

FINAL REPORT

UGC approval No. and Date
F. Psw-0093/13-14 (ERO) dt. 18.3. 2014.

Title of the Project

Studies on the state of iodine and iron nutrition in neonates, pregnant women and lactating mothers of Murshidabad district in West Bengal

Submitted by

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FINAL REPORT OF THE WORK DONE

Title of the project: Studies on the state of iodine and iron nutrition in neonates, pregnant women and lactating mothers of Murshidabad district in West Bengal

Brief objective of the project

The objectives of the study were

- to evaluate the state of iodine nutrition and nutritional anaemia in the neonates, pregnant women and lactating mothers i.e., most vulnerable group of the society in the socioeconomically retarded population in certain selected areas of Murshidabad district of West Bengal and
- to examine the health consequences for the coexistence of IDA and IDD in the vulnerable group at different stages of life.

1. Work done so far and results achieved and publications, if any, resulting from the work (Give details of the papers and names of the journals in which it has been published or accepted for publication)

Iodine Deficiency Disorders (IDD) is still now a public health problem throughout the World including India. According to WHO/UNICEF/ICCIDD (1994) recommended criteria, a prevalence rate of 5.0 – 19.9 % is considered as mild; 20-29 % is considered as moderate and a prevalence rate of above 30 % is considered as a severe public health problem.

Totally 524 pregnant women (aged between 18-45 yrs) were clinically examined for goiter from five sub divisions of Murshidabad district. The overall goiter prevalence was found to be 17.74%. Most of the goiter was palpable (grade-1) however; visible goiter (grade-2) also existed. To evaluate the occurrence of associated iodine deficiency disorders (IDD) every pregnant women was examined or enquired individually. In the studied population, most prevalent abnormalities were feeble mindedness (41.8%) followed by deaf mutism (11.3%), squint (1.9%), miscarriage (8.6%) and still birth (2.3%). Urinary iodine and thiocyanate concentrations were measured for all subjects and the mean urinary iodine were found 13.6 ± 9.4 . The mean thiocyanate excretion levels were 0.634 ± 0.26 . (Table 1,2 & 5)

In total, 543 lactating mothers (aged between 18-45 years) were clinically examined for goitre from five subdivisions of Murshidabad district. The overall goitre prevalence was found to be 13.1%. Most of the goitre was palpable (grade 1) however, visible goitre also existed. To evaluate the occurrence of associated iodine deficiency disorders (IDD) every lactating mother was examined or enquired individually. In the studied population, most prevalent abnormalities were feeble mindedness (41.6%) followed by deaf mutism (13.1%), squint (1.5%), miscarriage (5.9%) and stillbirth (1.7%). Urinary iodine and thiocyanate concentrations were measured for all subjects and the mean urinary iodine and mean urinary thiocyanate levels were found to be $12.6 \pm 8.9 \mu\text{g/dl}$ and $0.610 \pm 0.21 \text{ mg/dl}$ respectively. (Table 3,4 & 6)

A total of 88 Pregnant women and 56 of Lactating mothers of the age group 18-45 years were selected randomly from the studied population who had volunteered themselves for providing venous blood for the assay of T4 and TSH. It was found that 4.54% of Pregnant women and 10.71% Lactating mothers have T4 level less than $4 \mu\text{g/dl}$ whereas 13.64% of Pregnant women and 14.28% Lactating mothers have TSH level greater than $6.1 \mu\text{IU/ml}$. (Table 7 & 8)

It was also found that 6.81% of Pregnant women and 5.36% of lactating mothers have haemoglobin level less than 7 gm% and 10.23% of Pregnant women and 7.14% of Lactating mothers have Red cell count less than 3.5 million/mm^3 . This study indicates that a large number of studied population suffering mild to severe degree of anemia. (Table 9 & 10)

The overall clinical observations suggest that both pregnant women and lactating mothers of the studied region are affected by goitre or they are iodine deficient but biochemically they have no iodine deficiency as evidenced by their urinary iodine excretion pattern. They consume foods containing thiocyanate precursors as evidenced by urinary thiocyanate excretion pattern. Thus inspite of the consumption of adequate iodine, existing goitre prevalence may be due to the consumption of dietary goitrogens/antithyroid substances that possibly come through food and water.

Two papers have been communicated in two journals. One paper is already published. The published paper is attached herewith.

2. Has the progress been according to original plan of work and towards achieving the objective? If not, state reasons

The research work has been done according to original plan of work and towards achieving the objectives.

3. Please indicate the difficulties, if any, experienced in implementing the project

Due to deficiency of fund and some technical fault it was not possible to collect the blood samples of neonates. In first phase there was no problem to standardize the urinary iodine measurement. However in latter phase PI faced several technical problem to standardize this highly sensitive methods. For this purpose it is too late to submit the final report.

4. If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the commission on a separate sheet

The project has been completed now.

5. If the project has been completed, please enclose a summary of the findings of the study. Two bound copies of the final report of work done may also be sent to the commission

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The overall clinical observations suggest that both pregnant women and lactating mothers of the studied region are affected by goitre or they are iodine deficient but biochemically they have no iodine deficiency as evidenced by their urinary iodine excretion pattern. They consume foods containing thiocyanate precursors as evidenced by urinary thiocyanate excretion pattern. Thus inspite of the consumption of adequate iodine, existing goitre prevalence may be due to the consumption of dietary goitrogens/antithyroid substances that possibly come through food and water.

6. **Any other information which would help in evaluation of work done on the project. At the completion of the project, the final report should indicate the output, such as (a) Manpower trained (b) Ph.D awarded (c) Publication of results (d) other impact, if any**
 - a. Does not arise.
 - b. Does not arise.
 - c. Two papers have been communicated in two journals. One paper is already published.
 - d. More investigation is essential to find out the etiological factor (s) for the persistence of endemic goiter in Murshidabad district.

TABLE 1: Prevalence of goiter among pregnant women of Murshidabad district in West Bengal

Sl. No.	Study area (Sub-Division)	No. of population studied	Grade – 1 goitre	Grade - 2 goitre	Total goitre
1	Berhampore Sadar	110	18 (16.36%)	5 (4.54%)	23 (20.90%)
2	Domkol	102	14 (13.72%)	3 (2.94%)	17 (16.66%)
3	Murshidabad-Jiaganj	109	12 (11.01%)	2 (1.93%)	14 (12.84%)
4	Kandi	103	15 (14.56%)	4 (3.88%)	19 (18.45%)
5	Farakka	100	16 (16.00%)	4 (4.00%)	20 (20.00%)
	Total	524	75 (14.31%)	18 (34.35%)	93 (17.75%)

TABLE 2: Associated Iodine Deficiency Disorders (IDD) among the pregnant women of Murshidabad district in West Bengal (N=524)

Sl.No.	Associated IDD	No. of Population
1	Feeble mindedness	219 (41.79%)
2	Deaf mutism	59 (11.26%)
3	Squint	10 (1.91%)
4	Miscarriage	45 (8.59%)
5	Stillbirth	12 (2.29%)

TABLE 3 : Prevalence of goiter among lactating mother of Murshidabad district in West Bengal

Sl. No.	Study area (Sub-Division)	No. of population studied	Grade – 1 goitre	Grade - 2 goitre	Total goitre
1	Berhampore Sadar	116	14 (12.07%)	4 (3.45%)	18 (15.52%)
2	Domkol	106	11 (10.38%)	2 (1.89%)	13 (12.26%)
3	Murshidabad-Jiaganj	103	8 (7.77%)	1 (0.97%)	9 (8.74%)
4	Kandi	110	13 (11.82%)	3 (2.73%)	16 (14.54%)
5	Farakka	108	13 (12.04%)	2 (1.85%)	15 (13.89%)
	Total	543	59 (10.9%)	12 (2.2%)	71 (13.1%)

TABLE 4 : Associated Iodine Deficiency Disorders (IDD) among the lactating mother of Murshidabad district in West Bengal (N=543)

Sl.No.	Associated IDD	No. of Population
1	Feeble mindedness	226 (41.6%)
2	Deaf mutism	71 (13.1%)
3	Squint	8 (1.5%)
4	Miscarriage	32 (5.9%)
5	Stillbirth	9 (1.7%)

TABLE 5 : Urinary iodine and thiocyanate concentration level in pregnant women of Murshidabad district in West Bengal

Sl.No.	Study area (Sub-Division)	No. of Urine sample	Urinary iodine ($\mu\text{g}/\text{dl}$) Mean \pm SD	Urinary thiocyanate (mg/dl) Mean \pm SD
1	Berhampore Sadar	110	14.2 \pm 9.8	0.730 \pm 0.28
2	Domkol	102	10.1 \pm 8.4	0.601 \pm 0.19
3	Murshidabad-Jiaganj	109	12.8 \pm 7.5	0.682 \pm 0.24
4	Kandi	103	13.5 \pm 6.6	0.589 \pm 0.18
5	Farakka	100	12.3 \pm 6.9	0.612 \pm 0.21
	Total	524	13.6 \pm 9.4	0.634 \pm 0.26

TABLE 6 : Urinary iodine and thiocyanate concentration level in lactating mother of Murshidabad district in West Bengal

Sl.No.	Study area (Sub-Division)	No. of Urine sample	Urinary iodine ($\mu\text{g}/\text{dl}$) Mean \pm SD	Urinary thiocyanate (mg/dl) Mean \pm SD
1	Berhampore Sadar	116	13.9 \pm 8.4	0.689 \pm 0.23
2	Domkol	106	12.2 \pm 6.5	0.623 \pm 0.18
3	Murshidabad-Jiaganj	103	11.9 \pm 7.4	0.642 \pm 0.29
4	Kandi	110	14.2 \pm 7.9	0.518 \pm 0.19
5	Farakka	108	12.9 \pm 8.2	0.594 \pm 0.24
	Total	543	12.6 \pm 8.9	0.610 \pm 0.21

TABLE 7 : Distribution of Total T4 among pregnant women and lactating mother of Murshidabad district in West Bengal

Total T4 ($\mu\text{g}/\text{dl}$)	No. of Pregnant women (N=88)	No. of Lactating mother (N=56)	Total (N= 114)
<4.0	04 (4.54%)	06 (10.71%)	10 (8.77%)
4.0-7.4	53 (60.22%)	34 (60.71%)	87 (76.31%)
7.5-11.0	25 (28.41%)	14 (25.00%)	39 (34.21%)
>11.0	06 (6.82%)	02 (3.57%)	08 (7.02%)

TABLE 8 : Distribution of Total TSH among pregnant women and lactating mother of Murshidabad district in West Bengal

Total T4 (μ IU/ml)	No. of Pregnant women (N=88)	No. of Lactating mother (N=56)	Total (N= 114)
<0.3	04 (4.54%)	02 (3.57%)	06 (5.26%)
0.3-3.1	51 (57.95%)	29 (51.78%)	80 (70.17%)
3.2-6.1	21 (23.86%)	17 (30.36%)	38 (33.33%)
>6.1	12 (13.64%)	08 (14.28%)	20 (17.45%)

TABLE 9 : Distribution of haemoglobin level among the pregnant women and lactating mother of Murshidabad district in West Bengal

Hb gm %	No. of sample among the pregnant women (N=88)	No. of sample among the lactating mothers (N= 56)
<7 (Severe anemic)	6 (6.81%)	3 (5.36%)
7-9.9 (Moderate anemic)	29 (32.95%)	25 (44.64%)
10.0-10.9 (Mild anemic)	17 (19.32%)	10 (17.86%)
>11.0 (No anemic)	36 (40.90%)	18 (32.14%)

TABLE 10: Distribution of Red cell count among the pregnant women and lactating mother of Murshidabad district in West Bengal

Red cell count (million/mm ³)	No. of sample among the pregnant women (N=88)	No. of sample among the lactating mother (N=56)
3.0-3.5 (Severe anemic)	9 (10.23%)	4 (7.14%)
3.5-4.0 (Anemic)	21 (23.86%)	12 (21.43%)
4.0-4.5	35 (39.77%)	19 (33.93%)
4.5-5.5	23 (26.14%)	21 (37.50%)

SUMMARY OF THE FINDINGS (IN 500 WORDS)

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In post salt iodization phase, endemic goitre was found prevalent all over the India including West Bengal. Prevalence of goiter among the pregnant women and lactating mothers has been reported in many districts of West Bengal except Murshidabad. Present study is thus undertaken in Murshidabad district. The objective of the present study was to evaluate the state of iodine nutrition and nutritional anaemia in the neonates, pregnant women and lactating mothers i.e., most vulnerable group of the society in the socioeconomically retarded population in certain selected areas of Murshidabad district of West Bengal and to examine the health consequences for the coexistence of Iron Deficiency Anemia (IDA) and Iodine Deficiency Disorders (IDDs) in the vulnerable group at different stages of life.

Totally 524 pregnant women (aged between 18-45 yrs) were clinically examined for goiter from five sub divisions of Murshidabad district. The overall goiter prevalence was found to be 17.75%. Most of the goiter was palpable (grade-1) however; visible goiter (grade-2) also existed. To evaluate the occurrence of associated iodine deficiency disorders (IDD) every pregnant women was examined or enquired individually. In the studied population, most prevalent abnormalities were feeble mindedness (41.8%) followed by deaf mutism (11.3%), squint (1.9%), miscarriage (8.6%) and stillbirth (2.3%). Urinary iodine and thiocyanate concentrations were measured for all subjects and the mean urinary iodine were found 13.6 ± 9.4 . The mean thiocyanate excretion levels were 0.634 ± 0.26 .

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The overall clinical observations suggest that both pregnant women and lactating mothers of the studied region are affected by goitre or they are iodine deficient but biochemically they have no iodine deficiency as evidenced by their urinary iodine excretion pattern. They consume foods containing thiocyanate precursors as evidenced by urinary thiocyanate excretion pattern. Thus in spite of the consumption of adequate iodine, existing goitre prevalence may be due to the consumption of dietary goitrogens/antithyroid substances that possibly come through food and water.

Objectives of the Project:

The objectives of the study were

- to evaluate the state of iodine nutrition and nutritional anaemia in the neonates, pregnant women and lactating mothers i.e., most vulnerable group of the society in the socioeconomically retarded population in certain selected areas of Murshidabad district of West Bengal and
- to examine the health consequences for the coexistence of IDA and IDD in the vulnerable group at different stages of life.

Whether objectives were achieved (Give details):

Iodine is an important micronutrient found in water, soil and plants. Man needs iodine to make thyroid hormones, essential for normal development of the brain and maintenance of the body heat and energy. Lack of iodine in the diet leads to visible and invisible spectrum of health consequences known as iodine deficiency disorders or IDD. The major consequences of iodine deficiency are goitre (enlargement of thyroid gland than normal), mental defect, deaf mutism, stillbirth and miscarriage, weakness and paralysis of muscles as well as lesser degree of physical and mental function. Besides, iodine deficiency also affects the socio-economic development of a community. In the large area of Gangetic West Bengal, the population of all ages and both sexes irrespective of their socio-economic status are severely affected by endemic goitre and associated iodine deficiency disorders (IDD) in spite of the consumption of iodized salt. The reported areas are Howrah district, Sundarban delta of South 24-Parganas & North 24- Parganas, Birbhum, Purulia, Malda and Dakhin Dinajpur districts. But systemic studies on the iodine nutritional status of the population in Murshidabad district, attached to the river Ganga is not available.

So the aim and objectives of the present investigation were to find out the prevalence of endemic goiter and iodine nutritional status among pregnant women and lactating mothers of

Murshidabad district as per specification endorsed by the joint WHO/UNICEF/ICCIDD. To fulfill the objectives, the present investigation was thus undertaken to study the total goiter rate, urinary iodine and thiocyanate excretion pattern of the studied population along with T4 and TSH level, Hb% and Red cell count of the studied population. Attempt has also been made to evaluate the occurrence of associated iodine deficiency disorders (IDD). Results indicate that clinically the people of the studied region are affected by endemic goiter or clinically they are iodine deficient but biochemically they have no iodine deficiency as evidenced by their urinary iodine excretion pattern. The people of the region consume foods containing thiocyanate precursors as evidenced by urinary thiocyanate excretion pattern. Thus in spite of the consumption of adequate iodine, the existing goiter prevalence may be for the consumption of dietary goitrogens/antithyroid substances that possibly come through food and water. Though objectives were fulfilled in the present investigation but more investigation is essential to find out the exact causative factor(s) for the persistence of this major public health problem in the district of Murshidabad in West Bengal.

Achievement of the Project:

The problem of micronutrient malnutrition is also one of the burning problems in developing countries, out of which those of major public health significance are deficiency of one or more of the three micronutrients iron, iodine and vitamin A. Iodine deficiency disorders refer to all of the ill effects of iodine deficiency in a population, that can be prevented by ensuring that the population has an adequate intake of iodine. From this project work it is achieved that iodine deficiency disorders including goiter is still prevalent in the studied region though biochemically there is no iodine deficiency as evidenced by their urinary iodine excretion pattern. These findings suggest that there is the involvement of factor other than iodine deficiency for the persistence of endemic goiter. However more investigation is thus essential to find out the causative factor(s).

Summary of the findings:

In post salt iodization phase, endemic goitre was found prevalent all over the India including West Bengal. Prevalence of goitre has been reported in many districts of West Bengal except Murshidabad. Present study is thus undertaken in Murshidabad district. The objective of the present study was to evaluate the state of iodine nutrition and nutritional anaemia in the neonates, pregnant women and lactating mothers i.e., most vulnerable group of the society in the socioeconomically retarded population in certain selected areas of Murshidabad district of West Bengal and to examine the health consequences for the coexistence of IDA and IDD in the vulnerable group at different stages of life.

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Contribution to the society (Give details):

IDD are an important major public health problem in the country. Considering its importance India has adopted the strategy of salt iodization for control of IDD and has the goal of "Universal iodization of salt by 1995 and elimination of IDD by 2000. Accordingly the people of West Bengal are consuming iodide salt since 1990.

In spite of the consumption of iodized salt, the population of all ages, both sexes and irrespective of their socio-economic status in a large region of Gangetic West Bengal are affected by IDD. The common symptoms are visible goiter (grade 2), hypothyroidism, deaf-mutism and even cretinism are also reported.

The result of the present study in certain selected areas of Murshidabad district showed that goiter is still prevalent among Pregnant women and Lactating mothers. Many of the goiter are of grade 2 or visible. The iodine level in urine samples shows that there is no nutritional iodine

deficiency. This findings indicate that factor other than iodine deficiency like consumption of goitrogenic or antithyroid substances through food and water may responsible for the persistence of endemic goiter. Adequate amount of iodine intake can neutralize the antithyroidal substances only. However additional iodine intake also can neutralize the action of thiocyanate.

So the recommendations to all the people of the society are –

1. Always use iodated salt and save yourself from goitre and other iodine deficiency disorders
2. Whenever you buy salt, insist on iodated salt only.
3. Always store iodated salt in a container with lid and keep it away from direct sunlight/heat and moisture.
4. Iodated salt should be used within six months of its purchase.
5. Never store iodated salt near fire.
6. Never use ordinary, unlined jute bags for transported of iodated salt.
7. Never store in the open or in a damp, poorly ventilated godown.
8. Avoid transporting in open trucks or in open railway wagons.