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Iodine content of salt in Lae city of Papua New Guinea

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Papua New Guinea (PNG) is among those areas of the world where soils lack iodine. Iodine deficiency leads to a number of disorders including goitre and cretinism. The PNG government has chosen to promote the consumption of adequately iodised salt as one of its intervention programmes to eradicate the iodine deficiency disorders. A study was undertaken to assess the iodine content of salt in the distribution chain in Lae, as well as to assess the per capita salt consumption in the city. It was found that the average salt consumption was 6.59 g/d. However, not all the Lae population were consuming adequately iodised salt. Only 48% of salt samples from one school were adequately iodised. The percentage of wholesale salt samples containing more than the standard 30 p.p.m. iodine increased from 61.5% in 1996 to 90.9% in 1997. The iodine content of the retail samples were 73.5% and 87.1% in 1996 and 1997, respectively. Stricter, sustained and systematic monitoring of the quality of iodised salt procured and distributed in Lae is called for to ensure consumption of adequately iodised salt.

Key words: Papua New Guinea, Lae, iodine deficiency, salt.

Introduction

Iodine is an essential micronutrient for the synthesis of thyroid hormones. The consequences of severe iodine deficiency include endemic goitre; endemic cretinism; increased foetal and infant mortality; stunting; paralysis and muscular disorders; severe speech and hearing defects; permanent brain damage and mental retardation.[1] Over 1000 million people live in areas of the world where soils lack sufficient iodine.[2] Endemic goitre and cretinism have been known to occur in Papua New Guinea (PNG) for many years (PF Heywood & J Verrall, unpubl. data, 1987).[3–4] Regular consumption of adequately iodised salt prevents and corrects iodine deficiency[5] and is regarded as one of the simplest and cheapest methods of ensuring adequate iodine intake.[6]

Since June 1995 the Government of PNG has banned the sale of non-iodised salt in an effort to make iodised salt available to all households and thus combat the iodine deficiency problems of the country.[7] Such an intervention strategy must be coupled with programmes that include close monitoring to ensure that salt labelled as iodised actually contains an adequate concentration. All salt sold in PNG is imported. However, there has been no systematic monitoring of the iodine content of salt at the stage of importation or, in many areas of PNG, along the distribution chain to households. The salt consumption per person per day is also unknown.

Materials and methods

Accurately weighed packaged salt samples were distributed to 73 randomly selected households in both low and middle income areas in Lae. The salt packages were re-weighed after 9 days. The number of people in each household was noted and the amount of salt consumed per head per day was calculated.

Different brands of salt samples were purchased from four major wholesale outlets and four retail outlets in Lae at monthly intervals; in 1996 over a period of 2 months and in 1997 over a period of 3 months. The samples were tested for iodine content by the standard thiosulfate titration method.[6]

Two schools in Lae were selected for the household consumption tests. The first school was attended by students from all socio-economic sectors of the community, while the second school was attended by students from predominantly low income groups. All students in the second and third standard grades, aged 8–10 years, were briefed about the aims of the exercise. They were each given a small polyethylene bag and instructed to bring approximately 30 g salt from their homes the following day. The samples were labelled and the name, age, and place of residence of each student was documented. Fifty samples were randomly selected from each lot (a lot being the total number of samples from each grade in each school) and tested for iodine content by the thiosulfate titration method.[6]

Results and discussion

The PNG standards for iodine content of salt were based on an assumption of 10 g salt consumption/day. A preliminary survey of 73 randomly selected houses in Lae indicated an average consumption of 6.59 g salt/day (Table 1), which is below the assumed 10 g consumption basis for the salt standard. There is a need to cover more houses and also to extend the exercise to other areas of the country because cooking practices in some regions of PNG require very little salt.[3] Once identified, these communities can be targeted for programmes that promote the use of iodised salt.

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Table 1. Daily household salt consumption in Lae

No. people in households	Total weight consumed (g)	No. days used	Salt consumption g/person/day
287	17030.1	9	6.59

Table 2. Iodine content of salt at the retail and wholesale levels

	Nil p.p.m.	0–30 p.p.m.	≥ 30 p.p.m.
Retail	*n* (%)	*n* (%)	*n* (%)
1996 (*n* = 34)	4 (11.8)	5 (14.7)	25 (73.5)
1997 (*n* = 70)	3 (4.3)	6 (8.6)	61 (87.1)
Wholesale			
1996 (*n* = 26)	8 (30.8)	2 (7.7)	16 (61.5)
1997 (*n* = 33)	3 (9.1)	0 (0)	30 (90.9)

Table 3. Iodine content of household salt samples collected from children at two schools (per cent of samples)

Community school	Nil p.p.m.	< 30 p.p.m.	≥ 30 p.p.m.
School 1	0	2	98
School 2	6	46	48

The PNG salt legislation stipulates that the iodine content of salt other than table salt shall be not less than 30 p.p.m.[7] This standard is uniform for salt at the point of importation, through the distribution chain to the household level. Because the legislation requires that salt must be packaged in waterproof containers, very little iodine should be lost under proper storage conditions. While 90.9% of the salt samples collected from wholesale outlets in 1997 met the PNG Government's legislation on iodised salt, only 61.5% of the 1996 samples were adequately iodised (Table 2). The level of improvement was not so great with the retail samples, with 87.1 and 73.5% of the 1997 and 1996 samples, respectively, containing more than 30 p.p.m. iodine. There is still considerable room for improvement if PNG is to meet the International Commission for the Control of Iodine Deficiency Diseases (ICCIDD) 90% adequacy criteria at the retail level.[8]

There is an urgent need for sustained and systematic sampling and testing of salt available to consumers in Lae because it is the gateway for imported food supplies destined for Morobe Province and some areas of the highlands. Goitre and other iodine deficiency disorders have been shown to be endemic in a number of these areas (PF Heywood & J Verrall, unpubl. data, 1987).[3,] Currently, salt that is either packaged in unlined cardboard boxes or with the iodine present in the iodide form, is still being sold in some retail outlets in Lae contrary to the laws of PNG.

All of the children from the two grades at each school surveyed (*n*=461) brought salt from their homes, meaning that salt utilization in the communities in Lae is not a problem. A total of 98% of the salt samples tested from the first school were adequately iodised, but only 48% of the samples from the second school met the 30 p.p.m. standard (Table 3). Furthermore, 6% of the salt samples from the second school had no iodine at all. This indicates that not all of the households in Lae are consuming adequately iodised salt. While transportation within Lae is not a factor affecting iodine loss in the household samples prior to utilisation, packaging, storage, temperature and relative humidity are important factors. The second school is situated in a low socio-economic area. Although these households have easy access to the main supermarkets in the city, they are also serviced by small trade stores where environmental factors and length of storage are more likely to have a greater influence on the iodine content of salt.

Conclusion

Not all households in Lae are consuming adequately iodised salt. The availability of such salt in all homes cannot be realised if salt that fails to comply with PNG's regulations is allowed into the country. Stricter, systematic and sustained monitoring of the iodine content of salt, especially at the importer level in Lae, is called for in order to ensure that all salt distributed to retailers and ultimately to households is adequately iodised. The level of salt consumption in other areas of PNG as well as the effect of traditional cooking practices on iodine content of foods should also be ascertained. This information would help authorities make suitable modifications, if necessary, to the amount of iodine to be added to salt. Decisions on the best control measures for particular areas of PNG will also be facilitated.

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巴布亞新幾內亞 Lae 市食鹽的碘含量

摘　要

巴布亞新幾內亞是世界上土壤缺碘的地區之一。 碘缺乏會導致甲狀腺腫和克汀病（呆小病），當地政府選擇了足夠碘鹽的消耗作爲一個干預計劃以消除碘缺乏病。作者進行了 Lae 市食鹽中碘含量和每人鹽消耗量的評估，結果發現每人每日平均食鹽消耗量爲 6.59 克。然而，並非所有家庭都消耗足夠的碘鹽，從一間學校分析食鹽樣本，僅 48%含有足夠的碘，批發食鹽樣本含有較高的碘，較標準 30ppm 碘多,從 1996 年的 61.57%增至 1997 年的 90.9%,零售食鹽樣本在 1996 年和 1997 年分別爲 73.5%和 87.1%，作者認爲更嚴格的、持久的和系統的監控碘鹽的質量，以保證 Lae 市所有家庭足夠的碘消耗是需要的。

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