ORIGINAL RESEARCH

CURRENT DEVELOPMENTS IN NUTRITION

Nutritional Epidemiology and Public Health

Factors Associated with Urinary Iodine Concentration among Women of Reproductive Age, 20–49 Years Old, in Tanzania: A Population-Based Cross-Sectional Study

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ABSTRACT

Background: Universal salt iodization (USI) is the most feasible and cost-effective, and equitable, approach to prevent iodine deficiency. Severe maternal iodine deficiency during pregnancy is associated with serious adverse gestational and birth outcomes.

Objectives: The aim was to assess iodine status and identify independent factors associated with urinary iodine concentration (UIC) among women of reproductive age in Tanzania.

Methods: This was a weighted, population-based, cross-sectional study in 2985 women of reproductive age (20–49 y) in Tanzania who participated in the Demographic and Health Surveys in 2015–2016 (DHS 2015–2016) and had measured UIC. Multivariable generalized linear regression was used to identify potential factors that were associated with UIC.

Results: The median UICs among women consuming inadequately iodized salt (93.6 μg/L; 25th and 75th percentiles: 43.1, 197.9 μg/L) and women in the lowest socioeconomic status (92.3 μg/L; 45.6, 194.4 μg/L) were below the WHO-recommended ranges ($\geq$150 μg/L for pregnant women and $\geq$100 μg/L for nonpregnant women). The results of multivariable models indicated that pregnant women had 1.21 μg/L lower UIC than nonpregnant women ($\beta = -1.21$; 95% CI: −3.42, −0.12), breastfeeding women had 1.02 μg/L lower UIC than nonbreastfeeding women ($\beta = -1.02$; 95% CI: −2.25, −0.27), and women with no education had a 1.88 μg/L lower UIC compared with those with secondary/highest education ($\beta = -1.88$; 95% CI: −4.58, −0.36). Women consuming inadequately iodized salt had 6.55 μg/L lower UIC than those consuming adequately iodized salt ($\beta = -6.55$; 95% CI: −9.24, −4.33). The median UIC varied substantially across geographic zones, ranging from 83.2 μg/L (45.9, 165.3) in the Western region to 347.8 μg/L (185.0, 479.8) in the Eastern region.

Conclusions: Our findings indicated a great heterogeneity in median UIC across regions of Tanzania among women of reproductive age. Poverty, consuming inadequately iodized salt, and lack of education appeared to be the driving factors for lower UIC in Tanzania. *Curr Dev Nutr* 2020;4:nzaa079.

Keywords: sub-Saharan Africa, adequate iodized salt, iodine, pregnant women, breastfeeding

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Abbreviations used: DHS, Demographic and Health Survey; IDD, iodine deficiency disorder; IRB, Institutional Review Board; ppm, parts per million; SSA, sub-Saharan Africa; TDHS, Tanzanian Demographic and Health Survey; TFNC, Tanzania Food and Nutrition Center; TGP, total goiter prevalence; UIC, urinary iodine concentration; USI, universal salt iodization.

Introduction

There has been outstanding global progress towards the eradication of iodine deficiency disorders (IDDs) over the last 2 decades through the scale-up of universal salt iodization (USI) programs (1). The number of countries previously classified as iodine deficient decreased from 113 to only 20 (2). A previous study found that 37% (88/237) of pregnant women and 33% (24/73) of lactating mothers had iodine deficiency in India (3). In developing countries including sub-Saharan Africa (SSA), ∼38 million newborn infants are at risk of the devastating consequences of iodine deficiency every year (4). In 1980, it was estimated that 41% of the population in Tanzania lived in certain geographical regions subject to iodine deficiency (5). A national survey conducted in 2004 in Tanzania to assess the extent to which iodized salt was used and its apparent impact on the total goiter prevalence (TGP) and urinary iodine concentrations (UICs) among schoolchildren after the initiation of USI showed that TGP has decreased from 61% in the 1980s to 12.3% in 2004 (6). Despite legislation to implement USI in all salt for human consumption in early 1994, Tanzanians still suffer from mild to severe iodine deficiency. Pregnant and lactating women are the most vulnerable population to iodine deficiency (6). Insufficient iodine intake during pregnancy has a long-term impact on child normal growth, brain development, and intelligence quotient scores (7–10). Furthermore, iodine deficiency is considered to be a major cause of the most preventable mental impairment worldwide (11, 12). Inadequate iodine intake during pregnancy has been associated with maternal hypothyroxinemia, impaired brain growth, cognitive psychomotor deficits in neonates, and impaired neurodevelopment in infants and children (13–18). Iodine deficiency during pregnancy can cause serious health conditions such as spontaneous abortion, neurological impairment, congenital hypothyroidism, stillbirth, low birth weight, poor cognitive functioning, decrease in intelligence, and delay in mental development among infants and children (11, 12, 16, 19). Public awareness about the benefits of iodine nutrition in women of reproductive age is lacking (20). A recent report published by UNICEF recommends assessing the adequacy of iodine intake among different subgroups, such as by geographic region and socioeconomic status (1). Factors associated with UIC among women of reproductive age in Tanzania, however, have not been well studied. Previous studies highlighted the need for data assessing iodine status among this population in Tanzania (6, 21–23). To the best of our knowledge, there are no recent studies that have assessed iodine status among women of reproductive age in Tanzania using UIC. To fill this gap in the literature, we used the most recent national survey, the Tanzania Demographic and Health Survey 2015–2016 (TDHS 2015–2016), to conduct a population-based cross-sectional analysis to assess iodine status and to identify independent factors associated with UIC among women of reproductive-age (20–49 y) in Tanzania.

Methods

Data source and participants

This study analyzed the most recent round of national survey data from the TDHS 2015–2016, which is a nationally representative survey among childbearing-age women 20–49 y old to examine iodine deficiency. The survey was conducted using a multistage cluster-sampling scheme based on the Tanzania Census with a stratified design to collect information on population demographics and health. The surveys include detailed information such as family planning methods, maternal and child health, pregnancy and breastfeeding, biomarker measures, salt test for iodine content, and childhood immunization. We extracted household salt and UIC information from the household survey, and then linked these variables to women's record data, using the Demographic and Health Surveys (DHSs) merging guideline. The survey response rate among women was 97%. The present analysis included a total of weighted 2985 women aged 20–49 y with complete UIC tested results.

Ethical considerations

Written request to access the survey data was made and granted to DHS. Procedures and questionnaires for standard DHSs have been reviewed and approved by the ICF Institutional Review Board (IRB) and the IRBs of the host countries. The TDHS 2015–2016 was administered by the National Bureau of Statistics and Office of the Chief Government Statistician, Zanzibar, in cooperation with the Ministry of Health and Social Welfare–Mainland and the Ministry of Health, Zanzibar. The survey was funded by the Government of Tanzania, US Agency for International Development (USAID), Global Affairs Canada, Irish Aid, UNICEF, and United Nations Population Fund and implemented by ICF International (24). Written and oral informed consent was obtained from each study participant before beginning each survey and/or conducting biomarker tests. All of the data are Health Insurance Portability and Accountability Act (HIPAA) protected and de-identified. The ethical issues were handled by the ICF IRB and the IRBs of the host countries who conducted the primary surveys and not by the authors of this article. No further IRB approval was needed by the institutions of the authors of this article.

Assessment of iodine deficiency (outcome)

During data collection through questionnaires, interviewers requested women respondents to provide a spot urine sample for subsequent testing for urinary iodine content. Women who provided informed consent were given a small plastic cup for collection of a spot urine sample, and the urine samples were transferred from the plastic cup via a vacuum method into small tubes with tightly fitted caps. The urine samples were then transported to the Tanzania Food and Nutrition Center (TFNC) laboratory for testing for UIC using ammonium persulfate digestion with spectrophotometric detection of the Sandell-Kolthoff reaction (25). UIC has been considered as the most reliable biomarker to assess iodine adequacy from the diet at the population level because 90% of dietary iodine intake is excreted directly in the urine (26). It is commonly measured in spot urine samples and expressed as a median as a result of the high variability of spot urine samples (27). The WHO/UNICEF/International Council for Control of Iodine Deficiency Disorders (ICCIDD) recommend using the median UIC of a population to determine reference criteria to assess iodine status as follows: in nonpregnant women, median UIC <20 μg/L is indicative of insufficient iodine intake (severe iodine deficiency), 20–49 µg/L indicates moderate iodine deficiency, 50–99 µg/L indicates mild iodine deficiency, 100–199 μg/L indicates adequate intake, 200–299 μg/L indicates intakes above requirements, and $\geq$300 μg/L indicates excessive intake. During pregnancy, iodine requirements increase: a median UIC $<$150 μg/L is indicative of insufficient iodine intake, 150–249 μg/L indicates adequate intake, 250–499 μg/L indicates intakes above requirements, and $\geq$500 μg/L indicates excessive intake (28–31). For this study, the outcome of interest was UIC, which was square-root transformed to guarantee the normality of UIC distribution in the multivariable regression analysis. Women with excess iodine intake were kept in the present study because UIC depends on dietary iodine and varies greatly from day to day within individuals (1, 32). This variation is more likely to increase the spread of the distribution causing a different level of UIC in a population. Therefore, there will be always some individuals with higher UICs.

Assessment of factors associated with UIC (explanatory variables)

We investigated the following explanatory variables to assess whether they were associated with UIC: age, pregnancy status, breastfeeding status, educational status, marital status, wealth index status, iodine content in salt, place of residence, employment status, and

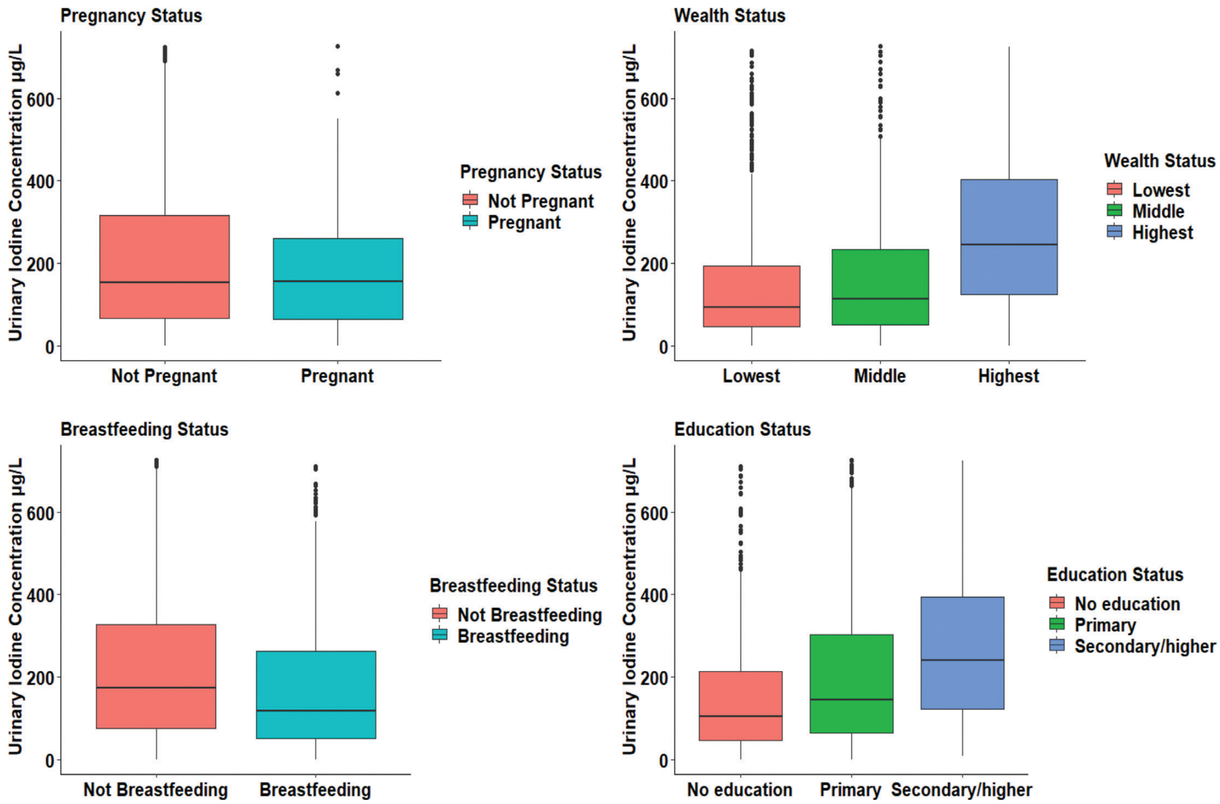

FIGURE 1 Weighted median (25th and 75th percentiles) urinary iodine concentration according to pregnancy status, wealth status, breastfeeding status, and educational status.

geographic zones. Previous studies reported that these aforementioned sociodemographic/-economic factors affect dietary iodine intake in Tanzania (6, 29). In every third sampled household, TDHS field teams asked the women respondents to provide a slightly larger sample of household salt for quantitative analysis of iodine content by titration methods at the TFNC laboratory (25). Educational status was broken down into 3 categories as done by a previous study (no education, primary education, secondary/higher education) (33). According to previous research, we re-categorized wealth index from 5 quintiles into 3 categories by combining poorest and poorer into 1 category (called "lowest"), the middle wealth level into the second category (called "middle"), and richer and richest into the third category (called "highest"), as previous researchers have done (34–36). Iodine content in salt was categorized into 2 categories—inadequately iodized salt [<15 parts per million (ppm)] and adequately iodized salt (≥15 ppm)—as done by previous researchers (37). The age of the respondent at the time of the DHS interview was originally measured as a continuous variable and was categorized into 3 categories: 20–30, 31–40, and 41–49 y old. The geographic zones of the country included 8 categories—Western, Northern, Central, Southern Highlands, Lake, Eastern, Southern, and Zanzibar—as previous researchers have done (29).

Statistical analysis

Univariate analyses were used to describe the characteristics of the study population. Summary statistics were presented as the proportion for the overall sample and medians with 25th and 75th percentiles. Multivariable analysis was performed using a generalized linear model in SAS (PROC GLM; SAS Institute) to explore the association between the explanatory variables and UIC adjusting for age, pregnancy status, breastfeeding status, educational status, marital status, wealth index status, iodine content in salt, place of residence, employment status, and geographic zone. After further examining the data, we noticed that the distribution of UIC was severely right-skewed. The log transformation did not improve the normality of UIC distribution. Therefore, we adopted a square-root transformation to guarantee the normality of UIC distribution in women as done by previous researchers (32, 38). After the transformation, we ran the fully adjusted model by including the square root of the UIC ($\sqrt{UIC}$) as the outcome, while all other parameters remained unchanged. Analyses were conducted using SAS version 9.4 (SAS Institute), and R software version 3.4.3 (R Foundation for Statistical Computing) was used to generate **Figures 1** and **2**. Multivariable regression results are presented with regression coefficients (β) with 95% CIs. Eastern zone was selected as the reference geographic zone because it was the zone with the highest median UIC. We conducted a subgroup analysis stratified by nonpregnant women (**Supplemental Table 1**) versus pregnant status (**Supplemental Table 2**). Women from a household where salt was not tested for iodine content were considered as missing by the TDHS field team and were not included in the analysis of multivariable linear regression. Statistical significance was assessed at $P < 0.05$.

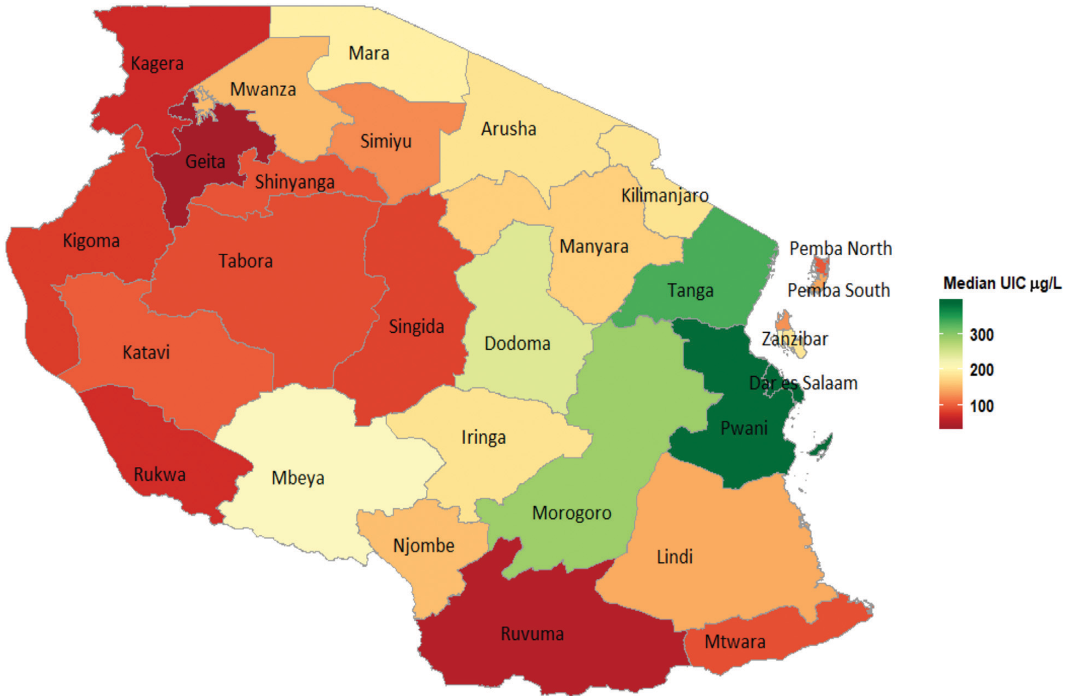

FIGURE 2 Weighted median UIC among women of reproductive age by region in Tanzania. UIC, urinary iodine concentration.

Results

Table 1 presents the summary statistics of the demographic characteristics of the study population. The mean (SD) age was 31.9 (8.4) y. More than half of the study participants used adequately iodized salt (≥15 ppm; 66.7%); approximately half were between the ages of 20 and 30 y (49.4%) and from highest socioeconomic households (45.4%). Also, 8.9% of the survey respondents were pregnant at the time of the DHS, breastfeeding (31.2%), and had a primary education (64.4%) (Table 1). The median UICs among pregnant women (median: 156.1 μg/L; 25th and 75th percentiles: 64.6, 260.4) and uneducated women (104.3 μg/L; 46.4, 212.6) were on the edge of the recommended ranges. Women who consumed inadequately iodized salt (93.6 μg/L; 43.1, 197.9) and women in the lowest socioeconomic status (92.3 μg/L; 45.6, 194.4) were below the recommended ranges (≥150 μg/L for pregnant women and ≥100 μg/L for nonpregnant women) by the WHO. Also, the median UIC varied substantially across geographic zones, ranging from 83.2 μg/L (45.9,165.3) in the Western region to 347.8 μg/L (185.0, 479.8) in the Eastern region. (Table 1, Figures 1 and 2).

To identify independent factors associated with UIC, we used a multivariable generalized linear regression model as presented in Table 2. Pregnant women had a 1.21-μg/L lower UIC than nonpregnant women ($\beta = -1.21$; 95% CI: −3.42, −0.12); breastfeeding women had a 1.02-μg/L lower UIC than nonbreastfeeding women ($\beta = -1.02$; 95% CI: −2.25, −0.27); women consuming inadequately iodized salt had a 6.55-μg/L lower UIC than those consuming adequately iodized salt ($\beta = -6.55$; 95% CI: −9.24, −4.33); women with no education had a 1.88-μg/L lower UIC compared with those with secondary/highest education ($\beta = -1.88$; 95% CI: −4.58, −0.36); women of the lowest socioeconomic status had a 1.61-μg/L lower UIC compared with those of the highest socioeconomic status ($\beta = -1.61$; 95% CI: −3.61, −0.41). Also, living in a rural area and living in other geographic zones compared with the Eastern zone were associated with significantly lower UICs. Subgroup analysis showed that inadequately iodized salt and being of a lower socioeconomic status were significantly associated with lower UIC among pregnant women (Supplemental Table 2).

Discussion

This population-based cross-sectional study in >2500 women of reproductive age in Tanzania assessed the magnitude of iodine deficiency using the UIC and its association with sociodemographic factors. Approximately one-third of women were consuming inadequately iodized salt. In the multivariable linear regression model, independent factors associated with UIC included currently pregnant and breastfeeding, consuming inadequately iodized salt, coming from a lowest or middle wealth index household, lack of education, and living in rural areas. Findings from our study show the existence of heterogeneity and inequalities of the UIC in Tanzania. The median UIC varied significantly across geographical regions of Tanzania. Our findings are of public health and clinical significance because iodine is one of the most critical and significant micronutrients required for the synthesis of thyroid hormones and fetal brain development (7). The negative significant association between pregnant and breastfeeding women and UIC is concerning and indicates that their unborn children and infants are still in danger of IDD. Mild to severe iodine deficiency during pregnancy can trigger serious maternal and fetal hypothyroxinemia and

TABLE 1 Sociodemographic characteristics of the weighted survey participants[1]

Characteristics	UIC, μg/L		
	Overall (n[1] = 2985)	Median	25th, 75th percentiles
Mean (SD) age, y	31.9 (8.4)		
Age group, *n* (%)			
20–30 y	1474 (49.4)	171.1	68.6, 322.6
31–40 y	928 (31.1)	143.3	66.7, 305.0
41–49 y	583 (19.5)	133.8	63.1, 290.7
Pregnancy status, *n* (%)			
Pregnant	266 (8.9)	156.1	64.6, 260.4
Not pregnant	2719 (91.1)	152.6	66.7, 315.9
Breastfeeding status, *n* (%)			
Breastfeeding	930 (31.2)	117.3	51.2, 262.1
Not breastfeeding	2055 (68.9)	174.0	76.0, 328.1
Iodine content in salt, *n* (%)			
Inadequately iodized salt (<15 ppm)	804 (33.3)	93.6	43.1, 197.9
Adequately iodized salt (≥15 ppm)	1613 (66.7)	226.9	112.9, 1369.0
Educational status, *n* (%)			
No education	507 (17.0)	104.3	46.4, 212.6
Primary education	1923 (64.4)	144.3	64.6, 303.6
Secondary/higher	555 (18.6)	239.8	121.9, 395.2
Wealth index status,[2] *n* (%)			
Lowest	1100 (36.9)	92.3	45.6, 194.4
Middle	530 (17.8)	113.7	51.1, 233.4
Highest	1355 (45.4)	243.9	125.1, 403.9
Place of residence, *n* (%)			
Urban	993 (33.3)	261.3	140.8, 414.4
Rural	1992 (66.8)	108.0	50.2, 234.2
Employment status, *n* (%)			
Employed	2396 (80.3)	144.3	62.8, 291.4
Unemployed	589 (19.7)	195.8	87.0, 371.6
Geographic zone,[3] *n* (%)			
Western	306 (10.2)	83.2	45.9, 165.3
Northern	355 (11.9)	224.2	99.4, 401.2
Central	304 (10.2)	167.4	73.4, 317.9
Southwest/Southern Highlands	482 (16.2)	141.0	54.3, 271.4
Southern	161 (5.4)	103.0	53.5, 173.4
Lake	817 (27.4)	116.3	48.3, 232.7
Eastern	468 (15.7)	347.8	185.0, 479.8
Zanzibar	92 (3.1)	178.5	94.1, 279.9

[1] *n* = 2985. ppm, parts per million; UIC, urinary iodine concentration.
[2] We categorized wealth index from 5 quintiles into 3 categories by grouping poorest and poorer into 1 category as lowest, middle, and richer and richest into another category as highest (lowest, middle, and highest).
[3] Geographic zone was categorized from 9 zones into 8 zones by grouping Southern and Southwest Highlands zone into Southwest/Southern Highlands (Western, Northern, Central, Southwest/Southern Highlands, Southern, Lake, Easter, and Zanzibar) (29).

impaired neurological development (39). Previous studies have shown that mild-to-moderate iodine deficiency during pregnancy can have a serious impact on children's intelligence quotient and cognitive functioning in offspring (7, 40–42). Furthermore, the most consequential effects of severe maternal iodine deficiency in the offspring are congenital hypothyroidism, which results in growth retardation including physical and intellectual developmental delay (40, 43). The negative association between pregnant women and UIC in Tanzania was not surprising. A previous study reported an iodine deficiency prevalence of 54% among pregnant women using the 2010 TDHS data (29). Our analysis showed a strong negative association between lack of adequately iodized salt consumption and UIC. In addition, a subgroup analysis stratified by nonpregnant compared with pregnant status also showed that inadequately iodized salt consumption was associated with lower UIC. Previous studies have indicated that consuming adequately iodized salt was associated with a decreased risk of developing subclinical iodine deficiency among pregnant women in Tanzania (29). USI, through fortification of salt, remains the most reliable method for sustainable elimination of iodine deficiency among women of reproductive age (30, 40, 43). The iodization of salt remains the main strategy and the most cost-effective for achieving sustained IDD control, with a cost of only US$0.02–0.05 per individual per year (1, 12). However, the full implementation of USI is still a big challenge in many SSA countries where noniodized salt is still being sold for human consumption, which may cause a lack of access to adequately iodized salt for women of reproductive age and pregnant women (40). In addition, one of the key problems in the prevention of IDD in

TABLE 2 Regression coefficients (95% CIs) and *P* values in the association between explanatory variables and UIC[1]

Characteristics	Coefficients (β)	95% CI	*P*
Age (y)	− 0.0004	− 0.0016, 0.0001	0.25
Pregnancy status			
Pregnant	− 1.21	− 3.42, −0.12	0.004
Not pregnant	Reference		
Breastfeeding status			
Breastfeeding	− 1.02	− 2.25, −0.27	<0.0001
Not breastfeeding	Reference		
Iodine content in salt			
Inadequately iodized salt (<15 ppm)	− 6.55	− 9.24, −4.33	<0.0001
Adequately iodized salt (≥15 ppm)	Reference		
Educational status			
No education	− 1.88	− 4.58, −0.36	0.0005
Primary education	− 0.45	− 1.54, −0.01	0.02
Secondary/higher	Reference		
Wealth index status			
Lowest	− 1.61	− 3.61, −0.41	<0.0001
Middle	− 1.72	− 3.88, −0.44	<0.0001
Highest	Reference		
Place of residence			
Rural	− 0.42	− 1.42, −0.01	0.02
Urban	Reference		
Employment status			
Employed	− 0.20	− 0.96, 0.01	0.09
Unemployed	Reference		
Geographic zone			
Central	− 9.61	− 16.81, −4.37	<0.0001
Lake	− 19.98	− 27.77, −13.40	<0.0001
Northern	− 7.13	− 12.89, −3.06	<0.0001
Southern	− 12.11	− 24.11, −4.24	<0.0001
Southern Highlands	− 23.43	− 31.81, −16.24	<0.0001
Western	− 26.63	− 37.70, −17.39	<0.0001
Zanzibar	− 11.02	− 17.98, −5.71	<0.0001
Eastern	Reference		

[1]Model fully adjusted for age, pregnancy status, breastfeeding status, educational status, wealth index status, iodine content in salt, place of residence, employment status, and geographic zone. ppm, parts per million; UIC, urinary iodine concentration.

SSA is the lack of adequate enforcement and monitoring of the iodized salt program due to political instability, famine, poverty, and conflict (44, 45). Even though Tanzania has had a USI policy in place since early 1994, the country is still struggling with the full implementation due to the network of >6000 various small-scale salt producers and noncompliance with the addition of adequate potassium iodate to the salt for adequate iodization (6, 29). Interestingly, there were some outliers in our data with a higher UIC. This could be due to the fluctuation of the iodine concentration at the individual level, which can vary from day to day and sometimes within the same day. However, this variation averages out when measuring UIC at the population level (46). Poor and uneducated women were more likely to have lower UICs during our study compared with those with a higher income and education. This was not surprising because women of a lower socioeconomic status were more likely to have access to salt that was inadequately fortified with iodine or with no iodine content and may be dependent on available household salt as the main dietary salt source (1). These findings were also consistent with a previous study that found that women belonging to the lowest socioeconomic categories had higher odds of subclinical iodine deficiency in Tanzania (29). This may be due to the inability to buy iodized salt and lack of knowledge about the benefits of iodized salt (47). Previous studies have indicated that women of higher socioeconomic status are more likely to access iodized salt than those of the lowest socioeconomic status in SSA (48). This could also be explained by the higher cost of purchasing adequately iodized salt compared with noniodized salt (49–51). This study highlights the significance of consuming adequately iodized salt and calls for national measures regarding routine quality control and assurance of salt iodization programs for compliance with the use of adequately iodized salt. Campaigns on the potential benefits of consuming adequately iodized salt could be effective in preventing iodine deficiency among women of reproductive age. Strong enforcement may be needed against small-scale salt producers, which are known to be the likely source of noniodized salt and are less likely to practice appropriate iodization of salt due to poor technologies (52). Strong collaboration with small-scale producers is critical for achieving USI. The variation in median UICs within and between regions of Tanzania (Figure 2) highlights the need for a policy at the national and regional levels. Policymakers need to collaborate with each region's salt iodization program officers, including continuous training, monitoring for quality control and assurance, and enforcement of adding adequate potassium iodate to the salt. Regions with a low median UIC could learn from regions with high median UICs such as Pwani and Tanga.

Study strengths and limitations

The strength of our study is the analysis of a nationally representative sample with a high response rate of UIC testing for iodine deficiency. Another strength of this study is the use of a biomarker (UIC), which is considered an excellent indicator for the assessment of iodine status and iodine deficiency in the population (53). Most of the previous national studies investigated the use of iodized salt consumption instead of the biomarker as done in this TDHS. However, the study has some limitations that need to be addressed. The cross-sectional nature of the survey does not allow for the determination of a temporal or causal relation between the explored variables and iodine deficiency among women. In addition, there was no follow-up for those who were consuming inadequately iodized salt. Second, only women's household salt was measured during this survey. TDHS field teams did not ask about the source of the salt (where the salt was purchased) during the survey. Besides these limitations, this study provides crucial information concerning the use of adequately iodized salt among women of reproductive age. In particular, this study identifies which regions in Tanzania may need enhanced efforts to improve access to iodized salt to all individuals.

Conclusions

Iodine deficiency is still a significant public health problem in Tanzania. The findings from our study showed great heterogeneity in the median UIC across regions of Tanzania and in relation to women's sociodemographic characteristics. Pregnancy and breastfeeding, consuming iodized salt inadequately fortified, being of a lower socioeconomic status, having a lack of education, living in rural areas, and living in certain geographical zones were significantly associated with lower UICs among women of reproductive age in Tanzania. The findings of this study demonstrate an urgent need to strengthen the national USI program, which was introduced in early 1994 to reduce iodine deficiency among reproductive-age women in Tanzania. The findings also highlight the need for collaborative efforts from stakeholders, health care providers, and government officials to combat iodine deficiency among pregnant and breastfeeding women in Tanzania through full implementation and enforcement of USI and health education programs about the consequence of iodine deficiency.

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