

Comparison of Urinary Iodine Excretion between Diabetic and Non-diabetic Pregnant Women

Quazi Salamatullah^{}, Sharmin Rumi Alim, Md.Mohiduzzaman and Shamsun Nahar Bela¹*

Institute of Nutrition and Food Science University of Dhaka,
Dhaka-1000. BIRDEM, Dhaka¹

Abstract

The present study was undertaken to compare the urinary iodine excretion (UIE) between diabetic and non-diabetic pregnant women at different gestational weeks starting from 12 weeks of gestational age until delivery. Iodine from the salts they were consuming at different times of urine collection was also estimated. Two hospitals namely Bangladesh Institute of Research and Rehabilitation in Diabetic, Endocrine and Metabolic Disorders (BIRDEM) for diabetic pregnant women, and Mother and Child Health Training Institute (MCHTI) for non-diabetic subjects who attended the hospitals for anti-natal check up were included during the study period. In these hospitals the pregnant women are supposed to come every month for check-up. For this reason the plan was to check them for a total of six times (initial and 5 times follow-up) starting from 12 weeks of gestational age. Although the number of subjects were decreased at each time of follow-up it was possible to complete the six check-up in BIRDEM (because they also come for blood sugar check-up), but in MCHTI initial and three times follow-up were possible.

Results indicated that median urinary iodine (MUI) was more than normal ($>100 \mu\text{g/L}$) in both diabetic and non-diabetic pregnant women at different times of follow-up. However, 4.3% to 7.6% of diabetic subjects, and 9.8% to 16.6% non diabetic subjects were iodine deficient (UIE $< 100 \mu\text{g/L}$). No particular pattern of increase or decrease in urinary iodine excretion (UIE) at different times (as gestational weeks increased) was found. MUI level was slightly higher in diabetic pregnant women. Their corresponding iodine intake from salt was also slightly higher than subjects from MCHTI who mostly came from poor and middle class family. More subjects and in depth study are needed to find out if any metabolic factors in diabetes were involved in these differences.

Key words: Diabetic pregnant women, urinary iodine excretion, iodized salt consumption

Bangladesh Journal of Nutrition, Vol 17, December 2004, Institute of Nutrition and Food Science, University of Dhaka-1000, Bangladesh

^{*} Author for correspondence

Introduction

Iodine, a non-metallic trace element, is required for the synthesis of thyroid hormones that in turn are necessary for the regulation of metabolic activity of all cells of the body throughout the life cycle¹. It also plays a key role in cell replication. This is particularly relevant for the brain since the neural cells multiply mainly in the utero and during the first two years of life². Thus thyroid hormones are required to ensure normal growth, especially of the brain, which occurs from foetal life to the end of third postnatal year. The long term consequence of iodine deficiency, during pregnancy and after birth of the baby upto 2 years of life, is irreversible mental retardation of the children.

An insufficient dietary supply of iodine results in the development of a variety of disorders grouped under a general heading of Iodine Deficiency Disorders (IDD), a worldwide health problem. The spectrum of IDD includes goitre at all stages with or without associated impairment of mental function, endemic cretinism, increased infant mortality^{1,3}.

Bangladesh is an iodine deficient (minute amount in soil and water, as a result foodstuffs contain very little iodine, can't fulfill daily human requirement) country which was found during 1962-64 National Nutrition Survey⁴, later confirmed during 1981 goitre survey⁵ conducted by IPHN. The government of Bangladesh passed a law in 1989 that all edible salt produced or imported must be iodised. UNICEF assisted government to provide salt iodization plant (SIP) in all 265 salt crushing factories which is completed at the end of 1994. During 1993 when about 20% iodised salt was available in the market, the first national IDD survey (goitre, cretinism, urinary iodine excretion) was conducted by Dhaka University and the results revealed that about 47% (8.8% visible) of the population had goitre, 0.5% had cretin and 69% population were suffering with iodine deficiency detected by urinary iodine excretion⁶. Due to massive salt iodisation it was found in 1999 national IDD survey that the goitre prevalence dropped to 17.8% and still 43% of the population have iodine deficiency⁷. However, in both the surveys pregnant and lactating women were not separately identified.

The iodine requirement during pregnancy is increased (normal 150 µg/day, pregnancy 175µg/ day) to provide for the needs of the fetus and to compensate for the increased loss of iodine in the urine due to increased renal clearance of iodine during pregnancy^{8,9}.

The present study was undertaken to assess the magnitude of iodine deficiency in pregnant women who are attending hospitals for interventions, and evaluate the Universal Salt Iodisation (USI) program at present.

The specific objectives were (1) to determine urinary iodine status of diabetic pregnant women at different time intervals and compare the results with non-diabetic

pregnant women, (2) to determine iodine content of salt (used in their household) samples collected from women of both hospitals.

Materials and Methods

The study was conducted among diabetic pregnant women at the Bangladesh Institute of Research and Rehabilitation in Diabetic, Endocrine and Metabolic Disorders (BIRDEM) and normal pregnant women at the Mother and Child Health Training Institute (MCHTI) who came to these hospitals for anti-natal check-up upto 6 months of the study period. Usually newly pregnant women at 12 weeks of gestational age enrolled in the hospital and are supposed to visit once in a month until delivery. A pretested questionnaire was used for each woman and specific informations were collected. On the first visit urine was collected in a screw capped plastic bottle specially prepared for this purpose. The pregnant women were asked to bring salts in polythene bags from their houses during the next visit. From second visit both urine and salt were collected, and transferred to ICCIDD laboratory at INFS, Dhaka University. A trained research assistant collected informations, urine and salt with the help of physician, nurse and their assistants in both the hospitals. Urine samples were analyzed by simple microplate method for urinary iodine estimation according to Ohashi et al¹⁰. Estimation of urinary iodine or thyroid hormone provide similar result. As urinary iodine estimation is easy and cost effective, it is now considered as gold standard employed for the assessment of iodine status. Iodine in salt samples was estimated titrimetrically in the laboratory¹¹.

Filled questionnaires were manually edited and coded. The data entry and analysis were done by SPSS programme.

Results and Discussion

Number of pregnant women initially examined and could be followed in both the hospitals (BIRDEM and MCHTI) is shown in table 1. More subjects (1822) could be initially contacted in MCHTI than in BIRDEM (836). However in both hospitals the number of subjects decreased sharply with the time of follow-up. As a result, in BIRDEM, 5 follow-ups could be managed, but in MCHTI, only 3 follow-ups were possible. Usually pregnant women are asked to visit anti-natal clinic once in every month, but most of them do not follow it.

Table 2 shows median urinary iodine (MUI) levels in pregnant women of two hospitals at different contact times. In general MUI ($\mu\text{g/L}$) level was always higher in diabetic pregnant patients at BIRDEM than non-diabetic pregnant women at MCHTI. Although the MUI level was always high ($>100 \mu\text{g/L}$ urine) there was no systematic decreasing or increasing trend of the levels among diabetic subjects as the gestational age increased (as per table contact time increased means gestational period increased). However, there was decreasing trend of MUI levels of pregnant women as the follow-up time increased in the non-diabetic pregnant women at MCHTI. The

reason is unknown. But it may be mentioned that number of subjects in this group was too low to reach any conclusion.

Table 1: Number of pregnant women examined and follow-up in the hospitals

Time of visit	Number of subjects	
	BIRDEM (diabetic)	MCHTI (nondiabetic)
Initial contact	836	1822
1 st follow up	536	349
2 nd follow up	308	85
3 rd follow up	186	12
4 th follow up	84	-
5 th follow up	46	-
Total	1996	2268

Dash indicates no subject found during 4th and 5th follow ups in MCHTI.

Table 2: Median urinary iodine levels and iodine deficiency in pregnant women at different time

Time of visit	Median urinary iodine ($\mu\text{g/L}$)		%Subject deficient with iodine	
	BIRDEM (diabetic)	MCHTI (nondiabetic)	BIRDEM (diabetic)	MCHTI (nondiabetic)
Initial contact	382.3	270.0	5.8	9.8
1 st follow up	327.7	235.6	5.3	10.9
2 nd follow up	346.5	226.9	6.5	12.9
3 rd follow up	370.9	163.7	7.6	16.6
4 th follow up	305.2	-	7.1	-
5 th follow up	368.2	-	4.3	-

Dash indicates no subject found during 4th and 5th follow ups in MCHTI.

Percent subjects deficient in iodine (identified by urinary iodine excretion, $<100\mu\text{g/L}$) initially and at different follow-ups (initial contact was at 12 weeks and then after every 4 weeks of gestational week they were followed until delivery) are also shown in table 2. In BIRDEM percent deficient subjects ranged from 4.3 to 7.6% at different time, which was 9.8 to 16.6% in MCHTI.

Table 3 indicates iodine content of salts consumed by the subjects each time the urine was collected at different follow-up times. Iodine content of salts was almost same consumed by the subjects of the two hospitals studied (overall mean at BIRDEM was 54.6-ppm and in MCHTI 47.3 ppm). In both the cases the values were higher than the level of iodine should be present at household level (as per law in factory 45-50 ppm; retail shop 20 ppm and assumed that at household level if it is 15 ppm then it will fulfill daily requirement).

Table 3: Mean salt iodine consumed by pregnant women

Time of visit	Mean salt iodine (ppm)	
	BIRDEM (diabetic)	MCHTI (nondiabetic)
1 st follow up	50.9	50.2
2 nd follow up	49.4	48.6
3 rd follow up	44.4	42.8
4 th follow up	35.1	-
5 th follow up	42.1	-

Dash indicates no subject found during 4th and 5th follow ups in MCHTI.

Although few subjects were iodine deficient (their salt iodine level was low and urinary iodine excretion was also low), overall MUI was more than normal (≥ 100 $\mu\text{g/L}$). It seems that as they were consuming excess iodine through iodized salt, their urinary iodine excretion was also high (about 300 $\mu\text{g/L}$). Again diabetic subjects urinary iodine excretion was more than non-diabetic subjects. Their iodine intake was slightly higher than non-diabetic subjects. Diabetic subjects who are attending BIRDEM are rich and buy costly and good quality iodized salt than those attending MCHTI who are mostly from poor and middle class family. However, in other study it was found that most of the salt (packed or opened) sold in Dhaka city contain good amount of iodine. Very few salt contain zero or lower amount of iodine. Another possibility is that in diabetes iodine metabolism may differ than in non-diabetic subjects. But this can not be concluded from this small pilot project. To find it out study should be conducted with more subjects and in depth (iodine containing hormones production, their metabolism, insulin resistance etc).

References

1. The Nature and Magnitude of Iodine Deficiency Disorders. In: Hetzel, BS. S.O.S for a Billion. The Conquest of Iodine Deficiency Disorders. 2nd Ed. Oxford University Press. New Delhi, 1996; 4-23.
2. Nutrition Throughout the Life Cycle, 4th Report on the World Nutrition Situation, ACC/SCN. January 2000.
3. Stanbury JB. Iodine Deficiency and Iodine Deficiency Disorders. In: Zeigler, EE and Filer, LJ. Present Knowledge in Nutrition, 7th Ed. ILSI Press. Washington, D.C. 1996; 378.
4. Nutrition Survey of East Pakistan (1962-64). Department of Biochemistry, University of Dhaka and U.S. Department of Health Education and Welfare, New York, 1966.
5. Report of National Goitre Prevalence Study of Bangladesh (1981-82). Institute of Public Health Nutrition, Ministry of Health and Population Control, Dhaka, 1983.
6. Report of the National Iodine Deficiency Disorders Survey in Bangladesh-1993. University of Dhaka/ICCIDD/UNICEF, Dhaka, 1993.
7. Report of the Iodine Deficiency Disorders Survey in Bangladesh-1999. IPHN/BSCIC/ICCIDD/UNICEF. Dhaka, 1999.
8. Recommended Daily Intake of Iodine In; Trace Elements in Human Nutrition. WHO, Geneva, 1994.
9. Iodine Requirement In: Iodine Nutrition During Pregnancy Ed: Stanbury, JB; Delange, F; Dunn, JT and Pandav, CS. Oxford University Press, Delhi, 1998.
10. Ohashi T, Yamaki M, Pandav CS, Karmakar MG and Irie M. Simple method for determination of urinary iodine. Clinical Chemistry, 2000, 46 (4), 529-36.
11. Analysis of Salt Iodized with Potassium Iodate. A Handbook on Analytical Aspects for Salt Industry. Salt Department, Govt. of India, 1988.