Iodine deficiency disorders among the pregnant women in a rural hospital of West Bengal

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Background & objectives: Iodine deficiency disorder (IDD) is a major nutritional problem in India. The pregnant women and their neonates have been important target groups for study of the prevalence of IDD in a community. No such study was available to assess the prevalence of IDD among the pregnant women and neonates in the state of West Bengal. The present study was undertaken to assess the status of IDD in the pregnant women and its effect on the neonatal thyroid function in Burdwan district of West Bengal.

Methods: The present study was a hospital-based, cross-sectional, non-interventional study among 267 full term pregnant mothers, and the neonates born to them. One hundred non pregnant healthy women were selected as controls. The overall iodine status of the pregnant and non pregnant women was estimated by measuring the urinary iodine excretion (UIE) and the serum thyroid stimulating hormone (TSH) levels. The neonatal thyroid function was estimated by measuring the TSH levels in their cord blood.

Results: A total of 78.4 per cent pregnant women showed UIE > 10 µg/dl with 7 per cent having a UIE < 5 µg/dl. The median UIE and the serum TSH values in the pregnant women were found to be 14.4 µg/dl and 4.1 mIU/l, respectively. No statistically significant difference was found when compared with the control values. Only 2.9 per cent of the neonates showed a cord blood TSH value > 5 mIU/l which is just below the recommended criteria for mild endemicity for IDD in the study population.

Interpretation & conclusion: Pregnant women of the study area were iodine repleted. The neonatal thyroid function was also within normal range. The findings of the present study indicates that the iodine supplementation of the salt should be maintained in the area with periodical surveillance.

Key words Cord blood TSH - iodine deficiency disorders (IDD) - urinary iodine excretion (UIE).

Iodine deficiency disorders (IDD) is a significant public health problem in 130 countries affecting 740 million people, and an estimated one-third of the world’s population is currently exposed to its risk¹. Although, the number of countries with iodine deficiency as a public health
problem decreased from 110 to 54 between 1993 (using total goitre population as an indicator) and 2003 (using urinary iodine)\textsuperscript{2} still in several studies conducted around the world the pregnant women have been found to be particularly vulnerable to IDD\textsuperscript{3-8}, most probably due to increased metabolic demand and other physiological adaptations\textsuperscript{9,10}. A compromised iodine status during pregnancy has been found to affect the thyroid function of the neonates as well\textsuperscript{5,6,10,11}. In studies conducted in Hong Kong\textsuperscript{3} and Saudi Arabia\textsuperscript{10}, maternal free thyroxin and urinary iodine excretion (UIE) values respectively, have been found to be negatively correlated with neonatal TSH values. In studies from India, the prevalence of IDD in the pregnant women, as apparent from UIE < 10 µg/dl, has been found to be 22.9 and 9.5 per cent in the states of Delhi and Himachal Pradesh respectively\textsuperscript{12,13}, whereas, in Uttarakanch a median UIE of 9.5 µg/ dl was found in adolescent pregnant women indicating the presence of IDD\textsuperscript{14}. No information on the iodine status of the pregnant women and its effect on the neonatal thyroid function was available from the Bardhaman district of West Bengal. The pregnant women in maternal and child health (MCH) clinics are considered as an important target group for IDD surveillance due to their high vulnerability, high accessibility with an intermediate representativeness of the community\textsuperscript{15}. Keeping these facts in mind, the present study was undertaken with an objective of assessing the iodine status of the pregnant women admitted to the Burdwan Medical College and Hospital in the Burdwan district, and to correlate it with the neonatal thyroid function at birth. The three most important indicators which should be used in IDD surveillance as advised by WHO are goiter prevalence, urinary iodine excretion and thyroid function tests especially the thyroid stimulating hormones (TSH) in neonates\textsuperscript{16}. In the present study the iodine status was based on the median urinary iodine excretion, serum TSH values of the pregnant women and the cord blood TSH levels of the neonates born to them.

Material & Methods

The present study was a hospital-based, non-interventional, and cross-sectional. The reference population was the full term pregnant women admitted to the Gynaecology and Obstetrics Department of Burdwan Medical College and Hospital, Burdwan, West Bangal, and the respective neonates born to them. The sample size was restricted to the, full term pregnant females (> 36 wk of gestation) within the reproductive age group of 15 to 45 yr, from one unit of the Gynaecology and Obstetrics Department during one calendar year (from May 2003 to May 2004). Pregnant women suffering from any acute or chronic disease at the time of presentation or developing thereafter, other than IDD related disorders were excluded. During the study period a total of 379 pregnant women were admitted, examined and screened, and of these 267 pregnant women fulfilling the above criteria were included in the study. Neonates born to these women were studied for neonatal TSH assay. Control women were healthy non pregnant women of child bearing age of 15 to 45 yr accompanying the patients or attending the hospital as visitors from the same district. However, the matching was not restricted to the near relatives only. Randomness was ensured regarding the age, occupation, dwelling place, etc. during the final selection of the controls, and 100 women (n = 100) were selected finally as the control population fulfilling the above criteria during the study period. Women in both the groups were explained about the study and written consents were obtained. The study protocol was approved by a duly constituted ethical committee of the institution.

Casual urine samples were collected from all subjects with toluene as preservative in screw capped plastic bottles and refrigerated at 4°C. The maternal blood was collected from the cubital vein of the forearm for serum TSH assay. For neonatal serum TSH assay, blood was collected from the umbilical cord. Urinary iodine was assayed in the samples by wet digestion method based on the
principle of Sandell and Kolthoff reaction\textsuperscript{17}. The method described by Dunn et al\textsuperscript{18} was followed. For the assay of cord blood TSH, commercially available Pathozyme-R-kit (Omega diagnostics, United Kingdom) was used. Median values were obtained for the UIE and serum TSH values for both cases and controls. Percentage of females (for both cases and controls) having UIEs in different ranges as well as a UIE < 10 µg/dl was obtained. On the other hand the percentage of the neonates having a cord blood TSH > 5 mIU/l was also determined to find out the degree of endemicity of IDD, if there was any, among the study population.

Chi square test was used to compare the two groups of women.

Results

Overall, 78.3 per cent of the pregnant women and 75 per cent of the control population were found to have UIE > 10 µg/dl. The median UIE levels were 14.4 and 13.0 µg/dl respectively in pregnant and control women (Table I). No statistically significant difference was found between the two groups. Seven per cent of the pregnant women had their UIE < 5.0 µg/dl and about 12 per cent had ≥ 20 µg/dl (Table II). A small percentage of neonates (2.9%) were found to have cord blood TSH values > 5 mIU/l which happened to be just below the recommended value of 3 per cent for determination of a mild IDD endemicity in the region under study.

Discussion

According to the criteria set by WHO/UNICEF/ICCIDD\textsuperscript{19}, our results indicated that the pregnant population under study was iodine repleted as far as the overall iodine status was concerned. Despite an increased demand, the iodine status in the pregnant women remained almost same as that in the non-pregnant females of the area. The results correlated well with some other studies conducted in parts of the country with adequate iodine supply\textsuperscript{12,13}. On the other hand, studies conducted in the other parts of India known to be endemic

| Table I. Distribution of different groups based on the urinary iodine excretion (UIE) < 10µg/dl, median UIE and serum thyroid stimulating hormone (TSH) levels |
|--------------------------------------------------|------------------------|
| Pregnant mothers (N=267)                        | Control Population (N=100) |
| Median urinary iodine excretion (UIE) in µg/dl   | 14.4                   | 13.0                   |
| Percentage (no.) of populations having UIE < 10.0 µg/dl. | 21.7 (58)             | 25 (25)                |
| Median value of serum TSH in mIU/l               | 4.1                    | 3.7                    |
| No statistically significant difference between the two groups |                      |                        |

| Table II. Distribution of urinary iodine excretion (UIE) among the pregnant women and the control population |
|--------------------------------------------------|-----------|
| Observations                                     | Urinary iodine concentration (µg/dl) |
| Pregnant women (N=267)                           | 10 (3.7) | 9 (3.3)  | 39 (14.6)  | 176 (66) | 33 (12.2) |
| Non pregnant controls group (N=100)              | 5 (5)    | 3 (3)    | 17 (17)    | 58 (58)  | 17 (17)   |
| values in parentheses are percentages            |                      |            |             |          |            |
for IDD probably due to consumption of poorly iodized salt showed a high prevalence of IDD among the pregnant mothers\textsuperscript{14}. In some studies conducted in other parts of the world, IDD has been found to improve after supplementation of iodine in the kitchen salt\textsuperscript{19,20}. Although, the actual estimation of the iodine in the household salts could not be done in the present study, results of the other studies indicated that the repleted iodine status, despite an increased demand of iodine among the pregnant women in the present day, was probably a reflection of the adequate iodine intake strengthened by the Universal Salt Idolization Programme implemented by the Government of India since 1984. In fact, in West Bengal about 62 per cent of the population was found to consume $\geq 15$ ppm of iodine in their household salt as found in survey by NFHS in 2000\textsuperscript{21}. Hence, most probably, the overall intake of iodine in the salt seemed to supplement the increased need of iodine during pregnancy in the present study.

Only 2.9 per cent of the neonates were found to have a cord blood TSH value $> 5$ mIU/l. The World Health Organization provides the following epidemiologic criteria to classify populations in terms of the severity of IDD based on the proportion of newborns with a TSH $> 5$ mIU/l whole blood: mild, 3-19.9 per cent; moderate, 20-39 per cent; severe, $> 40$ per cent\textsuperscript{22,23}. According to this the population under present study fell just below the recommended criteria for mild endemity (3-19.9\%) of IDD.

As the salt is supposed to be an obligatory vehicle for iodine supplement in the society, proper iodization of the salt during its production and maintenance of the required iodine content till its consumption is very important. In conclusion, the present study suggests that iodine supplement through salt iodization programme should be continued and monitored strictly with a close surveillance to maintain the iodine repleted status in the pregnant women and their neonates. However, the present data have limited utility as were collected from the women attending the Gynaecology and Obstetrics Department of a tertiary care rural hospital which may not have included all pregnant women of the district. A systematic survey at the MCH clinics of the district should be carried out along with the actual assessment of iodine content in the household salts, to provide a better picture regarding the iodine status among the pregnant women and neonates.

References


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