

Original Article

Iodine status of pregnant women in Lae

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Many areas in Papua New Guinea are regarded as endemic for iodine deficiency disorders (IDD). Salt iodization to combat IDD has been a policy of the government since 1973. Its effectiveness in many areas of the country has, however, not been assessed. The iodine status of pregnant women is an indicator of the iodine status of the community. This study was conducted in order to assess the effectiveness of the salt iodization program in Lae. Urine samples from a total of 120 pregnant mothers attending antenatal clinics in different areas in Lae were analysed for iodine content. It was found that 15% of the mothers had urinary iodine values below 10 µg/dL, 11.7% between 5 and 9.9 µg/dL, 0.83% between 2 and 4.9 µg/dL and 2.5% below 2 µg/dL. This indicates that IDD is still a problem in Lae and most certainly in other parts of the country. There is a need for proper monitoring of the iodine content of salt sold in the country and also for strengthening the whole IDD intervention program.

Key words: urinary iodine, pregnancy, iodized salt, Lae, Papua New Guinea.

Introduction

Several areas of Papua New Guinea (PNG) are known to be goitrous. Lae, however, is not regarded as one of those areas although Buttfield and Hetzel found subjects living in Lae to be iodine-deficient.¹ It is therefore possible that Lae and the surrounding areas could be endemic for iodine deficiency disorders (IDD). Iodine deficiency can lead to mental retardation, which if widespread, can have a profound effect on the development of a nation.²

Legislation for salt iodization in the country has been in existence since the early 1970s. Its effectiveness in combating the problem has not been evaluated. Compliance to the legislation is also not rigidly enforced and non-iodized or inadequately iodized salt is readily available in many areas.³

Several methods have been suggested to assess the extent of IDD in a community. These include measuring urinary iodine in vulnerable groups such as infants and preschool-age children, school-age children and pregnant women.⁴

The iodine status of pregnant women is particularly crucial because of the susceptibility of the developing fetus to iodine deficiency disorders. This study was conducted in order to assess the iodine status of pregnant women in Lae.

Materials and methods

There are six urban health centres in Lae (approximate population 100 000) where maternal and child health (MCH) clinics are conducted. Two are currently closed, forcing the inhabitants in those areas to attend other neighbouring centres, mainly, Butibam, Tent City and the University of Technology (Unitech) clinics. These three localities were selected for the study. One of the selected centres is situated in a traditional village, Butibam, and the other in a settlement, Tent City. While Butibam and Tent City clinic attendees are predominantly from the low socio-economic group, the Unitech clinic caters for students, employees of the university and their families and, hence, people from all socio-economic groups. Settlement dwellers around the university also attend

the clinic. The approximate population currently served by these centres is close to 60 000 with monthly average antenatal attendance of 206, 242 and 87 for Butibam, Tent City and Unitech, respectively.

All three locations have trade stores where the inhabitants purchase salt. There is, however, easy access to supermarkets in the city.

Casual urine samples were collected in screw-capped 100 mL plastic bottles from the pregnant women on clinic days (once a week) over a period of 1 month. Care was taken not to collect urine from a subject more than once. No attempt was made to separate new and repeat attendance samples. The samples were frozen until ready for analysis. All of the samples from one clinic were regarded as one lot. Forty samples were randomly selected from each lot as recommended by Dunn *et al.*⁵ and iodine content determined by the ammonium persulphate method of Pino *et al.*⁶ Standard reference urine samples provided by the IDD laboratory, Virginia, USA were used as control.

Permission for the study was granted by the Medical Ethics Committee and the Morobe Province Health department.

Results and discussion

The median urinary iodine values from the three clinics indicate that there may be no significant public health problem (20.4, 24.5, 24.5 µg/dL for Unitech, Tent City and Butibam clinics, respectively) (Table 1). Certainly, these results are higher than those reported three decades ago for subjects in

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Table 1. Urinary iodine levels of pregnant women

Urinary iodine (µg/dL)	Clinic (n = 40 at each clinic)							
	Unitech		Tent City		Butibam		Total (n = 120)	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
<2	3	7.5 (1.6–20.4)	0	0	0	0	3	2.5 (0.5–7.2)
2.0–4.9	0	0	0	0	1	2.5 (0.06–13.2)	1	0.8 (0.02–7.2)
5.0–9.9	4	10 (2.8–23.7)	5	12.5 (4.2–26.8)	5	12.5 (4.2–26.8)	14	11.7 (6.5–18.8)
≥ 10	33	82.5 (67.2–92.7)	35	87.5 (73.2–95.8)	34	85.0 (70.2–94.3)	102	85.0 (77.3–90.6)
Median		20.4 18.3–28.3		24.5 21.7–28.3		24.5 21.6–30.5		23.1 20.12–27.4

Note: The exact binomial 95% confidence interval (CI) was calculated using EPI INFO 6.0 (CDC Atlanta, GA, USA).

Lae, pointing to some improvement in the iodine status.¹ A closer look at the results, however, suggests otherwise.

A total of 18 women (15%) may be suffering from IDD given that their urinary iodine values were below 10 µg/dL. Of these 18 women, three had values below 2 µg/dL, indicating a possible severe iodine deficiency.⁵ All three were from the Unitech clinic which serves a cross-section of people from all socioeconomic groups including settlement dwellers. The relatively high number of pregnant women with low urinary iodine values cannot be ignored because of the possible risks of the children being born already suffering from the consequences of IDD.

All salt sold in PNG is imported and must be adequately iodized in compliance with the salt legislation. Non-rigorous enforcement of the legislation has, however, resulted in the ready availability of non-iodized or inadequately iodized salt in Lae and other parts of the country.^{3,7} The women could be consuming either inadequately iodized salt or inadequate amounts of salt that is adequately iodized, as the survey carried out in Lae in order to determine the per capita salt consumption indicated.³ Certain communities in the country, especially those in remote areas, use very little salt in their cooking, possibly because of non-availability and relatively high price in those areas.¹ It is possible that migration from these rural areas into towns and cities like Lae where salt is readily available may not, in some cases, have translated into consumption of adequate amounts of salt, as the people may still be adhering to their old cooking practices.

The price of salt is not based on whether it is iodized or not. Iodized and non-iodized or inadequately iodized salt very often sells at the same price. The problem is one of lack of awareness of the problems of IDD and the need to consume adequate amounts of the salt purchased. A sustained awareness campaign throughout the country is necessary. The relevant agencies must also ensure that only adequately iodized and properly packaged salt is available since consumer awareness is currently low and the onus cannot be placed on the average Papua New Guinean to buy only salt that complies with the legislation. The role of goitrogens such as cyanide found in cassava and the possible goitrogenic effects of some members of the *Brassica* group, such as cabbage, in the aetiology of goitre also need to be examined.⁸ This is because cassava is regularly eaten in certain areas and

cabbage is virtually a daily item in the diet. It must be stressed that cassava varieties found in Papua New Guinea are generally low in cyanide content. However, the cumulative effect of regular consumption of low cyanide levels may have a negative effect on the possibly already low iodine status of the consuming individuals.⁹

There has been no evaluation of the effect of the iodized salt legislation since it was passed in the early 1970s. The amendment in 1995 to make potassium iodate the only permitted form of iodine in salt because of its stability has not resulted in virtual elimination of IDD. If Lae, the gateway of food imports to many areas of the country and the second city of Papua New Guinea, still has IDD problems, then it would be reasonable to assume that IDD is problematic in many other areas of the country also. The results of this study, coupled with those of small surveys that indicate goitre in areas not previously thought to be goitrous, highlight the need for the establishment of a proper IDD control program.¹⁰ Crucial to the success of the program will be strategies for sustained monitoring and evaluation in order to ensure that the whole population is iodine sufficient in the lead-up to the virtual elimination of IDD in PNG.

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