Assessment and Effect of Nutritional Education on Iodine Nutriture Status of Children Under Five Years from Selected Slum Areas in Dhaka City

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Abstract

A prospective cohort study was undertaken among 106 slums dwelling households from Shahjahanpur and Shantibagh, situated in the City of Dhaka. Out of 125 children below five years, 44.8% of them were females and 55.2% of them were males. Nearly half (46.2%) of the respondent mothers were housewives and 38.7% of those women were maidservants. Occupations of the respondents' husbands were rickshawpullers (21.7%), drivers (26.4%), or unemployed (25.5%). Majority (66%) of the respondents belonged to the age group of 20-29 years and about 82.1% of them were illiterate. More than fifty percent (53.9%) of the households' income was below Tk. 4,000/- per month, whereas 57.6% of these households had five members or more in their families. In addition, seventy one percent (70.7%) of the subjects showed normal urinary iodine level (>100μg/L) but 29.3% had urinary iodine level below the cut off point (<100μg/L). Nutritional education sessions using a specific method and structured questionnaire were conducted after obtaining the base line information from the households. Which showed that the knowledge of the respondent mothers had increased by 86.8%, the use of iodized salt had increased by 10.6%, and the use of plastic pots for the storing salts had increased by 13.7%. As a result, median urinary level of iodine had increased from 247.35 μg /L to 307.75 μg/L and 229.10 μg/L to 271.10 μg/L, respectively in boys and girls; and median value had increased by 60.4 μg/L and 42.0 μg/L, respectively in boys and girls. Though median urinary iodine levels were with in the normal range in both base-line and follow-up cases but linear trend between the base line and the follow-up urinary iodine level showed significant improvement of the situation. From these findings it can be concluded that nutritional education may be considered as a supportive intervention in addition to Universal Salt Iodization (USI), for reducing IDD among the under five children of slum areas.

Key Words: Iodine Deficiency Disorders (IDD), Nutritional Education, Urinary Iodine Excretion (UIE), Universal Salt Iodization (USI).

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Introduction

A trace amount (150μg / day) [1,2] of iodine is essentially required for the synthesis of thyroid hormones (thyroxin & tri-iodo thyronine), that regulates a wide variety of physiological processes responsible for normal growth and development in man and animal. The deficiency of iodine has several important health consequences which are collectively known as 'Iodine deficiency disorders' (IDD), which includes goiter, still birth and miscarriages, neonatal and juvenile thyroid deficiencies, dwarfism, mental defects, deaf mutism and spastic weakness paralysis, as well as lesser degrees loss of physical and mental activities.[3]

Iodine Deficiency Disorders (IDD) is a significant public health problem in about 130 countries, affecting a total of 740 million people. One-third of the world's population is estimated to be at risk of IDD. Iodine deficiency remains to be the single greatest cause of preventable brain damage and mental retardation worldwide. In 1990, WHO estimated that 1570 million people, or about 30% of the world's population, were at risk of Iodine Deficiency Disorders (IDD). And WHO estimated in 1995, that the number of people with goiter was 750 million.[4]

Micronutrient deficiency is one of the principal factors responsible for malnutrition and IDD, the major micronutrient deficiency of public health significance in Bangladesh[5]. According to the estimation in 1993, the number of people exposed to the risk of IDD increased from 56.4 million to 82.7 million people. The first national survey (1993) showed that total goiter prevalence rate was 47.1% (38.3% was palpable and 8.8% was visible), and 68.9% of the population were biochemically iodine deficient (urinary iodine < 100μg/ L).[6] In institutional level several studies were carried out on iodine nutriture status among different cross-sectional population in Bangladesh. These results clearly showed that 67.2% of the students in Dhaka university[7], 40.5% of the female garment workers in Dhaka city[8], 41% of the school children studying in the schools located in Dhaka University campus[9], and 63.2% of the school going children in Savar[10] were biochemically iodine deficient. In 1989, considering the ramifications of IDD on human health and national productivity, the Government of Bangladesh adopted the policy to achieve universal iodization of salt by 1995 to eradicate the IDD by 2000AD. Two different surveys were conducted to evaluate the USI program in Bangladesh and found that almost 99% of edible salts were available in the markets/households were iodized; however, the level of the iodine in the salt was not maintained as per law in 67% of the cases[11]. The first follow-up national IDD survey was conducted during the year 1999, a notable

improvement of the IDD situation had occurred (total goiter prevalence rate was 17.8%)[12], although the aimed target could not achieved. While a remarkably measurable progress is being made throughout the universal salt iodization still, there are nearly 50 million people who are estimated to be affected with some degrees of IDD-related brain damages. [13]

On the other hand, KAP study on IDD among two different segments of the population from different socio-economic backgrounds from the staff quarters of Dhaka University and slums in Zikatola were found to have significant difference in awareness and knowledge regarding the consequences and prevention of IDD. It is strongly evident that TV was the most effective media for the dissemination of knowledge on IDD rather than other mass media including newspaper.[13] Therefore, to explore the cumulative effect of nutritional education as a supportive intervention with the USI for the improvement of IDD situation, this study was undertaken among the illiterate and low socio-economic population of urban-slum in Dhaka City.

Materials and Methods

Study Population

The study was conducted purposively in selected slums of Dhaka city, namely Shahjahanpur and Shantibagh, to assess the iodine nutriture status of the children. This study includes 106 households having children less than five years. The respondents' mothers having children aged 6 months to less than five years belonged to the low socio-economic status and lived in slums of Dhaka City.

Development of Questionnaire and Field Trials

A standard questionnaire was developed in accordance to the objectives of the study to obtain relevant informations regarding the socio-economic status, general health, dietary practices and intra-household food distribution pattern and knowledge, attitude and practice about iodized salt.

The questionnaire was pre-tested among the respondents in another area of the same socio-economic status (Shepahibagh), who were unaware about the purpose of the study. Then it was modified as required as per their responses and finalized to obtain a study data.

Urine Collection

A total of 150 urine samples were collected, of which, 100 samples were collected for the base line study and 50 were collected after the nutritional education. These

samples were collected in wide-mouthed plastic bottles with screw caps and were stored at 0°C. The samples were kept at room temperature one day before analysis.

Biochemical Estimation of Urinary Iodine

Urinary iodine was assessed by the wet digestion method adopted by Gutekunst et al [14]. All samples were assayed in duplicate and when the measurements differed by more than 10%, the analysis was repeated.

Collection of salts

A total of 212 salt samples were collected in plastic bags and sealed stored in a box until the analysis. From them, 106 salt samples were collected during the baseline survey and the rest of the samples were collected after the intervention.

Estimation of salt iodine

Iodine contents of the collected salts were roughly estimated by using kits in front of the respondents, at the spot.

Intervention Program

After the collection of baseline data and urine samples, sessions of nutritional education were conducted between the time of August 2000 to May 2001. A total of eight nutritional education sessions were conducted among the mothers living in slums, which includes information regarding basic nutrition, food classification, nutritional requirements, easily available nutritious food sources; nutritional deficiency diseases and their identification and preventive measures, especially IDD. Each sessions of nutritional education had the duration of 45 minutes and each group of these mothers were exposed to nutritional education twice a week, during November to December 2000 and subsequently once a week from January to April 2001, by a research team. Audio-visual aids used in those sessions include posters, leaflets and audio cassettes, for the deliberation of nutritional information.

Data Processing and Analysis

Data recorded in the questionnaire were transferred to coding sheets and necessary verifications were carried out. Then the coded data were entered in d-Base program for analysis after the necessary editing. The data were again transferred to the statistical package for the social sciences (SPSS/PC+) program for further analysis. And finally, appropriate statistical methods were used to present the results.

Results

A prospective cohort study was conducted among slum dwellers and a total of 125 children were studied from 106 households, aged between 6 to 59 months. Table-1 shows the socio-economic status of the respondents; more than half (66%) of the respondents belonged to the age group of 20-29 years, 46.2% of who were housewives and 38.7% were maidservants. Occupational pattern of their husbands showed that 21.7% them were Rickshawpullers, 26.4% were drivers, and 25.5% were unemployed. One third (36.6%) of these households had monthly income between TK.3000/- to TK. 3999/-, but 26.4% had monthly income upto Tk.4999/-. Only 16% of households could earn TK.5000/- and above per month. Whereas 39.2% of the households had five or more members in their families, nearly one fourth of the households were three family members, and the rest of 19.2% and 18.4% had four or five members. The ratio of income and the number of family members strongly indicate that expenditure for food was not enough for the proper maintenance of normal health.

The age of the subjects for this study ranged between 6-59 months, 35.2% of who were children about 48-59 months (4-5 years) old; the 18.4% of these children were boys and the rest of 16.8% were girls. Again, 23.2% of the target children were aged between 36- 47 months (3-4 years). But almost 60% of the studied children belonged to age of 3-5 years. The collection of urinary samples of this age group was more convenient than the younger groups and moreover, the salt intake of this group was also higher than younger group (data not shown).

Table-2 shows the percent distribution of these children according to the level of urinary iodine. Before the nutritional education, 70.7% of the subjects were normal ($>100\mu g/L$) where as the other 29.3% were biochemically iodine deficient ($< 100\mu g/L$).

In another words, their intake of iodine was not sufficient to fulfill their daily requirements. After the nutritional education to their mothers, 100% of the collected urine samples (n =50) showed sufficient intake of iodine.

Table 1: Socio-economic characteristics of the respondents (n=125)

Age					
Years	<20	20-24		25-29	30 & above
Percentage	1.9	33.0		33.0	32.1
Husband's Occupation					
Occupation	Rickshaw puller	Driver	Small Business	Unemlpoyed	Others
Percentage	21.7	26.4	19.4	25.5	6.6
Wife's Occupation					
Occupation	House wife	Maid Servant	Garment worker	Others	
Percentage	46.2	38.7	7.5	7.5	
Monthly Income					
Amount(TK.)	<2999	3000-3999	4000-4999	5000 & above	
Percentage	17.3	36.6	26.4	16.0	
Family Size					
Number of family member	3	4	5	>5	
Percentage	23.2	19.2	18.4	39.2	

Table 2: Percent distribution of the children according to urinary iodine level

Urinary Iodine Status	**Before intervention**		**After intervention**	
	Number	**Percent**	**Number**	**Percent**
Normal (>100ug/L)	70	70.7	50	100
Deficient (<100ug/L)	29	29.3	00	00
Total	99	100	50	100

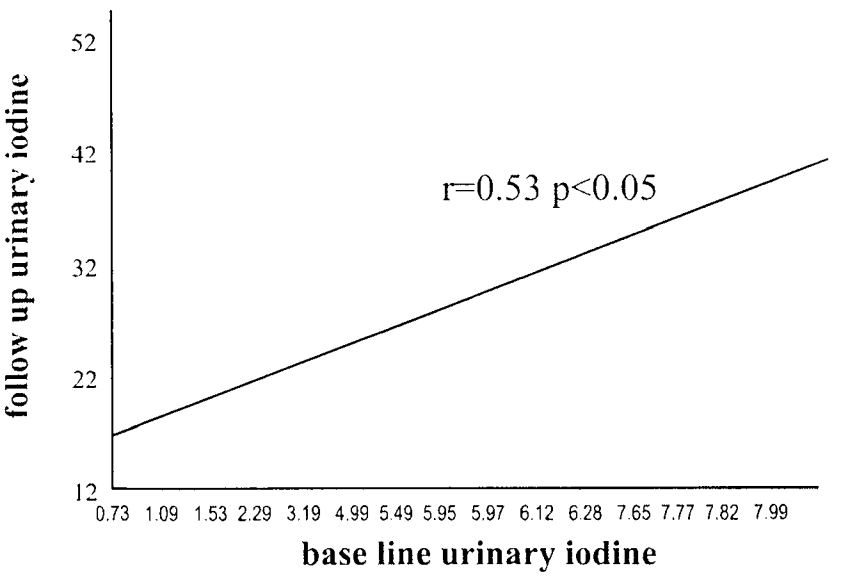
Table 3: Percent distribution of the respondents by pre and post nutritional knowledge and practice

Characteristics (Responses obtained on different questions)	**Pre nutritional education** Percentage of practice&knowledge **(N= 101)**	**Post nutritional education** Percentage of practice knowledge **(N= 101)**
Salt type		
Iodized salt	72.6	83.2
Non iodized salt	3.8	3.0
No choice	23.6	13.9
Storage of salt		
In pot made of clay	13.8	1.0
Plastic pot	85.3	99.0
In open place	0.9	0.0
Placing of salt beside chula		
Yes	13.8	3.0
No	86.8	97.0
Knowledge about test of iodine in salt		
Yes	13.2	100
No	86.8	0.0

Table 4: Effect of Nutritional Education on Urinary Iodine Excretion (μg/L) in under-five Children of Slum areas of Dhaka City

Urinary Iodine	Boys			Girls		
	Basal	Follow-up	Diff	Basal	Follow-up	Diff.
Median (ug/L)	247.35	307.75	60.4	229.10	271.10	42.0
Range	5.1- 1703.2	7.4-1399.2		121.7-456.8	108.5-538.0	
N	58	26		41	23	

Figure 1: Linear trend between base-line and follow-up of urinary iodine level (μg/L)



The baseline study of the knowledge, attitude and practice (KAP) showed that 72.6% of the respondents used iodized salts, 85.3% preserved salt in plastic pots, 86.8% kept salt other than beside household burners (Chula) and only 13.2% of the respondents knew the traditional test of iodine in salt (table 3). After eight sessions of nutritional

education, the practice of using cooking salt by these households were slightly increased (72.6% to 83.2%) and the households with no choice decreased from 23.6% to 13.9% (table 3). The storage of salt in plastic pots increased from 85.3% to 99%, placing of salt not beside household burners (Chula) were also increased from 86.2% to 97% (table 3). And the knowledge about traditional test of iodine in salt before intake were improved to hundred percent from 86.8%. These findings of KAP indicated that nutritional education plays a strong role in improving the knowledge, attitude and practice regarding the use of iodized salt.

The median urinary levels of iodine (μg/L) increased from 247.35 to 307.75 and 229.10 to 271.10, respectively in boys and girls after the nutritional education (Table 4). Comparison of the median urinary iodine between the baseline and after the nutritional education presented in table-4, shows that their median value was increased by 60.4 μg/L and 42.0 μg/L, respectively, in boys and girls. These findings also clearly indicated that nutritional education increased the iodine intake as an iodized salt by the deficient cases (match pair analysis) and as a result improved the IDD situation among under five children of the slum areas. The wide range of urinary iodine of boys as compared to girls roughly varied with the iodine content of salts intake. Whereas, the base-line survey showed that 30% of the total studied population was biochemically iodine deficient (<100μg/L). Additionally, match-pair analysis showed those fifteen cases of 29 i.e. fifty percent of the biochemically deficient became normal after the nutritional education. Due to the wide range of urinary iodine excretion, the impact of nutritional education could not show the significant difference of urinary iodine level. Though median urinary iodine levels were with in the normal range in both base-line and follow-up cases but linear trend between the base line and the follow-up urinary iodine level showed significant improvement of the situation (figure1). These results clearly demonstrated the beneficial impact of nutritional education in increasing urinary excretion of iodine.

Discussion

A diet deficient in iodine cause a wide spectrum of illness termed as Iodine Deficiency Disorders (IDD) may affect all ages, particularly pregnant women: the developing fetus and the neonates[15]. Endemic goiter is the most visible consequence of iodine deficiency but its most deleterious effect is on the developing brain of the fetus and neonate. [16,17]

Short and long term measures have been undertaken for the control of IDD in Bangladesh. As an interim measure, campaign of injecting iodized oil has been completed in 38 goiter hyperendemic upazillas. As long term measures 235 salt refining industries are equipped with iodization plant, and the salts are being universally iodized. But still there are iodine deficiencies in the community. In spite of the availability of effective technology, IDD control programs have until recently been conspicuous of their failure. It is now recognized that there is a social process involved which requires political will, community education, commitment, training as well as funding [18,19,20]. A prospective cohort study was undertaken to explore the cummulative effect of the nutritional education with the USI to accelerate the reduction of IDD. Purposively, 106 households having under five children and residing in slums in Dhaka City were selected for this study. Because, the population of slum in the urban center live with inadequate food, housing, primary health care facilities and lack of education, nutritional knowledge and awareness about child care and hygiene. The data presented in table-1 reflected the above mentioned facts.

For the assessment of iodine status among the children under five years, urinary iodine was used because the measurement of urinary iodine excretion provides the best single measurement of the iodine intake of the population. It can be used for both initial and follow up assessments.[18,19.20,21] The goiter prevalence also used for the assessment of iodine status but in case of goiter assessment among young children, ultrasound is more effective for the detection of the size of thyroid gland than by palpation method.[10]

Though the median urinary iodine values was found in normal range but the percent distribution of the children according to urinary iodine level showed that 29.3% were below the cut off point and this percentage reduced to zero after the nutritional education (table 2). Simultaneously, increasing trend of the median urinary iodine level after the nutritional education reflected the improvement of iodine intake by the deficient subjects (table 4). A wide range of urinary iodine excretion strongly co-related with the findings of national survey of USI, which found a wide variation (4 – 1000 ppm) of iodine content of the iodized salt available in market.[12]

Base line KAP status showed that the respondents were already well informed about the matter (table 3). The possible reason could be that, the respondents have more

access to radio, television than the rural population, and at the same time NGOs are more active in slums of Dhaka City. The household members of slums in Dhaka City possibly enjoyed more chances of being acquainted with the different awareness programs and thus became influenced in their behavior towards food. Further nutritional education of the study improved the KAP of the respondents to the optimum level.

The overall results of the present study demonstrated that after universal iodization of salt, still a significant number of slum-children (6-59 months) were biochemically iodine deficienct. Simultaneously, the findings also highlighted the importance of nutritional education sessions, more specially in a systematic manner, to create more awareness and motivate people about the intake of iodized salt to attain better iodine nutriture status among slum dwellers. Alternative or additional strategies may be required in countries or parts of countries where groups are at risk of IDD. Thus similar types of endeavors should be under taken for other slum communities of Bangladesh along with improvement of their quality of life.

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