Original Article

DOI: 10.7860/IJNMR/2016/23105.2194

A Community Based Survey on Prevalence of Iodine Deficiency among Pregnant Women in a Municipality Area of West Bengal, India

Community Paediatrics Section

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ABSTRACT

Introduction: In India, an estimated 200 million people were at risk for iodine deficiency disorders. Iodine Deficiency Disorder (IDD) is one of the most challenging nutritional problems in India. The pregnant women and their neonates are most vulnerable target groups of iodine deficiency disorder.

Aim: To assess the prevalence of iodine deficiency among pregnant women and to find out any association between urinary iodine excretion level of pregnant women and prevalence of low birth weight among newborn babies, if any.

Materials and Methods: The study was conducted in a block primary health centre of South 24 Paraganas West Bengal, among 1139 pregnant women admitted for delivery. Urinary iodine was measured by FAST B method.

Results: Out of all, 36.69% of the pregnant women were found to have inadequate urinary iodine concentration and there was significant association between maternal insufficient urinary iodine concentration and low birth weight of their babies.

Conclusion: As 24 Paraganas district is an iodine-replete area, about one third of the pregnant study population had inadequate urinary iodine excretion (<150µg/litre). There was significant association between the urinary iodine excretion and low birth weights of their babies. In conclusion, iodine supplementation through salt iodination programme should be strengthened.

Keywords: Goitre, Low birth weight, Urinary iodine concentration

INTRODUCTION

Iodine Deficiency Disorder (IDD) is one of the most challenging nutritional problems in India. The pregnant women and their neonates are most vulnerable target groups of iodine deficiency disorder [1].

IDD remains a significant public health problem in 130 countries especially in developing countries of Africa, Asia and Latin America and large parts of Europe [1,2].

Sample surveys conducted in 28 states and 7 union territories in India estimated that out of the 325 districts surveyed, IDD is a major nutritional problem in 263 districts where the prevalence is more than 10% [3]. In India it is estimated that out of 200 million people residing in goitre endemic areas and prevalence of goitre ranges from 1.5% (Assam) to 68.75% (Mizoram) [4].

Although IDD affects all age group but the population most affected are children 0 – 6 yrs and pregnant women and lactating women due to increased metabolic demand [5].

Deficiency of thyroid hormones will lead to severe retardation of growth and development. The iodine requirement per person is 100-150 µg/day. About 90% of iodine is excreted in urine [4]. Therefore, urinary iodine excretion is a good marker of very recent dietary iodine intake [6]. The urinary iodine excretion is done by FAST B – method which is a simple semi quantitative method for urinary iodine concentration [7].

Maternal iodine deficiency can lead to low birth weight, brain damage, hearing loss, learning deficits, brain damage, and infant mortality [4,8].

In this background the present study was done with the following objectives:

OBJECTIVES

1. To assess the prevalence of iodine deficiency among pregnant women.
2. To find out any association between urinary iodine excretion level of pregnant women and prevalence of low birth weight among newborn babies, if any.
3. To find out any association between prevalence of goitre with urinary iodine excretion level of pregnant women, if any.

MATERIALS AND METHODS

A descriptive, cross sectional study was conducted in a block primary health centre of South 24 Paraganas district of West Bengal, India, from September 2014 to December 2014, for the duration of four months. All pregnant women admitted during the study period were included in study group. The total sample size was 1139. Ethical clearance was taken from Institutional ethics committee of Calcutta National Medical College.

When the women were admitted for delivery they were explained about the study and the informed consent was obtained from them. All pregnant women who were admitted for delivery and delivered a living baby were included in the study. While who delivered still birth were excluded from the study. They were examined clinically by the researchers for presence of goitre.

Enlargement of thyroid was searched by observation and palpation as per WHO recommendation as follows [6].

Grade 0: No palpable or visible goitre.

Grade 1: A goitre that is palpable but not visible when the neck is in the normal position (i.e., the thyroid is not visibly enlarged). Thyroid nodules in a thyroid which is otherwise not enlarged fall into this category.

Grade 2: A swelling in the neck that is clearly visible when the neck is in a normal position and is consistent with an enlarged thyroid when the neck is palpated.

After examination of goitre the researchers with the help of health workers collected 2 ml urine sample in a capped plastic container from each woman. The samples were stored in a refrigerator at 4°C until analysis.

The collected urine samples were tested for measurement of iodine level. The analysis was done in Department of Biochemistry, Calcutta National Medical College by FAST B – method which is a simple semi quantitative method for urinary iodine concentration [7]. As per FAST B method among pregnant women <150 is insufficient, 150-249 is adequate, 250-499 is above requirement and >500 is excessive [7].

After urine collection the women were sent to the labour room for normal delivery or to the O.T for caesarean section as per their clinical condition. After delivery the weight of the newborns were taken from the birth records. In the present study the number of these mothers having still born was 7 and thus the ultimate numbers of study subjects were 1139. The babies were classified as having low or normal birth weight as per WHO classification [8]. These mothers were also interviewed for some socio demographic variables with a predefined and pre tested semi structured schedule.

Data thus obtained was analysed using SPSS for windows, version 18 and Epi info, chi square (x^2) test was used.

RESULT

Among the study population 634(55.66%) of pregnant women were between 21-26 years of age group and 627(55.04%) were second gravida [Table/Fig-1]. About 418(36.69%) and 500(43.89%) of the pregnant women were found to have inadequate level (<150µg/l) and normal (150-249µg/l) level of UIE respectively [Table/Fig-2]. In the present study, it was found that prevalence of low birth weight babies were 37.66% (429/1139) and there was significant association between maternal insufficient urinary iodine concentration and low birth weight of their babies [Table/Fig-3]. It was also found that prevalence of goitre in the study population were 52.41% (597/1139) [Table/Fig-4].

Socio demographic factors	Number (%)
Age	
15-20	115(10.09%)
21-26	634(55.66%)
27-32	339(29.77%)
32-37	51(4.47%)
Religion	
Hindu	804(70.58%)
Muslim	317(27.83%)
Christian	18(1.58%)
Literacy	
Illiterate	37(3.24%)
Just literate	81(7.11%)
Primary	149(13.08%)
Middle school	515(45.22%)
Secondary	320(28.09%)
Higher secondary and above	37(3.24%)
Parity	
Primi	369(32.39%)
2	627(55.04%)
>2	153(13.43%)

[Table/Fig-1]: Distribution of study population according to socio demographic factors (n=1139).

Urinary iodine concentration	Number (%)
<150µg/l	418(36.69%)
150-249 µg/l	500(43.89%)
250-499 µg/l	189(16.59%)
≥500 µg/l	32(2.80%)

[Table/Fig-2]: Distribution of study population according to urinary iodine concentration.

DISCUSSION

As per guidelines by World Health Organization, UNICEF, and International Council for Control of Iodine Deficiency Disorders the level of median urinary iodine excretion (UIE) represents recent iodine intake and accepted as a good indicator of iodine nutrition status.

(Insufficient iodine nutrition <150µg/l, adequate iodine

Urinary iodine concentration	Low birth weight		Statistical test
	Present	Absent	
<150µg/l (n=418)	198(47.36%)	220(52.64%)	χ^2 =14.28 p=0.0001 df=1
150-249 µg/l (n=500)	164(32.80%)	336(67.20%)	χ^2 =0.78 p= 0.37 df=1
250-499 µg/l (n=189)	62(32.80%)	127(67.20%)	χ^2 =0.73 p=0.39 df=1
≥500 µg/l (n=32)	5(15.62%)	27(84.38%)	χ^2 =1.63 p=0.201 df=1

[Table/Fig-3]: Association between urinary iodine concentration of pregnant women and low birth weight among newborn. (n=1139)

Urinary iodine concentration	Goitre		Statistical test
	Present	Absent	
<150µg/l(n=418)	197(47.12%)	221(52.87%)	χ^2 =6.02 p=0.1107 df=3
150-249 µg/l(n=500)	280(56.00%)	220(44.00%)	
250-499 µg/l(n=189)	111(58.73%)	78(41.26%)	
≥500 µg/l(n=32)	9(28.12%)	23(78.17%)	

[Table/Fig-4]: Association between urinary iodine concentration of pregnant women and prevalence of goitre. (n=1139)

nutrition 150-249µg/l, more than adequate iodine nutrition 250-449µg/l and no added health benefit >500µg/l) [6].

In this study it was shown that 418(36.69%) of the pregnant women were found to have inadequate UIE (<150µg/l) and 500(43.89%) and were found to have normal (150-249µg/l) level of UIE. Majumder A et al., [9] shown in their study that out of 237 pregnant women, 88 (37%) exhibited insufficient iodine nutrition (UIE < 150µg/l) which almost corroborates our study findings [9].

In a study done by Menon KC et al., [10] reveals that the median urinary iodine concentration (MUIC) at recruitment (mean gestation=17.5 weeks) of mothers was 106µg/l, 71µg/l at 34.5 weeks) and 69µg/l in the post partum period, indicating that these women were iodine deficient. In this study it was also found that postpartum maternal UIC was a significant predictor of infant urinary iodine concentration (p<0.001) [10].

Similar study done in Java, Indonesia found, (54.3%) pregnant women were iodine deficient of whom (28.1%) of them were severely iodine deficient [11]. Another study in Tehran, Iran revealed that 51% of pregnant women had a urinary iodine concentration less than that recommended during pregnancy [12].

In the present study it was evident that prevalence of low birth weight babies were 37.66% (429/1139) and there was significant association between maternal insufficient urinary iodine concentration and low birth weight of their babies (x^2 =14.28, p=0.0001).

In contrary, Majumder A et al., [9] found in their study that 32.3% of babies born from iodine deficient mothers had no deleterious outcome except respiratory distress at birth. Study done by Idris I et al., in U.K concluded that maternal hypothyroidism may increase the risk of low birth weight [13].

In present study it was found that prevalence of goitre in study population were 52.41% and there was no significant association between maternal insufficient urinary iodine concentration and prevalence of goitre.

WHO, UNICEF and ICCIDD (International Council for Control of IDD) concluded that iodine lost from salt is 20% from production site to house hold, another 20% is lost during cooking before consumption, so iodine concentration in salt at the point of production should be within the range of 20–40mg of iodine per kg of salt (i.e., 20–40 ppm of iodine) in order to provide 150µg of iodine per person per day [14]. South 24 Paraganas district is an iodine-replete area and the salt iodisation program is also implemented in this area but in the present study about 36% of the pregnant study population had inadequate urinary iodine excretion (<150µg/l).

In this situation, the present study recommends for further investigations. It would be more meaningful if the study involves more districts of West Bengal or larger part of India.

LIMITATIONS

The study was done in a particular district of West Bengal. The study result might be more generalised if it involves more districts.

CONCLUSION

It was ascertained from this study that large number of pregnant women had inadequate urinary iodine excretion and goitre. Significant association was found between maternal insufficient urinary iodine concentration and low birth weight of their babies. Further, study to ascertain the cause of inadequate iodine nutrition in pregnant women in an iodine repleted area is recommended.

REFERENCES

[1] Chakrobarty I, Chatterjee S, Bhadra D, Mukhopadhaya BB, Dasgupta A, Purkait B. Iodine deficiency disorders among the pregnant women in a rural hospital of West Bengal. *Indian J Med Res*. 123,2006:825-829.

[2] Zimmermann MB, Andersson M. Prevalence of iodine deficiency in Europe in 2010. *Ann Endocrinol* (*Paris*). 2011;72:164–66.

[3] National Iodine Deficiency Disorder Control Programme, Annual Report (2010-11). MOHFW, Govt. of India, New Delhi. [Last accessed on 7.12.2014].

[4] LakraK, Roy P. Pregnancy outcome of iodine deficiency: a study on tribal women in Orissa. *Int J Res Dev Health*. 2013;1(2):2321–23.

[5] Andersson M, Takkouche B, Egli I, Allen EH, Bruno de Benoist. Current global iodine status and progress over the last decade towards the elimination of iodine deficiency. *Bull World Health Organ*. 2005;83:518-25.
[6] WHO/UNICEF/ICCIDD(2007): Assessment of iodine deficiency disorders and monitoring their elimination. Third edition. WHO/NHD/01.1. Geneva World Health Organization. [Last accessed on 7.12.2014].
[7] Gnat D, Dunn AD, Chaker S, Delange F, Vertongen F, Dunn JT. Fast colorimetric method for measuring urinary iodine. *Clin Chem*. 2003; 49:186-88.
[8] K.Park, Park's textbook of Preventive and Social Medicine. ed-21.494-95.
[9] Majumder A, Jaiswal A, Chatterjee S. Prevalence of iodine deficiency among pregnant and lactating women: Experience in Kolkata. *Indian Journal of Endocrinology and Metabolism*. 2014;18(4):486-90.
[10] Menon KC, Skeaff SA, Thomson CD, Gray AR, Ferguson EL, Zodpey S, et al. The effect of maternal iodine status on infant outcomes in an iodine-deficient Indian population. *Thyroid*. 2011;21:1373–80.
[11] Yulia Lanti Retno Dewi, Sawartuti S, Sawartuti R. Maternal urinary iodine and pregnancy outcomes in Ngargoyoso sub-district, central Java, Indonesia. *Journal of Biology, Agriculture and Healthcare*. 2013;3(8).
[12] Azizi F. Iodine nutrition in pregnancy and lactation in Iran. *Public Health Nutr*. 2007;10(12A):1596-99.
[13] Idris I, Srinivasan R, Simm A, Page RC.Maternal hypothyroidism in early and late gestation: effects on neonatal and obstetric outcome. *Clin Endocrinol* (*Oxf*). 2005;63(5):560-65.
[14] Allen L, de Benoist B, Dary O, Hurrell R. Guidelines on food fortification with micronutrients. World Health Organization and Food and Agricultural Organization of the United Nations. 2006. page-52-54.

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FINANCIAL OR OTHER COMPETING INTERESTS:
None.

Date of Publishing: **Oct 01, 2016**