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Dietary Assessment of Healthy Pregnant and Lactating Women with Reference to Healthy Non-Pregnant, Non-Lactating (NPNL) Women Belonging to Low Socio –Economic Group

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Abstract:

The present hospital based diet survey study was carried on 395 pregnant, 195 lactating and 120 healthy non-pregnant, nonlactating (NPNL) women belonging to age group 20-45 years with low socio-economic background. The pregnant and the lactating women were taken from the antenatal clinic and the NPNL women were taken from other outpatient departments of the same hospital. The aim of the study was to compare the nutrient intake of the subjects with the revised Recommended Dietary Allowances (RDA) (2010) as recommended by the Indian Council of Medical Research (ICMR), Hyderabad, India. Any kind of nutritional deficiency during these two important physiological conditions can lead to increased chances for both maternal and infant mobidity and mortality. The diet survey was carried on using the 24-hour recall method. The result suggested that apart from the fat intake, the intake of all the other nutrients like proteins, energy, calcium and iron were found to be deficient among the pregnant and lactating subjects when compared with the RDA.

Keywords: Pregnant, Lactating, NPNL, RDA, ICMR, Diet survey

1. Introduction:

Diet surveys constitute an essential part of any complete study of the nutritional status of individuals or groups, providing essential information on nutrient intake levels, sources of nutrients, food habits and attitudes. The intake of all nutrients necessary and nutrition plays a very important role in the outcome of pregnancy. The nutrient supply to the foetus during pregnancy is a critical step that can affect the development , birth weight of the infant, development of the first few years of life which makes the foundation of the newborn strong enough to fight against different kind of infections and diseases. During these period of physiological stages of life a women needs an extra share of the best foods available to the family. She needs these foods right through two years of breastfeeding, not just in the first six months of exclusive breastfeeding. If a mother is severely malnourished, the quantity of breast milk produced for each feeding may be diminished. So adequate nutrition as per the suggestion of revised RDA by ICMR (2010) is very much required for well being of both the mother and child.

2. Aim

The aim of the study was to compare the nutrient intake of the subjects with the revised Recommended Dietary Allowances (2010).

3. Materials & Method

The diet survey was conducted among pregnant and lactating women attending the antenatal clinic of a city hospital serving the low socio-economic section of the society. The non-pregnant, non-lactating (NPNL) women were also selected randomly from other departments of the same hospital. The oral questionnaire method using the 24-hour recall of the previous day was applied to draw information regarding the food items normally consumed by the subject groups on a normal day. The interview for the previous day diet intake for the subjects under study was conducted during their outpatient clinic visit at the hospital. This method of diet survey was selected because it took less time and enabled to cover a larger number of subjects in comparison to other known methods of diet survey.

Dietary recall for the previous day food intake included all the food items which were eaten from early morning till the subjects under study went to bed (breakfast, mid morning snacks, lunch, mid afternoon, tea snacks, dinner , bed time snack). The food intake was estimated with help of different sizes of measuring cups (25g, 50g,100g, 250g) and teaspoons. The information of food intakes in breakfast, lunch, evening snacks and dinner was noted by the investigator of the study in a Proforma (**Annexure-1**) carefully which was prepared with prior consultation. Intake of food items or snacks in between the major meals was also accounted. The diet recall was conducted to get a clear picture of the previous day regular diet intake by the subjects under study and whether the diet was met the requirements as specified by revised Recommended Dietary Allowances (RDA) by ICMR $(2010)^{(1)}$. The subjects were made understood in their local language regarding the importance of their actual or approximate reply to the asked questions related to their previous day food intake. The subjects were categorized into insufficient and sufficient Iodine intake groups on the basis of their Median Urinary Iodine Concentration (MUIC)⁽²⁾ (µg/l).

• Note: No diet recall was done on subject, who had a fasting, or a ritual or any special festivity or occasion at her place the previous day or two in her home.

3.1. Diet Calculation

The analysis of the diet of the subjects under study had been done with the help of data published by ICMR (the Nutritive Value of the Indian food by C. Gopalan-1995)⁽³⁾. The revised Recommended Dietary Allowance (ICMR-2010) was applied in case of the study subjects. The nutrients such as protein (gm), energy (kcal), fat (gm), calcium (mg) and iron (mg) of the various food items consumed were calculated.

Group	Protein (g/d)	Fat (g/d)		Energy (Kcal)	Calcium (mg/d)	Iron (mg/d)	Iodine (µg/d)
Woman	55	20	Sedentary worker	1900	600	21	150
		25	Moderate worker	2230			
		30	Heavy worker	2850			
Pregnant woman	55+23=78	30		+350	1200	35	200
Lactating woman (0-6 m)	55+19=74	30		+600	1200	21	200

4. Result & Discussion

 Table 1a: Revised Recommended Dietary Allowances (ICMR-2010) for Normal Adult, Pregnant & Lactating Woman Source: Nutrient Requirements and Recommended Dietary Allowances for Indians –ICMR, 2010

Groups of subjects	Mean Protein Intake (g/d)	Mean Fat Intake (g/d)	Mean Energy Intake (Kcal)	Mean Calcium Intake (mg/d)	Mean Iron Intake (mg/d)
1) Insufficient Iodine Intake NPNL	52	38	2050	455	19
Woman N=7	(55)	(20)	(1900)	(600)	(21)
2)Adequate Iodine Intake NPNL	58	45	2203	650	23
Woman N=113	(55)	(20)	(1900)	(600)	(21)
3) Insufficient Iodine Intake Pregnant	55	39	1972	551	23
Woman N=175	(78)	(30)	(2250)	(1200)	(35)
4) Adequate Iodine Intake Pregnant	65	43	2293	935	29
Woman N=220	(78)	(30)	(2250)	(1200)	(35)

5) Insufficient Iodine Intake Lactating	52	40	2340	587	19
Woman	(74)	(30)	(2500)	(1200)	(21)
N=45					
6) Adequate Iodine Intake Lactating	65	45	2385	983	23
Woman	(74)	(30)	(2500)	(1200)	(21)
N=150					

 Table 1b: Mean daily dietary intake of different nutrients by the Control (NPNL), Pregnant and Lactating subjects

 *The numbers in the () indicate the RDA by ICMR-2010. Most of the study subjects were sedentary worker so the values of the adult woman were that of the sedentary worker.

Note: The subjects were classified into different groups on the basis of their Median Urinary Iodine Concentration MUIC ($\mu g/l$).

Qualifications	No. & % of NPNL women	No. & % of Pregnant women	No. & % of Lactating women
No formal education	2 (2%)	13 (3%)	6 (3%)
Elementary schooling	7 (6%)	154 (39%)	20 (10%)
High school	63(52 %)	162 (41%)	138 (71%)
Graduation	36 (30%)	57 (14.5%)	24 (12%)
Post Graduation	12(10%)	9(2%)	7(4%)
Total	120	395	195

Table 2: Percentage Distribution of Education of Pregnant, Lactating and NPNL Women

From the Table 1b & 2 the following observations were derived:

4.1. Group 1: Insufficient Iodine Intake NPNL women

The insufficient iodine intake NPNL women were found to consume less than what was recommended by the ICMR- Recommended Dietary Allowances. Other than the mean energy and fat intake all the nutrient intake was less than desired. The women of this group were found to consume more than adequate energy mainly through rice, puffed rice, rice flakes because rice is the staple cereal of people living in West Bengal. The intake of protein was found to be less than the daily recommendation of 55 gm and mainly second class in nature. The intake of first class protein sources such as fish, poultry, red meat, liver, shell fish was restricted due to their high cost. Intake of pulses in form of thin dals, dried beans, peas, gram flour was common. Eggs were consumed as a cheap source of first class animal protein. The intake of fat was almost double that of the recommended 20gm per day. Mustard oil formed the main source of fat intake. Other sources of fat such as butter, margarine, vanaspati or other variety of oils were not included in daily diet due to monetary constraints and family dietary choices. The calcium and iron intakes were also lesser than the requirement because milk and milk products such as paneer, cheena, sweets were not included in a daily basis. Milk intolerance was a common feature but home set curd was consumed by many subjects due to its beneficial effects. Intakes of green leafy vegetables and other vegetables were found to be adequate but the techniques of cooking them was found to be faulty. Iron rich food items such as eggs, liver, mix sprouts, dried fruits were avoided due to high cost. Intake of seasonal fresh fruits was rare which made diet deficient in Vitamin C and hence poor absorption of iron from diet. The iodine intake for healthy control is 150µg/day but it was seen that this group of NPNL women ingested inadequate amount of iodine as reflected by their MUIC (<100µg/l) hence they were categorized as insufficient iodine intake group..

4.2. Group 2: Adequate Iodine Intake NPNL women

The adequate iodine intake NPNL women were found to consume nutrients as per recommended by the ICMR- Recommended Dietary Allowances.

Intake of all the nutrients was found to be a little more than recommendation. Their fat intake was more than double ie 45g. The women in this group consumed mainly rice and rice products, dals and its products, included fair amounts of animal proteins such as fish, poultry, eggs (avoided red meat due to high cost), consumed curd or thin salted lassi (called ghol) and at times ate chenna or sweets prepared from them. Due to milk intolerance milk in its original form was avoided by the women of this group. Use of mustard and soyabean oil was found to be common. Intake of green leafy vegetables and other vegetables was found to be adequate along with intake of seasonal fruits (such as guava, banana, papaya, pummelo, lemon) as a result this group of women did not have iron inadequacy. The iodine intake was found to be greater than recommendation of $150\mu g/day$ as the women of this group had a MUIC > $100\mu g/l$.

The literacy level of the NPNL women was found to be 52% (n=63) who had been to high school, 2% (n=2) with no formal education and 40% (n=48) had completed their college education.

4.3. Group 3: Insufficient Iodine Intake Pregnant women

The protein intake of this group was found to be 23g less than the recommended 78g/d. Other than fat (39gm) intake all the other nutrients like energy (1972 kcal), calcium (551mg) and iron (23mg) were deficient in their diet. It was observed that the women of this group mainly included second class protein in their diet such as rice, thin dals, lentil, beans, grams and ate fish or poultry in very small amounts. Eggs were included but not regularly. Even intake of rice, rice products and other sources of cereals which form the main source of energy was found to less than the recommendation. Strong aversion towards milk prevented the women in this group from consuming milk. Other milk products such as paneer, cheena sweets etc which are good sources of calcium were consumed on special occasions. At times home set curd was consumed so calcium deficiency was a common feature among the pregnant women of this group. Intakes of green leafy vegetables, other vegetables and seasonal fruits rich in vitamins especially vitamin c which helps in iron absorption was not included adequately in the daily diet. The daily iodine intake of the pregnant women was less than their requirement of $200\mu g/d$ as reflected by the MUIC which was $<150\mu g/l$.

4.4. Group 4: Adequate Iodine Intake Pregnant women

The pregnant women of this group were found to consume adequate amounts of energy, fat and iodine but their mean daily intake of the other essential nutrient like protein, calcium and iron was less than the ICMR- recommendation. The main reason behind inadequate intake of protein like first class animal protein could be attributed to the high cost of these products but still fish and eggs were consumed by this group of pregnant women along with pulses and lentils. Milk was consumed in form of curd, sandesh or chenna as very few subjects could digest milk as it caused flatulence in them. Intake of green leafy vegetables, other vegetable and seasonal fruits were included but could not make up for the daily requirements of iron. The pregnant women of this group had adequate iodine intake ie 200μ g/d as their MUIC was >150 μ g/l.

4.5. Group 5: Insufficient Iodine Intake Lactating women

Almost a 22g of protein deficiency was observed in the diet of this lactating women group. There were marginal deficiencies of energy and iron but the calcium intake was just half of the recommendation. Out of all the nutrients only the fat intake was found to be greater than the daily requirement by the lactating subjects. The primary source of protein in daily diet for this group of lactating women was found to be pulses, lentils, dried beans and peas along with besan and sattu. Animal proteins were included especially different types of fish but in very small amounts. Liver, mutton, poultry, other variety of sea fish rich in protein and iodine were avoided due to their high cost. Eggs were included on a regular basis. Milk and milk products were not included adequately due to monetary constraints as well as ignorance and lack of information regarding importance of nutritious diet during pregnancy and later during breastfeeding. Green leafy vegetables and other vegetables were consumed inadequately along with fresh fruits. Food taboos and myths were quite prevalent so plantain flower and stem were consumed with belief that they provided good amounts of iron. Inadequate iodine intake ie $<200\mu g/d$ resulted in their insufficient MUIC which was $<100\mu g/l$.

Almost 41% (162) and 39% (154) subjects had completed their high school and elementary education.

4.6. Group 6: Adequate Iodine Intake Lactating women

The protein, energy and calcium intakes of this group of lactating women were found to be better than the insufficient iodine group lactating women but still found to be deficient in the above mentioned nutrients other than fat, iron and iodine which were adequately met as per the RDA by ICMR. The lactating women consumed animal proteins in form of fish, poultry, eggs and different types of pulse and pulse products. Milk and milk products were regularly included o provide calcium. Fresh vegetables and fruits were included on a daily basis. This group did not have iodine deficiency as they were categorized on the basis of their MUIC (μ g/l). 71% (n=138) subjects had high school education.

According to Buzzard, I. M et al (1996)⁽⁴⁾ Casey, P. H. et al (1999)⁽⁵⁾- the 24-hour dietary recall is conducted by interview, in person or by telephone where the respondent is asked to remember and report all the foods and beverages consumed in the preceding 24 hours or in the preceding day.

Srinivasan and Tara (1989)⁽⁶⁾- found that women are generally vulnerable to under-nutrition especially during pregnancy and lactation as the food and nutrient requirements are greater during that period.

Chatterjee (1989)⁽⁷⁾-observed that in the traditional Indian household a women's access to foods were even more restricted through taboos and ritual observances during pregnancy. Apart from that socio-economic factors also determined the extent of nutritional status of a women.

Chatterjee (1990) ⁽⁸⁾-advocated that maternal education had a significant influence on nutritional status. The negative effects of malnutrition among women are compounded by heavy work demands and poverty. Similarly Dharma lingam et al. (2009) ⁽⁹⁾-indicated that the impact of Nutritional Status of mother is more pervasive than the impact of other factors on birth weight of their newborn. Jood et al (2002) ⁽¹⁰⁾-found that the dietary intake of rural pregnant women was lower than the recommended level. Rao KM et al.(2010)⁽¹¹⁾⁻found that there is a paucity of information on diet and nutritional status of women including non pregnant non-lactating (NPNL), pregnant and lactating women (less than12 month of lactation). The authors conducted a survey and found that the intake of all the foods except for other vegetables and roots and tubers was lower than the suggested level among rural as well as tribal women. The intakes of all the nutrients were lower than the recommended levels suggested by ICMR in all the physiological groups in both the areas. The deficit in protein and energy intake was more among pregnant and lactating women, when compared to NPNL women in both tribal and rural areas.

5. Conclusion

From time immemorial it has been recognized that the pregnant and lactating women form one of the most nutritionally vulnerable segments of the population; the ill effects of maternal under nutrition affect not only the mother but also her offspring. From the present study it was observed that the pregnant and the lactating women consumed deficient amounts of protein, energy, calcium and iron except fat intake when compared with the revised RDA. The studied subjects had low purchasing power as they belonged to the low socio-economic strata of the society so consumption of expensive nutritional food items like sea fish, milk, yoghurt, eggs, liver, fruits etc was restricted.

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PROFORMA- (Dietary Intake Recall Sheet) ANNEXURE-1

Name: Age: Years; Occupation: Housewife Employed
Address: Contact no.
Pregnant Lactating Control
Trimester: First Second Third
LMP: EDD:

• Assessment of food consumption by the subjects under study on the previous day of recall (24-hour recall method)

Times of meal/day	FOOD ITEMS CONSUMED
Morning tea	
Breakfast	
Mid-morning snacks	
Lunch	
Mid-afternoon	
Tea time	
Evening snacks	
Dinner	
Bed time	

(Specify if any other food item has been consumed outside home)