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Evaluation of Iodine Content and Suitability of Common Salts Sold in Mubi Metropolis, Adamawa State, Nigeria

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ABSTRACT

Background: Human beings and animals need iodine as an essential micronutrient. Deficiency of this mineral has a wide range of negative consequences referred to as iodine deficiency disorders (IDD). IDD has been recognized as a public health problem in Nigeria. Universal salt iodization (USI) was identified as a global strategy for elimination of IDD (UNICEF, WHO, 1994). IDD-Task Force (2002) reported cases of Salt of uncertain quality and iodine content making its way into the markets and finally the households.

Objectives: The study investigated the iodine content and suitability of common salts sold in Mubi market Adamawa state, Nigeria.

Materials and Methods: Five types of sachet salts (250mg) were randomly purchased from the market and coded S1 to S5. The manufacturing companies were noted. Titrimetric method was used to determine the iodine and potassium iodate content of the salt samples. The National Agency for Food and Drug Administration and Control (NAFDAC) standard of > 30ppm iodine and > 50ppm potassium iodate content at retail level, was used as the standard to determine the suitability of the salt samples.

Results: Iodine content of the salt samples ranged from 12.80 – 35.70ppm and potassium iodate content ranged from 28.60 – 52.84 ppm. Samples S2 (35.70ppm, 52.84ppm) and S3 (34.24ppm, 51.60ppm) iodine and potassium iodate content respectively met the NAFDAC requirement while S1 (29.80, 47.66ppm), S4 (25.33, 30.75ppm) and S5 (12.80, 28.60ppm) iodine and potassium iodate content respectively, did not meet the standard for retail level salt iodization. S5 a locally made salt which had less than half the requirement for retail level salt iodization (12.80 ppm iodine) is not suitable for household consumption based on the NAFDAC standards.

Conclusion: Sixty percent of the salts sampled in Mubi market did not meet the NAFDAC Standard of iodine content and suitability at retail level. Consumers are advised to buy salts made by reputable companies. People are advised to take note of these facts when buying salts for household use. Further studies are required to ascertain the iodine content of the salts in the households.

Keywords: iodine content, sachet salts, suitability, Mubi market.

INTRODUCTION

Human beings and animals need iodine as an essential micronutrient. Iodine helps in the development and function of the thyroid gland, metabolism of fat, promotes energy production and growth. Natural sources of iodine are seafoods and vegetables. Other sources include the diet, by consumption of foods fortified with iodine such as salt, dairy products and bread. Deficiency of this mineral has a wide range of negative consequences such as still births, congenital abnormalities and decreased cognitive capacity, goiter and cretinism (Bohac *et al.*, 2009). Goiter and cretinism are the easily identifiable manifestation of iodine deficiency. Iodine deficiency disorders (IDD) was recorded as a singular cause of most cases of mental retardation in children and one of the contributing factors to high infant mortality worldwide (UNICEF, 1994, Gulati, 1994). IDD has been recognized as a public health problem in Nigeria and its elimination, a major public health goal for all countries (Ekpechi, 1967; UNICEF, May 2008). Although goiter is less frequent and cretinism not so common as IDD elimination progressed, iodine deficiency exists and persists in its more silent but devastating way - infants are unprotected from brain damage caused by IDD and loss of IQ levels in some areas especially mountainous and hilly areas (Bohac *et al.*, 2009). The world summit for children in 1990

resolved to virtually eliminate iodine deficiency disorders from the face of the earth (UNICEF, WHO, 1994). World leaders including Nigeria committed themselves to specific goals to ensure the right of the children to adequate iodine nutrition (UNICEF, WHO, 1994). Universal salt iodization (USI) which intends that all salt for human and animal consumption be iodized thus ensuring adequate iodine nutrition was identified as global strategy for elimination of IDD (UNICEF, WHO, 1994). Salt is an excellent carrier for iodine and other nutrients. This is because it is safe, consumed at relatively constant well-definable levels by all people within a society, independent of economic status (UNICEF, WHO, 27 JANUARY, 1994). World Health organization (WHO) provides guidelines as to the recommended prescribed levels of iodization. In Nigeria salt iodization laws are enforced through two key regulatory agencies; The Standards Organization of Nigeria (SON) which sets the standard and the National Agency for Food and Drug Administration and Control (NAFDAC) which enforce the standards. In turn the salt manufacturers have established an umbrella association for effective self regulation and to ensure distribution of adequately iodized salt (Akunyili, 2007; Untoro, 2006). The standard defines properly iodized salt as > 50ppm iodine at port of entry and salt factory level; > 30ppm iodine at distributor and retail levels and > 15ppm iodine at household level (NAFDAC, 2003). It is easy to monitor the iodization and iodine content of salts at the factory but more useful is to assess whether that iodized salt is making its way into household use or if there may be a leakage of non-iodized salt into the household, the latter being especially important (Sullivan *et al.* 2007). Nigeria has achieved remarkable success in its universal salt iodization programme but the report of the regulatory bodies expose challenges that provide the bases for continuous improvement and investigations (NAFDAC, 2009). The regulatory bodies are still facing challenges of local salt production and smuggling of non-iodized salt into the country as well as lack of awareness amongst the consumers on the need to demand for and consume iodized salt. Raw salt producers, who often do not have the capacity to constantly produce good quality iodized salt and to monitor its quality, supply their un-iodized salt to multiple small repackagers who take on the task of iodization and packaging the salt into consumer sized bags. The result can be salt of uncertain quality and iodine content making its way into the markets and finally the households (IDD-Task Force, 2002). Equally solid monitoring of iodine status reveals not only an insufficiency of iodine intake but also an excess. WHO data shows 34 countries with more than adequate or excess iodine intake (WHO, UNICEF, 2007). Excess iodine is generally well tolerated but for some with pre existing thyroid disease and the elderly, they may have iodine induced thyroid dysfunction (Joshi, 2002). Recommended daily intake of iodine is 150 microgramme for adults that are not pregnant and lactating. Mubi town in Adamawa state of Nigeria is surrounded by hills and cases of iodine deficiency are often reported (Adebayo, 2004). All these reports lead to the thrust of this study to evaluate the iodine content of sachet salts sold in Mubi daily market (retail level) and so assess their suitability as household quality salts since the salts will eventually get to the households.

MATERIALS AND METHOD

Study area

Mubi town is located on North Eastern part of Adamawa state of Nigeria, situated on latitude 10° 16' 12" N and 13° 16' 12" E. Mubi shares border with Borno state in the North, Hong and Song Local Government Areas in the west and Republic of Cameroon in the south and east. Mubi is surrounded with hills and highlands (Adebayo, 2004).

Sample collection

The salt samples used for this research were randomly bought from Mubi daily market in Adamawa state Nigeria on the 16th of October 2014. One sachet (250g) each of different salt brands was bought. The manufacturing companies were noted. The samples were coded S1 - S5 and analyzed at the animal nutrition laboratory of Adamawa state University Mubi. Titrimetric method (Diosdy *et al.* 1998) was used to determine the iodine and potassium iodate content of the salt samples. The means of the triplicate determinations were calculated. The simple percentages of the samples were calculated.

METHODOLOGY

Iodine Determination

Ten grammes of each salt sample were dissolved in about 100ml of distilled water. The pH was adjusted to 2.8 using 0.6 % HCL. 30mg of potassium iodide was added to convert all of the iodate present to elemental iodine.

The librated iodide was titrated with 0.004ml freshly prepared sodium thiosulphate solution using starch as the end point indicator

Iodine content was calculated using conversion formula above for iodine determination

Determination of Potassium iodate

50g of each salt sample was measured with technical scale and put into a 500cm³ Erlen meyer flasks. Salt was dissolved in 1.7 200cmm3 of distilled water solution in which 3 drops of indicator methyl red was added. This was titrated with hydrochloric acid solution of 0.1000mo/dm³ concentration till the colour changed from pale yellow to pale pink. 1.50cm³ of bromine water was added to the solution, the solution was boiled for 5 minutes and cooled under water stream. 1.00cm³ of formic acid solution and 1cm³ of phosphoric acid were added and then cooled to room temperature. 1cm³ of concentrated phosphoric acid and 0.1g potassium iodide were added to the solution stirred and left for 5 minutes in the dark. The solution was titrated with sodium thiosulphate solution which was previously standardized until the colour changed from yellow to light yellow. 1cm³ starch solution was added and the solution changed into blue. The solution was titrated until it lost the blue colour of indicators.

RESULTS AND DISCUSSIONS

Table 1: Iodine and potassium iodate content of salt samples bought from Mubi market

Type of salt Company	salt brand samples	iodine ppm	potassium iodate ppm
LSC	S1	29.80	47.66
LSC	S2	35.70	52.84
LSC	S3	34.24	51.60
SSC	S4	25.33	30.75
LMS	S5	12.80	28.60
SON/NAFDAC (2003)	ASR	>30	> 50

LSC = Large scale salt company

SSC = Small Scale salt company

LM = locally made salt

ASR = All salts at retail level

ppm = parts per million

SON/NAFDAC = Standard Organization of Nigeria / National Agency for Food and Drug Administration and Control.

Table 1 shows that sample S2 (35.70 ppm iodine and 52.84pp potassium iodate) and S3 (34.24ppm iodine and 51.60ppm potassium iodate) met the NAFDAC standard for retail level salt iodization of > 30ppm iodine and > 50 ppm potassium iodate. Two out of five (40%) of the samples met the standard while three (60%) of the samples did not meet the standard. The two samples S2 and S3 that met the standard were produced by large scale salt companies. Equally S1 (29.80ppm iodine and 47.66 ppm potassium iodate) which was approximately up to the standard was produced by another large scale company. The other salt samples were made by small scale companies. This is in line with the report that small scale salt repackagers often produce salt of uncertain quality and iodine content (Akunyilli, 2007). In the process of repackaging and sometimes due to lack of proper instruments of iodization the small scale repackagers often produce and sell salts of poor iodine quality (Diosady, albertZi, Mannar & Fitzgerald, 1998; NAFDC, 2004). Sample S5 (12.80 ppm iodine and 28.60 ppm potassium iodate) produced locally had less than the recommended iodine level for retail level and not up to the household level. This shows that this salt is not suitable as table salt. NAFDAC in 2003 reported that such local salts are made in Benue and Taraba State. The salts can easily be brought into Mubi town which is in a neighboring state. None of the salts sampled had excess iodine content. It is necessary to draw the attention of the consumers on the iodine quality of the various salts sold in Mubi market.

CONCLUSION AND RECOMMENDATION

Although universal salt iodization has been established as a major public health intervention for elimination of iodine deficiency, improperly iodized salts are still sold in Mubi market. Sixty percent of the sampled sachet salts sold in Mubi market did not meet the NAFDAC standard for salt iodization at retail level. The locally produced salts did not meet the requirements of salt iodization and therefore are not suitable as table salts. Consumers are advised to buy salts made by reputable companies. The government should continue to operationalize sentinel site system to check iodine content of sachet salts in the markets.

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