including stillbirth and congenital anomalies. Inadequate iodine intake during pregnancy may lead to irreversible fetal brain damage [4]. The recommended intake of iodide for adults is a minuscule amount. Consuming seafood, vegetables grown in iodine- rich soil and iodized salt easily meet the body's need for iodine [1,2, 6]. Urinary iodine (U.I) analysis is the most common method for assessing population wide iodine sufficiency and deficiency, because more than 90% of dietary iodine is excreted in the urine with normal renal function[7, 8]. There is scarcity of information on iodine status in this environment, since the Federal Government campaign on iodized salt some years ago hence the need for this pilot study.

Aim of the study: To determine the iodine status of non-pregnant females in the reproductive age group in this environment.

MATERIALS AND METHOD

Study design: This study is a prospective case study.
Ethical approval: Ethical clearance was obtained from the University of Maiduguri Ethical Committee. Personal consent of the students were sought after explaining the purpose of the research.
Sample size: The study Subjects comprised of 158 apparently healthy female students of University of Maiduguri Borno State, Nigeria.
Inclusion criteria: Their ages ranged between 20-41 years and been resident in Maiduguri for at least seven years. These groups of female students are in their reproductive age and their iodine status may be of public interest for better management. Female volunteers were recruited within six (6) months.
Exclusion criteria: Those diagnosed with thyroid disorders, obvious goiter, on medication with iodine contain reasonable to influence patient iodine, on antithyroid medications or on hormonal replacement therapy, Females not in the reproductive age group, Pregnant or breast feeding mothers
Methodology:

Ten (10ml) of random urine sample was collected into clean and sterile universal bottle from all the students who were selected for the study. Their anthropometric measurements were taken using standard methods such as Digital scale (weight) and Height Ruler taped to the wall (Height). Since the samples were not analyzed immediately, it was stored frozen at -20^{0}C until ready for analysis.

Estimation of urine iodine levels: The standard method of Sandell-Kolthoff reaction (the ammonium persulphate technique), as described by Dunn et al [9] was used for estimating the level of iodine in the urine. Urine is digested with ammonium persulphate. Iodine present in the urine acts like a catalyst in the reduction of ceric ammonium sulphate (yellow) to cerous ammonium sulphate (colourless). The degree of disappearance of the yellow colour is a measure of iodine content in the urine. The data obtained was analyzed using statistical package for social science (SPSS) version 20.0 for descriptive statistics and student's t-test at the confidence interval of 95% and P<0.05.

RESULTS

This study investigated the random urinary iodine concentration in female students of reproductive age in the University of Maiduguri with the mean age of 21±0.06. Table 1 shows the measured parameters in the study population; age, Weight,57.53±10.29Kg, Height,1.62±0.006M^2, Mean Urinary Iodine 101.42±29.01 µg/L, a Median Urinary Iodine (MUI) of 95µg/L and the BMI, 21.9±3.74Kg/M^2 . Table 2 shows the classification of iodine nutrition of the studied population based on the Epidemiological

Criteria for Assessing Iodine Nutrition using joint criteria of WHO, UNICEF and ICCIDD[10]. It shows no severe Iodine Deficiency and no excess Iodine but 4.43% (7) had moderate Iodine deficiency, 46.84% (74) had mild iodine deficiency and 48.73% (77) are Iodine Sufficient.

Table 1: Measured parameters in the study population

PARAMETERS	MEAN± SD	MEDIAN
Age (yrs)	21.1±0.06	23.0
Weight (kg)	57.53±10.29	55.70
Height (m)	1.62±0.06	1.62
UI (µg/l)	101.42±29.01	*95
BMI (kg/m^2)	21.9±3.74	20.9

KEY: BMI= Body Mass Index, SD= Standard Deviation, UI=Urinary Iodine, *Median Urinary Iodine

Table 2: Percentage distribution of Iodine Nutrition of the Studied Population based on the Epidemiological Criteria for Assessing Iodine Nutrition [10]

Range (µg/L)	% Distribution
Severe (<20)	0(0)
Moderate (20-49)	4.43(7)
Mild (50-99)	46.84(74)
Sufficient (100-199)	48.73(77)
Excess (>300)	0(0)

DISCUSSION

The potential impact of iodine deficiency on the intellectual development of large segments of the populations in underdeveloped countries is of particular concern, especially when all of the adverse effects of iodine deficiency can be prevented by long-term, sustainable iodine prophylaxis [10],[11] . Universal salt iodization has been extremely effective at reducing the burden of iodine deficiency and represents a major global public health success. Iodine deficiency can be prevented by iodization of table salt with one part of sodium iodide to every 100,000 parts of sodium chloride [12] . Urinary iodine excretion has been reported as a good marker of th e dietary intake of iodine, and used as an index for evaluating the degree of iodine deficiency, correction and toxicity [10],[11],[15] . Many countries including Nigeria have adopted massive salt iodization as a means of correcting iodine deficiency disorders (IDD) in countries where they were prevalent [13] . The World Health Organization gave an epidemiologic criteria for assessing iodine nutrition based on median urinary iodine concentrations in different target groups i.e. school-age children (6 years or older) with Median urinary iodine (µg/l) < 20 indicates insufficient iodine intake (severe iodine deficiency), 20-49 indicates insufficient iodine intake (moderate iodine deficiency), 50-99 indicates insufficient iodine (mild iodine deficiency), 100-199 indicates adequate iodine intake (adequate iodine nutrition) and 200-299 indicates above requirements iodine intake that may pose a slight risk of more than adequate iodine intake in these populations. Median urinary iodine (µg/l) ≥300 indicates excessive iodine intake with risk of adverse health consequences (iodine-induced) of hyperthyroidism, autoimmune thyroid disease etc [4] .The consequence of excess iodine is Job-Basdow or even hypothyroidism and may lead to malignant changes particularly the follicular type of thyroid carcinoma From this study, the median urinary iodine excretion in the population studied was 95.0µg/l (table1), which is below the recommended value of (100-199 µg/l) by WHO. The results from this study indicate that none of the students had severe iodine deficiency. However, that there were still moderate (4.4%) and high percentage (46.84%) of mild iodine deficiency suggests insufficient of iodine intake in our study population (table 2), which is of great public health concern. This finding is consistent with the findings of Mu et al[14], who reported mild to moderate iodine deficiency across the populations' including school children. This study shows higher percentage of mild deficiency compared to the findings of Onyeaghala et al [15] and Cosmos et al [16]. Iodized salt is widely available commercially in this environment but the percentage in the salt need to be evaluated in further study. It is likely that household salt may not contain the recommended level of iodine. Our study showed none of the student had excess urinary iodine (table 2). This finding contradicts the report of Delange et al[17], who reported high concentrations of urinary iodine in some African countries few years after the introduction of massive iodization

programme. Our study revealed that 77 (48.73%) have sufficient iodine intake among the population studied which is less than 50% of the study population, hence the need to encourage and sensitize the public in this environment about the importance of iodized salt. Bellamy[18] reported that the success of the drive for universal iodization of salt shows that the diets of children, women and families worldwide can be changed in small but very beneficial ways in just a
few years because of concerted global, national and local action.

CONCLUSION

Study population are of reproductive age, hence any preventive measure taken will go a long way to forestall the effects of iodine deficiency disorders such as neonatal hypothyroidism and mental retardation on the generations yet unborn. In addition, more awareness campaign on iodine deficiency disorders and the role of iodized salt intake is necessary. Large community screening of urinary iodine is not expensive and can be used to establish the status of iodine consumption in this environment.

ACKNOWLEDGEMENT

I wish to appreciate all the female students of the University of Maiduguri that voluntarily avail them self for the success of this research and Chemical Pathology Department University of Maiduguri Teaching Hospital Borno State Nigeria for allowing us used their Laboratory.

Conflict of Interest: Nil

REFERENCES

1. Whitney, E.N. and Rolfes, S.R. Understanding nutrition (6th ed.). Minneapolis: West publishing company. 1998; 293-32
2. Author names, National Health and Medical Research Council and New Zealand Ministry of Health. Nutrient Reference Values for Australia and New Zealand including Recommended Dietary Intakes. Commonwealth of Australia. 2006; Available online at http:// www. nhmrc. gov.au.
3. Centers for Disease Control and Prevention. Ensuring the Quality of Urinary Iodine Procedures.2012. Retrieved on 20th April, 2014 from http://www.cdc.gov
4. World Health Organization. Urinary iodine concentration for determining iodine status deficiency in populations. Vitamin and Mineral Nutrition Information System. Geneva: 2013; Retrieved on 20th April, 2014 from http:// www. who.int/nutrition/ vmnis/ indicators/ urinary iodine
5. Berdenier, C.D. Advanced nutrition micronutrients. Florida: CRC press.2000.
6. National Institutes of Health office of dietary supplements. Iodine Quickfacts.2011; Retrieved 20th April, 2014 from http://ods.od.nih.gov.
7. Amir A. M., Kathleen L. Caldwell. The U.S. CDC's 'Ensuring the Quality of Urinary Iodine Procedures (EQUIP) Program' is 10years old.2011; Retrieved on 20th April, 2014 from http://www.cdc.gov
8. Augustine, A.O., Anetor, J.I., Nurudeen, A., and Oyewole,O.E. Assessment of urinary iodine status of primary school children in Saki, in south western Nigeria. Bulletin of Environment, Pharmacology and Life Sciences.2012; 1(5), 5-9.
9. Dunn JT, Semigran MJ, Delange F. Methods for measuring Iodine in urine. ICCIDD,UNICEF, WHO. The Netherlands, ICCIDD, 1993. 73-75.
10. WHO, UNICEF, ICCIDD. Assessment of the Iodine Deficiency Disorders and monitoring their elimination. Geneva: World Health Organization; 2001. WHO Document WHO/NHD/01.1.
11. World Health Organization. Assessment of iodine deficiency disorders and monitoring their elimination. A guide for programme managers.2001; 2nd ed.1-124
12. Sembulingam, K., Sembulingam, P. Essentials of medical physiology (5th ed.). India: Jaypee Brothers Medical Publishers (P) ltd.2010.358-68
13. Daniel N.Lantum. Did universal salt iodization help reduce the infant mortality rate in Nigeria? IDD Newsletter, May 2009; (32), 24-26.
14. Mu Li, Gary Ma, Karmala Guttikonda , Steven C Boyages ,Creswell J Eastman. Re-emergence of iodine deficiency in Australia. Asia Pacific J. Clin. Nutr.,2001; 10(3): 200-03.
15. Onyeaghala, AA, Anetor, JI, Nurudeen, A Oyewole OE. High urinary iodine content (UIC) among primary school children in Nigeria, a public health concern. J of Toxicology and Environmental Health Science; 2010; 2(7), 93-96.
16. Ujowundu CO, Ukoha AI, Agha CN, Nwachukwu N, Igwe, KO. Assessment of current iodine status of pregnant women in a suburban areav of Imo State Nigeria twelve years after universal salt iodization. African journal of Biochemistry Research;2010; 4(1) 6-12
17. Delange F, de Benoist B, Alnwick D. Risks of iodine-induced hyperthyroidism after correction of iodine deficiency by iodized salt. Thyroid Jun 1999; 9(6): 545-56.
18. Bellanmy, C. Micronutrient-iodine iron and vitamin A. UNICEF.2008; Retrieved April 2014 from unicef. Org/nutrition/index iodine. UNICEF/HQ98-0992