Monitoring Iodine Deficiency in a District Hospital, Nepal

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ABSTRACT

Background

Iodine deficiency possesses serious threat to pregnant women and infants. During pregnancy, iodine deficiency can result in stillbirth while in infants it can lead to impaired brain development.

Objective

This study was conducted to assess the status of iodine deficiency among pregnant women and infants.

Method

Ninety seven pregnant women seeking antenatal check-up (ANC) from Chautara Hospital Sindhupalchowk were included to analyze urine iodine. Thirty one mothers and their children were followed-up for their clinical status. Additionally, the infants were assessed for their urine iodine excretion and the mothers were assessed for their awareness about iodine and iodine deficiency disorder (IDD).

Result

Urinary iodine excretion revealed 25.2% of pregnant women and 20% children below one year of age had insufficient iodine intake while 42.9% of pregnant women and 24% children had iodine level above normal. Almost all households were found using iodized salt, 80% respondents had heard about iodized salt, 13% mothers were aware of benefits of iodized salt, 41.9% had knowledge of iodine deficiency diseases and 38.4% cognized the source of iodine.

Conclusion

Though awareness about iodine and iodine deficiency disorder was satisfactory, pregnant women and children were at risk of iodine deficiency and excessive iodine disorder. Therefore, to improve health of pregnant women and newborn, their nutrition must be prioritized which ultimately will help reduce morbidity and mortality.

KEY WORDS

Infant, Iodine deficiency, Pregnant women, Urine iodine

INTRODUCTION

The significant cause of preventable brain damage and mental retardation, iodine deficiency disorder (IDD), can began even before the child is born.[1-3] Though need of iodine is scanty (150 mcg per person per day), lack of iodine causes wide range of clinical and sub-clinical conditions.[1,4] Goiter being the most common, IDD can also lead to infant mortality, stillbirths, birth complications, mental retardation and depressed psychomotor functions. Moderate IDD in early childhood can lower the intelligence quotient by about 10-15 points, while in adults it causes lethargy.[5]

IDD is leading micronutrient deficiency problem in Nepal. In some mountains of Nepal, most adult woman were suffering goiter and cretins, the severest form of IDD.[6] Goitrogenesis and hypothyroidism were common disorders in mother and newborn in areas with severe iodine deficiency because of the inability to adjust changes in thyroid associated with pregnancy. Hence, pregnant woman and newborn are considered primary targets for iodine supplementation and IDDs are in priority in the nutrition policy and strategy of Ministry of Health and Population, Nepal.[7,8]

Therefore, this study was designed to identify urine iodine among pregnant women and newborn in Sindhupalchowk district in 2015 and 2016.

METHODS

This cross-sectional study was conducted to determine the status of IDD among pregnant women. The follow up of mothers and infants was conducted for assessing general health status and IDD.[9]

The study was approved by the Nepal Health research council. Written consent was obtained from all the participants.

The site of this study was Chautara Hospital, Sindhupalchowk, Nepal. Women and newborn were followed up in their household to assess their general health.

We enrolled 97 pregnant mothers for urine iodine estimation from Chautara Hospital in 2015/2016. We followed 31 mothers and 31 infants in 2016 for assessment of general health as well as urine iodine estimation from infants. Urine samples were collected for the determination of urinary iodine excretion.

Women visiting Chautara District Hospital for ANC were examined for blood pressure from the attending nurses. Follow up examination of mothers and infants were conducted in the household. Samples were collected from 97 pregnant women in the hospital in 2015 and 31 children below one year of age from communities in 2016. Samples were collected in clean leak proof container and refrigerated at -20°C until analysis. Urine iodine estimation (UIE) was conducted through Sandell-Kolthoff reaction. Structured questionnaire was used to assess mother's knowledge and perceptions on iodine, iodized salt and IDD. Descriptive qualitative information regarding the mother's knowledge and perceptions were collected through interview.

SPSS version 21 was used for data entry and analysis. Descriptive analyses including mean, frequency, percentages, range were calculated.

RESULTS

Mean age of enrolled women was 23.2 years (SD-3.8 years; range 17-35 years), majority (83.9%) were 21-35 years of age. Similarly, mean weight of 97 mothers was 51.1 Kg (S.D.-7.6 Kg). One mother had hypertension. All the women had normal clinical status as assessed by the physician (Table 1).

Table 1. Demography and clinical status of women

Characteristics	Number (n=97)	Percent (%)
Age distribution (in years)		
Less than or equal to 20	16	16.1
21-35	81	83.9
More than 35	0	0.0
Mean age (S.D.)	23.2±3.2 (Min.-17; Max.-35)	
Mean weight (Kg)	51.1±7.6 (Min.-38; Max.-74)	
Blood pressure		
Normal	96	99.0
Hypertension	1	1.0
Clinical status		
Normal	97	100.0
Abnormal	0	0.0

Insufficient urine samples from pregnant mothers and fecal contaminated samples from children were not processed. Hence, we processed only 91 samples from pregnant women and 24 from children. Urinary iodine excretion (UIE) level indicated that 25.2% women and 20% children had below normal iodine intake while 42.9% women and 24% had above normal UIE (Table 2).

Table 2. Level of urine iodine excretion among mothers and children

UIE level (µg/l)	Mothers (n= 91)	Children below one year (n= 24)
Insufficient (<150)	23 (25.2%)	5 (20%)
Adequate (150-249)	29 (31.9%)	13 (52%)
Above requirements (250-499)	39 (42.9%)	6 (24%)
Excessive (≥ 500)	0	0

The followed up mothers in 2016 were from Chautara and the surrounding VDCs (Supplementary Table X). Some mothers had height less than 145 cm, low weight upto 37 Kg and BMI less than 18 Kg/m^2 (Table 3). About 22% mothers had BMI greater than 25 Kg/m^2.

Supplementary table X. VDC wise distribution of number of mother and newborn followed up

VDC	Number	Percent (%)
Batase	3	9.7
Chautara	11	35.5
Irkhu	3	9.7
Kunchowk	3	9.7
Pipaldanda	8	25.8
Sanosiruwari	3	9.7

Table 3. Parameters of followed up mother

Physical parameters	Mean (±S.D.)	Range (min.-max.)
Height (cm)	150.23±4.63	141-161
Weight (Kg)	52.65±7.25	37-69
BMI (Kg/m^2)	23.25±2.83	17-28

Not any mothers had pallor sign, jaundice, oedema or swelling of thyroid during physical examination. Mothers during follow up mentioned that 77.4% of them had still birth in the past but none had still birth in last delivery (fig. 1).

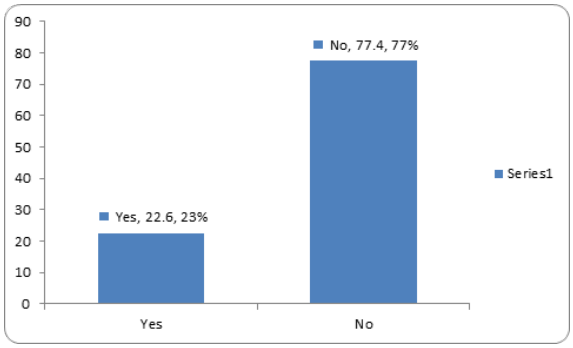

Figure 1. Still birth in the past from follow up mother

Table 4. Iodine related responses of mothers

Particulars	Number, n=31 (%)
Listened about iodized salt	25 (80.60)
Use of two child logo iodized salt	30 (96.8)
Perception about benefits of iodized salt (multiple response)	4 (12.9)
Mental development	3 (9.6)
Physical growth	2 (6.4)
Disability prevention	1 (3.2)
Perception about iodine deficiency disorders (multiple response)	13 (41.9)
Goitre	5 (16.0)
Disability	4 (12.8)
Memory loss	1 (3.2)
Lethargy	1 (3.2)
Perception about source of iodine (multiple response)	12 (38.4)
Beans	3 (9.6)
Vegetables	5 (16.0)
Meat	2 (6.4)
Fruits	3 (9.6)

Four out of five respondents had heard of iodized salt and except one all other households were using iodized salt with two children logo. About 13% respondents conferred good knowledge on benefits of iodized salt, 41.9% had knowledge about iodine deficiency diseases and 38.4% had knowledge of iodine source (Table 4).

Supplementary table Y. Characteristics of followed up children

Characteristics	Number	Percent (n=31)
Age of child (months)		
<1	7	22.6
1-3	14	45.1
4-6	10	32.3
Sex		
Male	18	58.1
Female	13	41.9
Birth order		
1	9	29.0
2	16	51.6
3	4	12.9
4	2	6.5

Majority of mothers (93.5%) took iron tablets during their last pregnancy. Goiter was not observed in any of the family members of followed up mothers. Among follow up children, 29% were first, 51.6% were second and 19.4% were third and fourth child of the mother (Supplementary Table Y).

Table 5. Clinical status of newborn babies

Particulars	Number, n=31 (%)
Congenital anomalies	1 (3.2)
History of jaundice within 24 hours of birth	7 (22.6)
Feeding and suckling ability of baby	
Normal	29 (93.5)
Sluggish	2 (6.5)
Smile at mother	
Yes	15 (48.4)
No	1 (3.2)
Not at applicable to this age	15 (48.4)
History of disease/surgery/hospitalization	7 (22.6)
Status of fontanel	
Open	12 (38.7)
Wide	6 (19.4)
Fused	13 (41.9)
Eyelid	
Normal	29 (93.5)
Swollen	2 (6.5)
Pallor	2 (6.5)
Cardiovascular system	
Clinically clear	28 (90.3)
Wheeze and crepitations	1 (3.2)
Wheezy	2 (6.5)

The followed-up children were properly immunized within six months of age and were normal weight by age. One child possessed congenital anomalies and one had no smile at mother. Puffiness in face, open mouth with protuberant tongue, and neck swelling goiter was not observed in any newborn (Table 5).

DISCUSSION

This study found variable iodine level in the urine of pregnant women and children. Similar studies conducted in pregnant women and children in Nepal have also reported urine iodine level beyond normal.[10-13] Iodine level below normal in pregnant women and children signifies that the intake of iodine by mother during pregnancy and lactation was not sufficient to meet the iodine requirements. Increased urinary iodine in the mother might be because of the increased glomerular filtration rate which cause increased loss of iodine ingested and therefore more iodine is seen in the urine.[14-16] While in babies, the use of povidone iodine used during delivery for obstetric purposes might be the cause for increased urinary iodine level. This use causes iodine overload in the mother and excessive iodine transfer to the baby through placenta and breast milk.[17]

Shortly after the identification of the new element 'iodine' in 1811, it was found that iodine deficiency was the cause of goiter, myxedema and cretinism.[18,19] WHO in 1980 reported 20-60% of the world's population was iodine deficient majority from the developing countries.[20] To overcome iodine deficiency, universal salt iodization was adopted and Nepal started to fortify all edible salt through iodine.[21-23] The continuation to fortify all edible salt with iodine is now questioned as most studies mentioned either below or above normal iodine level in the human body.[24-27]

Most household's conferred good response about the iodized salt and majority were using salt with two child logo which is the iodized salt from salt trading corporation. To make people aware about the consequences of iodine deficiency and to promote the use of iodized salt, tremendous effort has been played by the government of Nepal. Department of Health Services, Ministry of Health and Population plays crucial role in improving awareness, promoting and marketing iodized salts to increase consumption.[22] There were some health disorders in pregnant women and in newborn which were related with the factors other than iodine.

Unable to recollect urine samples that were insufficient from pregnant women and fecal contaminated from children plus low sample size was limitation of this study.

CONCLUSION

There was discrepancy in the urine iodine level of the pregnant women and the newborn which questions about the policy to fortify all edible salts through iodine. This indicates that the pregnant women and newborns are at risk of iodine deficiency disorder and also of the consequence of excess iodine. Therefore, mothers and newborn health and their nutrition should be in priority to achieve desirable results of reducing maternal and neonatal/infant morbidity and mortality.

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