

Prevalence of Goitre and Urinary Iodine Level among Female Garment Workers of Dhaka City

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Introduction

Iodine is essential for normal growth and development in man and animal. A very little amount of iodine is necessary every day to produce adequate amount of thyroxin and other thyroid hormones, that regulate a wide variety of physiological processes in virtually all tissues of higher organisms. The optimum development of human brain from the early embryonic to the adult stage is critically dependent on these hormones¹. A deficiency of the thyroid hormone whether in a severe iodine deficiency or a congenitally defective thyroid, is associated with severe retardation of growth and maturation of almost all organ systems².

The various physiological problems that arose in iodine deficiency are collectively known as "Iodine Deficiency Disorders" (IDD).

According to latest estimates, some 1.57 billion people worldwide are at risk of iodine deficiency, 655 million are goitrous and about 20 million suffer from varying degrees of mental retardation (cretinism)³. Iodine deficiency is one of the major public health problems in Bangladesh. Survey conducted in 1993 showed goitre prevalence in our country is 47.1% (38.3% palpable and 8.8% visible)⁴. In institutional level several studies were carried out on iodine nutriture status among school children and university students. But no study has yet been carried out in garments workers to know their iodine nutriture status since garment industries have revolutionized the economy of the country. Moreover, in export oriented ready-made garment factories 9,66,600 females are working. Therefore, in the present study the prevalence of goitre and iodine status of the female garment

workers were determined since their poor iodine nutriture status can adversely effect their working capacity. Moreover, the rate of consumption of iodized salts among the garment workers was also estimated.

Materials and Methods

Four hundred and two female workers from 7 garment factories were studied, of which 63 from Prince Garment in Tejgaon Commercial Area, 52 from Anika Garment in Katabon, 60 from Babylon Garment of Mirpur-11, 32 from Apparel Garment in Shamoli, 65 from Creative Garment of Mirpur-1, 67 from Friends Garment in Mirpur-II and 63 from Sarwar Garment in Mohammadpur, Dhaka.

Clinical examination : The size of the thyroid gland changes inversely in response to alteration in iodine intake during the age of 6 to 12 months in children and young adults⁵. Palpation and inspection are the two major traditional methods for the detection of thyroid gland size. In the present study, goitre grading (palpation) was done by the help of expertise according to the grading system recommended by the joint WHO/UNICEF/ICCIDD, that was used in the national IDD survey of Bangladesh in 1993⁴.

Collection of urine : A total of 393 urine samples were collected, of which, 63 from Prince Garment, 49 from Anika Garment, 63 from Creative Garment, 58 from Babylon Garment, 67 from Friends Garment, 32 from Apparel Garment and 61 from Sarwar Garment. The urine samples were collected in wide mouth screw capped plastic bottles and stored at 0°C. They were kept at room temperature one day before analysis.

Estimation of urinary iodine : Urinary iodine was assessed by the wet digestion method adopted by Gutekunst et al.¹⁶ At a time 30 samples, along with 5 different concentrations of standard and one blank were digested. Deionized water was used as blank. The results were expressed as µg of iodine/dl of urine.

Collection of salt : A total of 280 salt samples of which, 42 from Prince Garments, 25 from Anika Garment, 43 from Creative Garment, 37 from Babylon Garment, 61 from Friends Garment, 14 from Apparel Garment and 58 from Sarwar Garment were collected in plastic bags sealed tightly with rubber bands and stored in a box until analysis.

Estimation of salt iodine : In iodized salt, iodine is added in the form of potassium iodate (KIO₃). By adding sulfuric acid salt iodate was

converted to iodine. Liberated iodine was then trapped by addition of potassium iodide (KI). The iodine is then titrated against standardized sodium thiosulfate using starch as an indicator⁷. The results were expressed as ppm of iodine in salt samples.

Results

Goitre prevalence among the female garment workers as estimated by palpation are shown in Table 1. Among all the subjects studied, goitre prevalence was found highest in the workers of Prince (55.6%),

followed by 46.0% in the Sarwar Garment. The lowest total goitre rate was found in Creative Garment (25.4%). In summary 43% were found goitrous of which 38% had grade 1 (palpable) and 5% had grade 2 (visible) goitre.

Table 2 shows iodine deficiency (UI <10.0 µg/dl) and also the median urinary iodine values in female workers working in different garment factories. As shown in the table, 57.1% respondents from Prince Garment are iodine deficient, i. e. they have urinary iodine level below

Table 1. Goitre prevalence in respondents detected by palpation.

Name of the garments factory	Total subject	Prevalence (%) of goitre			Total goitre rate (Grade 1+2)
		Grade 0	Grade 1	Grade 2	
Prince	63	44.4 (28)	50.8 (32)	4.8 (3)	55.6 (35)
Anika	52	63.5 (33)	36.5 (19)	0.0 (0)	36.5 (19)
Creative	65	64.6 (42)	30.8 (20)	4.6 (3)	35.4 (23)
Babylon	60	56.7 (34)	40.0 (24)	3.3 (2)	43.3 (26)
Friends	67	56.7 (38)	37.3 (25)	6.0 (4)	43.3 (29)
Apparel	32	62.5 (20)	34.4 (11)	3.1 (1)	37.5 (12)
Sarwar	63	54.0 (34)	34.9 (22)	11.1 (7)	46.0 (29)
Total	402	57.0 (229)	38.0 (153)	5.0 (20)	43.0 (173)

Figures in parentheses indicate the number of subjects.

Table 2. Urinary iodine sufficiency and median urinary iodine value in workers of different garment factories

Name of the garments factories	Number of samples	Urinary iodine ($\mu\text{g}/\text{dl}$)		Median urinary iodine value
		<10.0	≥ 10.0	
Prince	63	57.1 (36)	42.9 (27)	8.0
Anika	49	40.8 (20)	59.2 (29)	11.9
Creative	63	33.3 (21)	66.7 (42)	14.3
Babylon	58	36.2 (21)	63.8 (37)	14.2
Friends	67	31.3 (21)	68.7 (46)	14.5
Apparel	32	34.4 (11)	65.6 (21)	11.9
Sarwar	61	47.5 (29)	52.5 (32)	11.7
Total	393	40.5 (159)	59.5 (234)	12.3

Figures in parentheses indicate the number of subjects.

Biochemically iodine status: Normal, $\text{UI} \geq 10.0 \mu\text{g}/\text{dl}$; deficient, $\text{UI} < 10.0 \mu\text{g}/\text{dl}$ of urine. Abbreviation used: UI, urinary iodine.

10 $\mu\text{g}/\text{dl}$. The lowest median urinary iodine value was also from Prince Garment (8.0 $\mu\text{g}/\text{dl}$). On the other hand subjects with normal urinary iodine excretion level with higher median urinary iodine value (14.5 $\mu\text{g}/\text{dl}$) was found highest in Friends Garment. However, in total out of 393 samples tested, 159 (40.5%) were found iodine deficient.

Tables 3 and 4 show the iodine content of salt collected from workers working in different garment factories and the distribution for iodine content of collected salt samples, respectively. The mean values of iodine in salt collected from Prince, Anika, Creative, Babylon, Friends, Apparel and Sarwar Garment are 30.44, 24.38, 53.48, 36.71, 63.91,

34.71 and 29.19, respectively. But to 15 ppm iodine which should be present at household level. more clear idea of salt iodization was obtained from Table 4 which On the other hand 191 indicates that 9 samples had no iodine at all and 89 (31.8%) samples contain lesser than or equal samples (68.2%) contained slightly excess or excess iodine level (> 15 ppm).

Table 3. Mean iodine content of salts collected from different garment factories

Name of the garments factories	No of samples	Mean salt iodine value (ppm)	Range (ppm)
Prince	42	30.44	0.0-460.0
Anika	25	24.38	0.0-99.5
Creative	43	53.58	10.6-329.1
Babylon	37	36.71	0.0-140.7
Friends	61	63.91	0.0-500.0
Apparel	14	34.71	4.2-133.4
Sarwar	58	29.19	0.0-118.5
Total	280	38.98	0.0-500.0

Table 4. Distribution of iodine content of salts collected from different garment factories

Iodine content of salt (ppm)	No of sample	% of total sample
0.00	9	3.2
3.1 - 10.0	44	15.7
10.1 - 15.0	36	12.9
15.1 - 20.0	19	6.8
> 20.1	172	61.4
	280	100.0

No. sample had iodine content in the range of 0.1—3.0 ppm.

Discussion

Iodine is known to be an essential micronutrient for growth and development. A diet containing inadequate amount of iodine causes miscarriages, dwarfism, physical disabilities, twisted eyes, deaf and mute disorders, reduced mental ability and retardation (cretinism). A recent United Nations Bulletin (UNB) reported that on account of a malnourished population, Bangladesh will incur a colossal loss of 22.9 billion US (\$) in ten years time (1993 to 2003). Of this total, some 4.7 billion may incur from iodine deficiency. From ready made garments sector Bangladesh has earned about 52% of our total foreign currency during 1995-96. Iodine deficiency in workers of garment factories may reduce intellectual potential which in turn might have had effect on production. So it is very important to observe their iodine nutriture status. The present study was carried out in female garment workers aged between 12 to 30 years. Iodine nutriture status was measured clinically by goitre grading as well as biochemically by estimating iodine content in urine. Iodine content in salt samples was also estimated. A total number of 402 female garment workers from seven garment factories were participated in this study.

According to epidemiological criteria for assessing the severity of IDD (> 30% of the total population) a high prevalence of goitre was found in female garment workers of Dhaka city. The overall goitre prevalence was found 43.0% (5% visible and 38% palpable-Table 1). But this high prevalence of goitre is not very surprising because Bangladesh is a flood-prone country and it is well established that annual flooding and heavy rains constantly leach away iodine from soil, making the soil iodine deficient. Plants grown on this soil are naturally poor in iodine. Livestock are also suffering from iodine deficiency in these areas. In the last national IDD survey, 1993, it was found that 47.1% population had grade 1 and grade 2 goitre⁴. The prevalence of goitre in the present population is slightly lower than the national figure. This may be because of the strong campaign on health benefit of iodized salt during the last 5 years.

Urinary iodine level > 10.0 µg/dl is recognized as normal. In Table 2, 40.5% respondents were found biochemically iodine deficient. The highest percentage of iodine deficiency (57.1%) was found among the subjects of Prince Garment factory. In this factory the goitre prevalence was also found high in the female workers.

The median urinary iodine value is the most appropriate way of expressing iodine excretion level of a population. The lowest median value was found in the workers of Prince Garment (8.0 µg/dl) and highest in Friends garment (14.5µg) where the prevalence of goitre and iodine deficiency was also in better condition.

In iodine deficient areas iodized salt has been universally recognized as the strategy to eliminate iodine deficiency in the population⁸. In 1989, the Bangladesh government passed a law from parliament that all edible salts for human and animal consumption should be iodized. Thus, iodized salts are a main source of iodine for the population of country. In household level 15.0 ppm iodine in salt is known as adequate for our country. In the present study 68.0% salt samples were found to have adequate or excess amount of iodine. So from the present survey it seems that there are still non-iodized salt available in the market and a good percent of salts contain inadequate amount of iodine.

The overall results of the present study indicate that a good percent of females belonging to low socio-economic group such as workers of garment industries still have biochemical iodine deficiency and

are goitrous. So, universal salt iodization and proper distribution of iodized salt should be accelerated throughout the country.

Summary

A study was carried out to determine the iodine nutriture status among the female garment workers of Dhaka city by goitre grading and by estimating urinary iodine levels. Besides these, iodine content in salts that were used by the study subjects was also measured. A total number of 402 female garment workers of Dhaka city was randomly selected from seven garment factories to study iodine nutriture status. The age range of the subjects was 12 to 30 years. This study revealed a high prevalence of goitre among the garment workers. The overall goitre prevalence was found 43.0% (of them 38.0% had grade I, palpable; and 5.0% had grade 2, visible goitre). Among the seven garments studied, the highest and lowest goitre prevalence were found in Prince Garment (55.6%) and Creative Garment (35.4%) respectively. About 41% of the study respondents had urinary iodine level below 10.0 µg/dl (biochemically iodine deficient). The average median urinary iodine value was 12.3 µg/dl among the garment workers. Only 0.2% study population was severely iodine deficient, 12.2% moderately and

27.7% were mildly iodine deficient (data not shown in tables). In laboratory, the collected salt samples were analyzed titrimetrically. It was found that 68.2% samples had adequate and more than adequate amount of iodine i. e. samples contain 15.0 ppm or more iodine. In 31.8% samples the iodine level was found inadequate and 3.2% samples contained zero iodine. The overall results indicate that there is high prevalence of goitre among female garment workers and a good percentage of salts available in Dhaka City markets still contain inadequate amount of iodine.

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