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Short Communication

Potassium iodate levels in processed edible salts available in retail shops throughout Kenya, 2013

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Abstract

Objective: Iodine-deficiency disorders, due to insufficiency of iodine in the diet, are a global public health problem. The Kenyan Food, Drugs and Chemical Substances Act stipulates that processed retail-available edible salts contain 50–84 mg of potassium iodate (KIO_3) per kilogram of salt. The present study determined the status of KIO_3 levels in commercial salts, for public health action.

Design/Setting/Subjects: As part of the Kenya Demographic and Health Survey 2013, field workers collected salt samples from seven different local manufacturers/packers across eight regions of the country and sent them to the National Public Health Laboratory (NPHL) for KIO_3 titration analysis.

Results: A total of 539 samples were collected and analysed at NPHL. The samples had a mean KIO_3 of 62 mg/kg. Thirty-three (6 %) samples had KIO_3 of <25 mg/kg; ninety-eight (18 %) had 25–49 mg/kg; 335 (62 %) had 50–84 mg/kg; and seventy-three (13 %) had KIO_3 of >84 mg/kg.

Conclusions: The study found that 62 % of salts sampled met the Kenyan standards, 24 % were below the required limits and 13 % were above the recommended range. Continuous monitoring of edible salts at the retail level is important to detect brands not adhering to standards and trace them for remedy. However, governmental efforts should be directed to the quality control and quality assurance of the salt-manufacturing industries.

Keywords
Universal salt iodization
Iodine-deficiency disorders
Kenya
Retail

Iodine-deficiency disorders, caused by low dietary intake of iodine, are major causes of preventable developmental disabilities and conditions such as goitre, which is why they are of major concern during pregnancy and childhood[1]. The WHO and UNICEF have long recommended universal salt iodization standards to achieve elimination of iodine-deficiency disorders[2]. The recommendations for universal salt iodization are that processed edible salt globally be adequately iodized. In Kenya, legislation on mandatory salt iodization was passed in 1978 and revised in 1988[3,4]. Surveys on iodine-deficiency disorders undertaken in 1994 and 2004 showed that the prevalence of goitre among children aged 8–10 years had decreased from 16 to 6 %, respectively[5]. This improvement is attributed to the increase in consumption of iodized salt by most (91 %) Kenyan households.

In Kenya, salt iodization is legislated in the Foods, Drugs and Chemical Substances Act, Chapter 254, article 299, which states that table salt should contain a minimum of 50 mg of potassium iodate (KIO_3) per kilogram[3]. However, as a demonstration of good manufacturing practice, manufacturers are required to add more than 50 mg KIO_3/kg because iodine and its derivatives easily dissociate with time as salt moves from the manufacturer to the retail establishment. The present study aimed to: (i) measure KIO_3 levels in edible salts sold at retail shops throughout the country; and (ii) determine whether the salts sold in retail outlets meet government standards for salt iodate content.

Methods

As part of the Kenya Demographic and Health Survey 2013, field workers collected iodized salt samples from randomly selected retail establishments across eight regions of the country. One sample of each brand of the

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packaged salts that were available in the sampled retail shops was collected. All the sampled salts from the eight regions in the country were delivered unopened to the National Public Health Laboratory (NPHL) for analysis.

General titration methods were used to determine KIO_3 of the submitted samples. Titration was continued until the concentration of KIO_3 was calculated from the fact that 1 ml of 0·005-M sodium thiosulfate reacts with 0·635 mg of iodine. Data for each sample were entered into a Microsoft® Excel 2007 spreadsheet and descriptive statistics were calculated.

Results

A total of 539 salt samples were analysed, with mean of 62 mg KIO_3/kg. Thirty-three (6 %) of the samples had KIO_3 levels of <25 mg/kg; ninety-eight (18 %) had 25–49 mg/kg; 335 (62 %) had 50–84 mg/kg; and seventy-three (13 %) had KIO_3 of >84 mg/kg. When the data were analysed by region, we noted that the Eastern region had the highest mean KIO_3 of 65·9 mg/kg, followed by Nyanza (63·5 mg/kg), Rift Valley (63·4 mg/kg), Northeastern (62·7 mg/kg), Western (62·0 mg/kg), Coast (61·8 mg/kg), Central (57·4 mg/kg) and Nairobi with the least at 51·7 mg/kg (Table 1). There was a good distribution of KIO_3 levels in all forty-one counties sampled. Tana River, one of the poorest and most vast counties, had half of the sampled salts in the 20–49 mg/kg range (Fig. 1, arrowed).

Of the 539 salt samples analysed, brand 3 had the highest mean KIO_3 level of 75 mg/kg with fifty-five salt samples analysed. Brand 5 had the largest number of salts analysed (264, i.e. 49 % of all the salts), with a mean KIO_3 level of 62 mg/kg. This brand was present in all forty-one counties and its KIO_3 levels were as follows: 3 % had <25 mg/kg; 27 % had 25–49 mg/kg; 55 % had 50–84 mg/kg and 16 % had >84 mg/kg. Brand 7 had twenty-seven salt samples analysed and had the lowest mean KIO_3 level of 13 mg/kg. Its KIO_3 levels were as follows: 85 % had <25 mg/kg and 15 % had 25–49 mg/kg. Brand 7 also had the salt sample with the lowest KIO_3 (0 mg/kg). Overall, 24 % of the samples were below the 50 mg/kg threshold and 13 % of the samples were above the mandated maximum (Fig. 2).

Table 1 Status of iodized salt per region, Kenya Demographic and Health Survey, 2013 (*n* 539)

		KIO_3 (mg/kg salt)	
Region	Number of salt samples	Mean	SD
Eastern	45	65·9	29·0
Nyanza	58	63·5	25·7
Rift Valley	188	63·4	26·6
Northeastern	40	62·7	19·5
Western	76	62·0	24·7
Coast	65	61·8	21·4
Central	48	57·4	26·9
Nairobi	19	51·7	22·1

Discussion

The national mean KIO_3 level was 62 mg/kg for all salts sampled. This indicates that Kenyans are consuming iodized salt. These study findings are similar to observations from 2010 that most households in Kenya were using adequately iodized salt[4]. All brands sampled met the required KIO_3 level except for brand 7, which had 85 % of the salts sampled below 25 mg KIO_3/kg and 15 % with 25–49 mg KIO_3/kg. Possible reasons for this could be that the company producing brand 7 was not iodizing its salt properly or the salt was iodized properly but staying too long on the shelves and lost the iodate through chemical dissociation combined with lack of proper quality

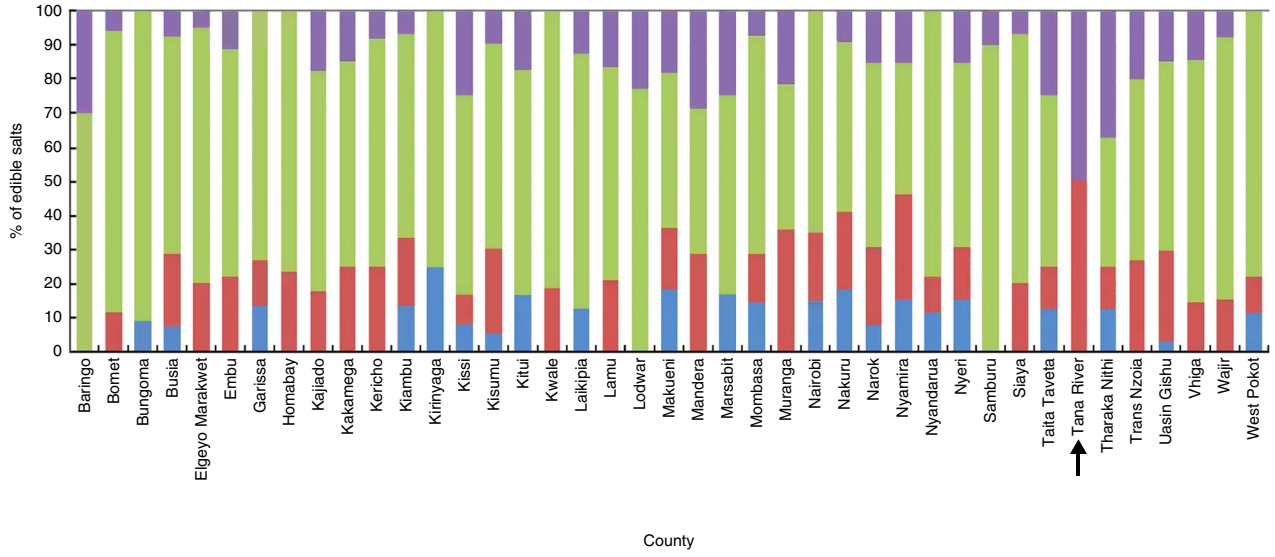

Fig. 1 (colour online) Potassium iodate levels (■, <25 mg/kg; ■, 25–49 mg/kg; ■, 50–84 mg/kg; ■, >84 mg/kg) in processed edible salts available in retail stores, per county, Kenya, 2013 (*n* 539)

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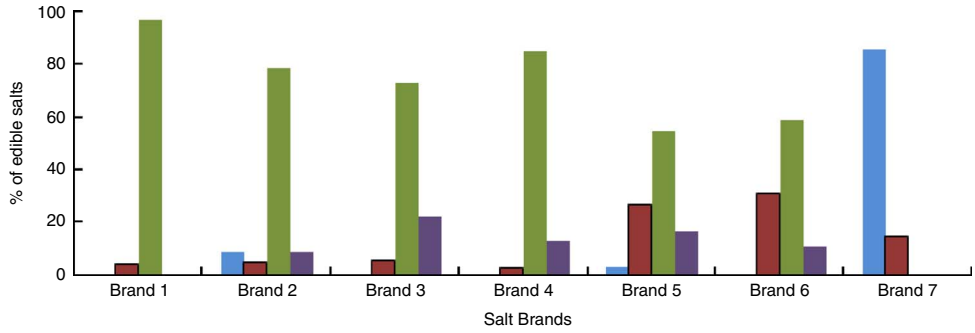

Fig. 2 (colour online) Potassium iodate levels (■, <25 mg/kg; ■, 25–49 mg/kg; ■, 50–84 mg/kg; ■, >84 mg/kg) in processed edible salts available in retail stores, per brand, Kenya, 2013 (*n* 539)

assurance in the factory. According to another global study, packaging salt in an effective moisture barrier, such as solid low-density polyethylene bags, can reduce iodine losses significantly[6]. The present study also corroborates that of Kishoyian *et al.*, who studied six different salt brands in two primary schools in Nairobi, Kenya and found that the iodate levels varied significantly between 2·02 and 191·5 mg/kg[7].

There was a relatively stable distribution of salt KIO_3 levels in the eight regions. However, two regions of the country, Nairobi and Central, had the lowest mean levels of KIO_3. Their mean values were just barely meeting the lower limit of KIO_3 recommended for iodization.

Conclusion

Results from the current study indicate that Kenya is not in compliance with the universal salt iodization recommended level for processed edible salts and that there is ample room for improvement of the iodized salt supply. The study illustrates the critical utility of retail monitoring as it identified two salt brands with mean KIO_3 content outside the mandated range. Therefore, the Ministry of Health should continuously monitor KIO_3 levels in Kenyan salts in all regions, to adequately inform relevant stakeholders on the trends of salt iodization. Monitoring will also assure that companies producing edible salts adequately iodize their salts. By doing this, we can reduce the incidence of iodine-deficiency disorders in Kenya even further.

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