Iodine supplementation in pregnancy and its effects on perinatal outcome

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ABSTRACT

Iodine is an important micronutrient for mental growth and development. Limited information is available on the role of iodine supplementation in pregnancy and its effect on perinatal outcome. We designed intervention study to assess the effect of iodine supplementation during second half pregnancy and its effect on perinatal outcomes (maternal and neonatal health). Among 60 intervened with oral iodine tablet in pregnancy and 60 control pregnant women in Sindhupalchowk District Hospital Chautara, we assessed maternal and neonatal health after the delivery. The significant differences were found among duration of pregnancy, weight of pregnant mother before and after intervention of at least three months duration (56.1 kg vs. 59.6 kg, $p<0.001$), weight of neonate (3.3 kg in intervention vs. 3.0 kg in control, $p<0.001$), and thyroxin hormone (1.1ng in intervention vs. 1.2ng in control, $p<0.001$) of women between intervened and control subjects. Therefore, regular supplementation of iodine in oral form for more than three months during pregnancy preferably during early stage will bring significant positive changes in perinatal outcomes.

Keywords: Iodine supplementation, pregnancy, perinatal outcome, Sindhupalchowk.

INTRODUCTION

IDD is an important major micronutrient deficiency problem in Nepal. In some isolated mountainous area of Nepal, most of the adult woman had goiter and up to 10% of population were cretins, the severest form of IDD.[1] An assessment of IDD problem by estimation of urinary iodine among Nepalese school children conducted in 2005 in 190 urine samples showed 3.2 percent of children had urine iodine less than 20 micro grams per liter.[2]

An adequate iodine intake during pregnancy is required for the synthesis of maternal thyroid hormones and normal brain development in the fetus. It is revealed that mild to moderate iodine intake during pregnancy might affect the neuropsychological development of the child.[3] Therefore, several studies recommended iodine supplementation in pregnant women in iodine deficient population.[4-7]

Ministry of Health and Population has prioritized Iodine Deficiency Disorders as a high level activity in its Nutrition Policy and Strategy 2004 and has an objective to virtually eliminate iodine deficiency diseases and sustain the elimination by the year 2017. [8] Data on reduction in iodine deficiency disorders and sufficient level of urinary iodine excretion in school children are available; however, limited information is available regarding iodine status and effect of iodine supplementation among pregnant women in Nepal. With these motivations, the present intervention study has been designed to assess the effect of iodine supplementation during second half pregnancy to its outcomes.

PATIENTS AND METHODS

Study Hospital: This intervention study was conducted in the Sindhupalchowk District Hospital Chautara among the pregnant women who were attending the ANC clinic and maternity ward from first week of June to last week of November 2007.

Study Population: The intervention group was of 60 pregnant women of first and second trimester those who were registered in Chautara Hospital and district ANC centre. The control group was of 60 pregnant women of similar pregnancy status those who were admitted in the maternity ward of same hospital. Since the study design was interventional, subjects were compared and tested with appropriate statistical tests.

Table-1: Duration of use of iodized salt by subjects

Duration of use of iodized salt	Intervention group (n=60)	Control group (n=60)	Total
Less than 1 year	11 (18.3)	11 (18.3)	22 (18.3)
1 to 3 year	15 (25.0)	24 (40.0)	39 (32.5)
More than 3 year	34 (56.7)	25 (41.7)	59 (49.2)

Table-2: Period of gestation at delivery and mean weight of subjects

Period of gestation	Intervention group (n=60)	Control group (n=60)	Total	p-value
29 - 37 weeks	0	9 (15)	9 (7.5)	0.002
38 - 42 weeks	60 (100)	51 (85.0)	111 (92.5)	
Mean weight in Kg	Pre intervention	Post intervention	-	
Mean weight in KG (SD)	56.12 (3.284)	59.62 (3.325)	-	<0.001

Examination: Initially 60 pregnant women of different centers of Sindhupalchowk who had completed first trimester of gestation were screened. All were interviewed with structured questionnaires along with general physical and obstetrical examination. Blood tests for haemoglobin, total count and differential count, routine urine tests for colour, acidity, and protein and especial tests for iodine and thyroid hormones were performed according to standard procedures. Salt iodine estimation of all samples from respective household was performed. Findings were recorded in recording forms.

Intervention and Follow up: Intervention group was provided with a mineral capsule (Komb) containing 150 mcg of iodine to take orally every day from the day of enrolment till delivery along with iron plus folic acid tablets and maternal and neonatal health care package.

Control group was taken from regular attendants of maternity ward of Chautara hospital and assessed for enrollment. No any intervention was given to the control group.

All the pregnant mothers in the study group were followed every month for regular consumption (consumption) of iodine, iron and folic acid tablets and ANC care. Findings were recorded in standard forms for further analysis. Special counseling procedures were applied to minimize defaulter. Subjects were followed up for their weight gain, development of fetus and appearance of any abnormal findings. Importance of regular consumption of iodine, iron and folic acid tablets was explained during their visits.

Ethical Consideration: Women participating in the study were explained about the study and consent was obtained from each pregnant women. The proposal was submitted in the Institutional Review Board of the Institute of Medicine, Tribhuvan University and ethical clearance was obtained.

Data analysis: Data were entered into SPSS version 11.5 and analyzed to compare the neonatal and maternal outcomes after delivery. Perinatal outcomes comprises of fetal maturity, weight of newborn, general condition of fetus, fetal length perinatal morbidity and mortality. The status of thyroid hormones of study subject, biochemical indicators, difference in thyroid profile before and after intervention were compared. Descriptive and inferential statistics were used.

RESULTS

Number of study subjects who knew about iodized salt was nearly universal (98.3%). Those who didn't know about Aayonoon (iodized salt) were less than 2%. Considering the percentages of use of iodized salt, four out of five (82.5%) were using iodized salt in their family. There was not much difference between subjects of intervention and control group in the use of iodized salt.

Nearly half of the families were using iodized salt for more than 3 years. Percentages of families using less than one year was still 18.3%. Nearly one third of the families were using iodized salt for 1 to 3 years duration (Table-1).

More than 90% of the mothers had delivered between 38 to 42 weeks of pregnancy which is considered as normal. Only less than 7.5% pregnant women had delivered before 38 weeks of gestation. None had delivered before 29 and after 42 weeks of gestation. The difference in duration of pregnancy is statistically significant between intervention and control group (p= 0.002). The difference in weight of pregnant mother before and after intervention of at least three months duration is also statistically significant (p<0.001) (Table-2).

Mean weight of newborn in intervention group was 3.333 Kg (SD= 0.2515); and in control group was 3.046 Kg (SD= 0.4408) (Table-3).

Table-3: Mean weight and length of newborn

Weight of newborn	Intervention group (n=60)	Control group (n=60)	p-value
Mean weight, Kg (SD)	3.333 (0.2515)	3.046 (0.4408)	<0.001
Mean length, cm (SD)	51.00 (1.507)	50.18 (1.546)	0.004

Table-4: Laboratory characteristics of study subject

Thyroid function test	Pre intervention mean value	Post intervention mean value	p-value
Triiodothyroxin (T3) pg	2.660 (0.7019)	2.798 (0.6407)	0.097
Thyroxin (T4) ng	1.115 (0.1777)	1.220 (0.1870)	<0.001
Thyroid stimulating hormone (TSH) IU	1.570 (1.1282)	1.655 (0.9143)	0.554

Among the three hormones thyroxin (T4) was significantly different between pre intervention and post intervention ($p<0.001$). Rest of the hormones, triiodothyroxin (T3) and thyroid stimulating hormone (TSH) did not show significant increase between pre and post intervention (Table-4).

DISCUSSION

Significant differences were observed in weight and length of the new-born born from mother supplemented with iodine during pregnancy and control. Similarly, serum free thyroxin was found significantly increased in post-intervention as compared to pre-intervention mothers ($p<0.001$). Percentage of using iodized salt was found high; however, adequate iodine supplementation has been recommended to meet the increased hormone demand over gestation.[9] The American Thyroid Association (ATA) recommends a supplement of 150 ìg iodine/day during pregnancy and lactation, in addition to the use of iodized salt.[10] We compared maternal and neonatal outcome between iodine supplemented mother and control mother during pregnancy. Although we did not observe long term effect of the iodine supplementation during pregnancy, we found increase in thyroxin, triiodothyroxin, and thyroid stimulating hormone (TSH) in iodine supplemented newborn. It is reported that exposure of the fetus to low levels of thyroid hormones for extended periods during pregnancy can lead to irreversible brain damage and potential delays in neurological and behavioral development. [11] The study conducted in different ecological regions of Nepal reported that people are still consuming salt with low level of iodine. [12] We did not observe any side-effects in pregnant mothers due to iodine supplementation. Similarly, rare side-effects were observed by iodine supplementation during pregnancy at the recommended doses. [13-15] Therefore, this study justifies the need of iodine supplementation in mothers during pregnancy. Oral supplementation of iodine along with iron and folic acid for more than three months during pregnancy will bring significant positive change in perinatal outcomes.

Regular supplementation of iodine in oral form for more than three months during pregnancy preferably during early stage along with regular intake of iron and folic acid and intervention of standard maternal and neonatal health care package will bring significant positive changes in perinatal (maternal and neonatal) outcomes.

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