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Diet survey of iodine on pregnant women of Prayagraj district Uttar Pradesh

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Abstract
Hypothyroidism during pregnancy has an adverse effect on both mother and child. Children born to untreated or undertreated mothers have profound effect on future intellectual development. Pregnancy is a stressful condition for the thyroid gland resulting in hypothyroidism in women with limited thyroid reserve or iodine deficiency. Prevalence of hypothyroidism in pregnancy in the Indian population is 4.8-12%. There is change in the level of thyroxine-binding globulin, total thyroid-hormone level and change in the level of thyroid stimulating hormone (TSH) during normal pregnancy. Thyroid dysfunction has varied impact on pregnancy outcome. The risk of miscarriage is increased in autoimmune thyroid disease. Severe maternal hypothyroidism can result in irreversible neurological deficit in the offspring. Graves' disease (GD) can lead to pregnancy loss as well as fetal thyroid dysfunction. The most common cause of maternal hypothyroidism is the autoimmune disorder known as Hashimoto's thyroiditis. In this condition, the body mistakenly attacks the cells of the thyroid gland, leaving the thyroid without enough cells and enzymes to make enough thyroid hormone to meet the body's needs. Therefore, it is important to eat the right variety of foods in the correct proportions, a varied and healthy diet. Choose low fat, low calorie spread rather than butter or ordinary margarines avoid high salt intake and cut down on hidden fats & sugars (cakes, biscuits, chocolate) with calcium rich foods and / or supplements, and normal vitamin D levels. Along with the diet, it is recommended to all the women who already have known thyroid dysfunction should immediately go for thyroid function tests as soon as the pregnancy is confirmed. Careful monitoring of the medicine should be done during the course of pregnancy.

Keywords: Hypothyroidism, pregnancy, healthy diet, thyroid disease, hashimoto's thyroiditis

Introduction
Iodine is essential for the production of maternal and fetal thyroid hormones that regulate the development of the fetal brain and nervous system. A woman's iodine requirements increase substantially during pregnancy to ensure adequate supply to the fetus. (LM *et al.*, 2015) [1] Globally, although nearly a third of school-age children (246 million) are estimated to have insufficient iodine intake, this commonly-used surrogate measure likely greatly underestimates the number of pregnant and lactating women with inadequate iodine nutrition status. Depending on the timing and severity, insufficient iodine intake increases the risk of negative reproductive outcomes, such as perinatal and infant mortality, and intellectual impairment, the most extreme form of which is cretinism (WHO 2015) [2]. Iodine deficiency disease (IDD) is the most common cause of preventable mental deficiency in the world today as iodine plays a critical role in infant brain development and hence this nutrient has immense importance during pregnancy and lactation. Most of the 1,572 million people worldwide, estimated to be at risk of IDD, live in developing countries of Africa, Asia and Latin America; however, large parts of Europe are also vulnerable. IDD was recognized as a public health problem in India after the pioneering work of Prof. V. Rama linga swami and others and led to the formation of National Goitre Control Program (NGCP) in 1962. (EN *et al.*, 2013) [3] The implementation of NGCP continued till 1983 with limited success. In 1984, the Govt. of India decided to adopt the programme of Universal Salt Iodization (USI) under which all salt meant for human consumption was to be fortified with iodine. In 1992, the NGCP was renamed as National Iodine Deficiency Disorder Control Programme (NIDDCP).A ban on the sale of non-iodized salt was lifted in September (U *et al.*, 2000) [13] and the ban was re-imposed on 27th May 2005.

The factors responsible for a higher requirement of iodine are: (1) increased requirement of Thyroxin (T4) to maintain a normal global metabolism in the mother, (2) transfer loss of T4 and iodide from the mother to the fetus and (3) increased loss of iodide through the kidney due to an increase in the renal clearance of iodide in pregnancy. The recommended dietary intake of iodine during pregnancy is therefore higher than the value of 100 µg/day, which is recommended for non-pregnant adults and adolescents. Iodine balance is negative during pregnancy below a daily intake of 150 µg/day. The iodine intake of an exclusively breastfed infant is dependent on the iodine intake of the mother during pregnancy and lactation. Pregnant and lactating women and neonates are the main targets of the effects of iodine deficiency because of the impact of maternal, fetal and neonatal hypo thyroxinemia on neonatal brain development. In this study, we have evaluated the prevalence of iodine deficiency among pregnant and lactating mothers, almost three decades after the adoption of USI program by the Indian Government. The recommended iodine intake during pregnancy was increased from 200 to 250 µg/day and median UIE concentration cut off was increased from 100 100 µg/l to 150 µg/l.

International prevelence of Hypothyroidism in pregnancy

The estimated prevalence of hypothyroidism in pregnancy is 2-3%. Of these, 0.3-0.5% is OH and 2-2.5% is SCH. Studies have demonstrated 60% risk of fetal loss and 22% risk of gestational hypertension with untreated OH. A firm association between OH and adverse risk to the maternal-fetal unit has been demonstrated. The miscarriage rate in SCH is 6% vs 3.6% in euthyroid women. A two-to threefold increased risk of pregnancyrelated complications was demonstrated in untreated women with SCH. American Thyroid Association's (ATA 2011) recommendation is neither for nor against universal screening in the first trimester. It recommends treatment of OH (TSH > trimester specific values with low T4 or TSH > 10 irrespective of T4) and SCH with positive TPO antibodies. ATA also recommends regular TSH monitoring of euthyroid TPO positive pregnant women (PW) throughout pregnancy. SCH in PW who have not been treated initially should be monitored every 4 weeks with serum TSH and FT4 approximately, until 16–20 weeks of gestation and at least once between 26 and 32 weeks gestation. The Endocrine Society (2012) does not recommend universal screening of all PW but encourages TSH in "high risk" individuals and low dose thyroxine to target TSH to <2.5mIU/l. It recommends repeating the screening in the second trimester if initial screening is normal. (NGSHDP, 2014)

National prevelence of Hypothroidism in pregnancy

Prevalence of hypothyroidism in pregnancy in the Indian population is 4.8-12%. Reported prevalence by Sahu *et al*., 2010 was 6.47% with 4.58% as OH. Another Indian study has reported the prevalence of hypothyroidism to be 12%, of which 3% was OH and 9% was SCH. TPO antibodies are positive in around 50% pregnant women in SCH, as compared to 7% in euthyroid pregnant women. Incidence of hypothyroidism in women with recurrent pregnancy loss up to 12 weeks is 4.1-16.6%. The miscarriage rate in SCH is 12 - 21%, while in OH, it is 21%. The rate of stillbirth is 0-16.6% for SCH and 4.2% for OH. The incidence of pre-eclampsia has been reported as 16% for OH and 22% for SCH. The incidence of abruptio placentae is 16% for OH and 5% for SCH. Intrauterine Growth Restriction (IUGR) prevalence is 25% in OH and 8% in SCH, while the incidence of pre-term delivery is 33% with OH and 11% with SCH. Indian Thyroid Society (ITS) recommends screening of TSH levels in all PW at the time of their first visit, ideally during prepregnancy evaluation or as soon as pregnancy is confirmed, although evidence for this is limited from studies that have already been carried out. (NGSHDP, 2014).

Justification

Pregnancy can be viewed as a state in which a combination of events concurs to modify the thyroidal economy. Hypothyroidism during pregnancy has an adverse effect on both mother and child. Children born to untreated or undertreated mothers have profound effect on future intellectual development. Pregnancy is a stressful condition for the thyroid gland resulting in hypothyroidism in women with limited thyroid reserve or iodine deficiency. Prevalence of hypothyroidism in pregnancy in the Indian population is 4.8-12%. There is change in the level of thyroxine-binding globulin, total thyroid-hormone level and change in the level of thyroid stimulating hormone (TSH) during normal pregnancy. Thyroid dysfunction has varied impact on pregnancy outcome. The risk of miscarriage is increased in autoimmune thyroid disease. Severe maternal hypothyroidism can result in irreversible neurological deficit in the offspring. Graves' disease (GD) can lead to pregnancy loss as well as fetal thyroid dysfunction. The most common cause of maternal hypothyroidism is the autoimmune disorder known as Hashimoto's thyroiditis. In this condition, the body mistakenly attacks the cells of the thyroid gland, leaving the thyroid without enough cells and enzymes to make enough thyroid hormone to meet the body's needs. Radioiodine therapy and thyroid surgery, but also iodine, medicines or rare genetic disorders may cause hypothyroidism. According to the data revealed by the report, India is facing a serious threat of under-nutrition where more than half of the women of reproductive age suffer from thyroid dysfunction. Having hypothyroidism can make feel exhausted and sluggish, and it can make it difficult to concentrate, among other things. Therefore, it is important to eat the right variety of foods in the correct proportions, a varied and healthy diet. For example, choose low fat, low calorie spread rather than butter or ordinary margarines avoid high salt intake and cut down on hidden fats & sugars (cakes, biscuits, chocolate) with calcium rich foods and / or supplements, and normal vitamin D levels. Along with the diet, it is recommended to all the women who already have known thyroid dysfunction should immediately go for thyroid function tests as soon as the pregnancy is confirmed. Careful monitoring of the medicine should be done during the course of pregnancy. The trimester specific reference intervals for thyroid hormones established for pregnant Indian population after serially following the pregnant women should be used to identify at risk women. Very limited data is available regarding the iodine nutritional status of pregnant women in India. Therefore, the present investigation will be carried out to know the prevalence and associated risk factor that increases the possibilities of causing hypothyroidism in pregnant mothers.

Objectives

1. To assess the iodine nutritional profile of the hypothyroidism pregnant women.
2. To find out the consumption pattern of selected Iodine

intake of the hypothyroidism pregnant women.
3. To educate the pregnant women regarding iodine deficiency in order to prevent or reduce incidences of iodine deficiency disorder.

Material and Methods
The project entitled "Diet survey of iodine intake on Pregnant women of Prayagraj district Uttar Pradesh"

The study will be conducted using the following methodology
Design of the study: Cross sectional and descriptive design will be opted.

Area of the study: The study will be conducted in the village of Prayagraj.

Technique of sampling: Random sampling will be the Technique of sampling followed.

Population of the study: hypothyroidism pregnant women of vulnerable group.

Sample Size of the study: 30 pregnant women of vulnerable group will be taken for the study from neighbouring area of residence.
The Prayagraj city will be selected purposively for the study.

Tools and Techniques
Educational aid:-Educative Leaflets will be used to educate them.

Collection of data: Open-ended questionnaire will be used for the data collection from the respondents.

Methods of enquiry and data collection
The survey method will be used as the method of enquiry. The selected respondents will personally interviewed and necessary information collected using a pre structured and pretested questionnaire. The questionnaire included aspects which led to the fulfilment of the objectives of this study. 24 hours dietary recall (Swami Nathan) will be done and average nutrient intake per day calculated of each respondents using the nutritive value for Indian foods by C. Gopalan *et al.*
The questionnaire included the following information:
- General Profile Survey
- Dietary intake (24 hours dietary recall method)
- Anthropometric measurement
- Clinical sign and symptoms

General Profile Survey
Data regarding general profile of the hypothyroidism pregnant women will be collected using the first part of the questionnaire. The section covered aspects including respondent's name, age, type of family, Monthly income, monthly expenditure on food items.

Dietary Survey
Diet surveys constitute an essential part of any complete study of nutritional status of individuals or groups, providing essential information on nutrient intake levels, sources of nutrients, food habits; attitudes. It will help to following information. A diet survey will be conducted

24 hour dietary recall
24- Hour dietary recall method is widely used in dietary surveillance. The interviewer asks the respondents questions to obtain information on the types and the amount actually consumed by an individual one or more specific days.

Anthropometric Measurement
Nutritional anthropometry is concern with the measurement of variations of physical dimensions, the gross composition and degree of nutrition. Hence, anthropometric measurements are useful criteria for assessing the nutritional status. The anthropometric measurement including height and weight are recorded using the process prescribed by Gibson (1990).

Height Measurement
Height (cm) of the subject will be taken with the help of measuring tape in centimetres by sticking it to the wall. The subject will be made to stand erect, look straight with buttocks, shoulders and head touching the wall, heels together, toes apart and hands hanging loosely by the sides.

Weight Measurement
The weighing scale with maximum capacity of 120 kg and the minimum division of 0.5kg will be used to weigh all the subjects. The respondents will be made to stand erect on the weighing scale with minimum of clothes, without footwear, not learning against and holding anything and the weight was recorded in kg.

Body mass index (BMI): BMI was calculated as the standard of nutritional status anthropometrically, by using the following formula derived from the weight and height (WHO, 1995).

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

Statistical Analysis: The collected data will be analysed with the help of t-test, anova and other appropriate statistical technique.

Result and Discussions
The data collected and tabulated under the study are presented.
- General information

Table 1: Distribution of the respondent according to the general information.

Particulars	Distribution	Frequency	Percentage
Family type	Joint	18	60
	Nuclear	12	40
Occupation	Business	11	36
	Service	9	30
	Any other	10	33
Total family income	Below 5000	8	26
	5000-10000	11	36
	10000-20000	9	30
	21000-25000	2	6
Education of the Patient	Uneducated	7	23
	Primary	6	20
	High school	7	23
	Intermediate	10	33.3

Family type: The majority of respondents, 60 percent belonged to joint family and 40 percent respondent belonged to Nuclear family.

Occupation of the family: According to the table most of the respondent family head were in business 36 percent and in government and private service 30 percent and in other occupation (agriculture etc.)33 percent respectively.

Total family income: showed that 26 percent monthly income belonged to below 5000 and 36 percent monthly income belonged to 50,00-10,000, 30 percent monthly income belong to 10000-20000 rupees and 6 percent monthly income belong to 21000-25000
6.6 percent belong to more than 25000 rupees per month.

Education of the Patient: the majority of the respond belongs to the Uneducated that is 23 percent also 20 percent are primary pass and high school pass belongs to 23 percent followed by intermediate belongs to 33.3 percent.

Anthropometric Measurements

Table 2: Distribution of hypothyroidism pregnant women patients according to BMI.

BMI Range	Frequency	Percentage
18.5 (underweight)	6	20
18.5-24.9 (normal)	4	13.3
25-29.9 (obese grade I)	6	20
30-40 (obese grade II)	12	40
40 (obese grade III)	2	6.6
Total	30	100

Table-2 shows that 13.3 percent of hypothyroidism pregnant women were normal BMI, 20 percent pregnant women were underweight and obese grade 1 is 20 percent, and grade II were 40 percent patients and obese grade III were 6.6 percent. Escobar G *et al.* (2007) A 50% increase in iodine intake is recommended in order for pregnant women to produce enough thyroid hormones to meet fetal requirements. A lack of iodine in the diet may result in the mother becoming iodine deficient, and subsequently the fetus. The mother and the fetus, however, respond differently to this situation, with the mother remaining euthyroid and fetus becoming hypothyroid.

Diet and Nutrient intake

Table 3: Distribution of hypothyroidism pregnant women according to the food habits.

Food habits	Frequency	Percentage
Vegetarian	12	40
Non-Vegetarian	10	33.3
Eggetarian	8	26.6
Total	30	100

Table 3- study shows that majority number of respondents 40 percent were vegetarian, 33.3 percent were non-vegetarian and 26.6 percent were eggetarian.

Table 4: Average daily nutrients intake of hypothyroidism pregnant women.

RDA	Reference value of pregnant women	Average intake of nutrients of pregnant women	Difference between ranges of pregnant women	Percentage of pregnant women
Energy(kcal)	3200	2100	-1,100	152.38
Protein(g)	78	55	-23	141.81
Fat(g)	30	20	-10	150
Calcium(mg)	1200	600	-600	200
Iron(mg)	35	21	-14	166.66
Retinol(µg)	800	600	-200	133.33

Source- ICMR, (2010)

Table 4- shows six the average nutrients intake of all nutrients with reference to energy, protein, fat, calcium, iron, and retinol compared to the RDA given by the ICMR (2010). According to RDA energy intake 3200 and 152.38 percent is consumed by the hypothyroidism pregnant women which shows that they intake energy in low amount,
similarly protein intake percent is 141.81 which means that protein intake in the hypothyroidism pregnant women is less, the fat intake is also less in the diet of the hypothyroidism pregnant women the fat percentage is 150, calcium intake is also very low it is only 200 percent, the iron intake is less in the hypothyroidism pregnant women's diet is the percentage is 166.66 and retinol is 133.33 percent is very less respectively. Jorgensen T *et al* (2018) Lack of education among pregnant women was associated with a twofold increased risk of iodine deficiency and goiter rate was found to be higher among illiterate than literate ones. A study in Denmark found lower occurrence of goiter among participants with higher education level.

Table 5: Distribution of hypothyroidism pregnant women according to the food consumption frequency

Food group	Daily		Occasionally		Never	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Cereals	30	100	-	-	-	-
Pulses	16	53.33	10	33.33	4	13.33
Milk & Milk products	10	33.33	14	46.66	6	20
GLVs	12	40	14	46.66	4	13.33
Roots & tubers	25	83.33	5	16.66	-	-

Fruits	6	20	10	33.33	14	46.66
Meat & Poultry	4	13.33	11	36.66	15	50
Fats & Oils	30	100	-	-	-	-
Sugars	30	100	-	-	-	-

Table 5 shows that the food consumed daily by all respondents included cereals, pulses, milk and milk products, green leafy vegetables, roots and tubers, fruits, meat and poultry, fats and oils and sugar. Regarding the consumption of cereals, it was found that all respondent consumed cereals daily by 100 percent. Pulses were consumed daily by 53.33 percent, occasionally 33.33 percent and some respondent never intake the pulses by 13.33 Percent respectively .Milk and milk products were consumed daily by 33.33 percent, occasionally 46.66 percent and some respondent never intake the milk by 20 percent respectively.

Green leafy vegetables were consumed daily by 40 percent, occasionally 46.66 percent and some respondent never intake the milk by 13.33 percent respectively. Roots and tubers were consumed daily by 83.33 percent, occasionally 16.66 percent respectively. Fruits and vegetables were consumed daily by 20 percent, occasionally 33.33 percent and some respondent never intake the milk by 46.66 percent respectively. Meat and poultry were consumed daily by 13.33 percent, occasionally 36.66 percent and some respondent never intake the milk by 50 percent respectively. Fats and oils, sugars are consumed daily by 100 Percent.

WHO and UNICEF explained that iodine is an essential micronutrient and component of the thyroid hormones which play key roles in normal growth, development and metabolism. Insufficient iodine intake results in inadequate production of thyroid hormones which subsequently exerts effects on different organs and body systems and results in multiple adverse health effects collectively named as "iodine deficiency disorders (IDD)".

Table 6: Distribution of male and hypothyroidism pregnant women according to their clinical sign and symptoms.

Signs and Symptoms	Frequency	Percentage
Obesity		
Absent	8	26.66
Present	22	73.33
Swelling on the Face		
Absent	12	40
Present	18	60
Disease		
Carpal tunnel syndrome (hand tingling or pain).	12	40
Cold.	8	26.66
Low blood pressure	10	33.33
Eye		
Stare double vision	4	13.33
Difficulty in closing the eyes.	7	23.33
Watery eyes.	9	30
Dry eyes.	10	33.33
Tongue		
Furred	18	60
Light brown	12	40
Skin		
Scaly skin	12	40
Patchy and dry skin	10	33.33
Loss of hair	8	26.66

Table-6 shows that obesity was present 26.66 and it absent 73.33 percent and swelling on the face was present in 40 percent and absent. Disease like carpel tunnel syndrome (hand tintling or pain) was 40 percent, cold was 26.66 percent and low blood pressure was 33.33 percent respectively.In eye there was stare double vision was observed 13.33 percent and difficulty in closing the eyes were observed 23.33 percent. Watery and dry eyes was observed 30 percent and 33.33 percent. Furred tounge was observed 60 percent and light brown 40 percent respectively. Scaly skin and paddy dry skin was examined 40 percent and 33.33 percent respectively. Loss of hair was seemed 26.66 percent respectively.

Conclusion

This study provides, clinical symptoms, nutritional profile, and Consumption pattern among the hypothyroidism among pregnant women. India is facing a serious threat of under-nutrition where more than half of the women of reproductive age suffer from thyroid dysfunction. Having hypothyroidism can make feel exhausted and sluggish, and it can make it difficult to concentrate, among other things. Therefore, it is important to eat the right variety of foods in the correct proportions, a varied and healthy diet. For example, choose low fat, low calorie spread rather than butter or ordinary margarines avoid high salt intake and cut down on hidden fats & sugars (cakes, biscuits, chocolate) with calcium rich foods and / or supplements, and normal vitamin D levels. Along with the diet, it is recommended to all the women who already have known thyroid dysfunction should immediately go for thyroid function tests as soon as the pregnancy is confirmed. Careful monitoring of the medicine should be done during the course of pregnancy.

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