SERUM ZINC STATUS OF THE PREGNANT WOMEN (3RD TRIMESTER) FROM LOW AND HIGH INCOME GROUPS

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ABSTRACT

Maternal nutritional status is an important factor in determining the outcome of pregnancy. A sample of 80 women in the 3rd trimester of pregnancy were taken for the study. The number of pregnancies, still births and abortions were more in Low income group pregnant women. Rice was the main staple diet and consumption of protein rich and protective foods was less irrespective of the income group. Similarly nutrient intake by all the pregnant women was less than the recommended allowance with the deficit ranging from 10 to 75% for various nutrients. Dietary Zn levels were better in HIG women than (7.01 mg% and 63.24 ug%) LIG women (5.9 mg% and 53.67 ug%) but, both the groups were not meeting the normal levels. Positive correlation was found between serum Zn levels and calories, protein, Vit. C, iron and Zn in the diet. Hence, consumption of the above nutrients, increases the serum Zn levels. The results suggested that the majority of the pregnant women were below the ideal body weight and suffering from protein malnutrition.

The study reveals the problem of illiteracy, ignorance, poverty on the Zn status and pregnancy outcome due to inadequate food intake and improper selection of food. Hence, poor nutrient intake and low serum Zn profile of these pregnant women irrespective of income group further strengthens the need for supplementation of iron and Zn and to establish norms for supplementation to improve the status of pregnant women and outcome of pregnancy.

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INTRODUCTION

Women during pregnancy are generally believed to be nutritionally at risk. There are obvious energy and nutrient costs arising not only from enlargement of the maternal reproductive tissues and the deposition of a substantial energy reserve in the form of fat. Severe maternal malnutrition in early pregnancy is known to impair the linear growth and weight gain of foetus (Evans and Leonard, 1976).

The relationship between nutrition and reproduction however, begins at an early stage. Maternal status is an important factor in determining the outcome of pregnancy. Intra-uterine growth retardation is a known complication of maternal malnutrition. The increased requirements for most nutrients that are imposed by pregnancy may add to the risk of deficiency of trace elements. Zinc is an essential nutrient required for normal development and growth. The deficiency of zinc was associated with poor reproductive performance. Pregnancy is often accompanied by decreased concentrations of zinc in blood plasma particularly during the late months. Although the cause is not known, it appears likely that the needs of the foetus and placenta are largely responsible (Hurley et al 1968).

Zinc nutriture during pregnancy is of particular concern because it is important for the development of central nervous system and other organic systems of the foetus. The requirements for Zn increases with pregnancy and adverse effects of Zinc deficiency during gestation have been documented in experimental animals. For example, a severe restriction of dietary Zn during embryogenesis in rats caused severe congenital malformations and fetal death (Hurley and Swenerton, 1966). Anemia, growth retardation, congenital malformations, prematurity and abnormalities of labour have been associated with zinc deficiency (Jameson, 1976). Strong association of low zinc levels with the incidence of pregnancy induced hypertension (PIH) was reported (Cherry et al 1981). Low serum Zn concentration during mid pregnancy was associated with increased risk of intrapartum hemorrhage (O'Dell et al 1977). Simmer et al (1985) reported that maternal Zn depletion was associated with altered differential production of prostaglandins in human leucocytes.

In theory, congenital abnormalities associated with fetal Zn deficiency could result from extrinsic factors such as inadequate maternal intake or poor bioavailability of dietary Zn. Despite these theoretical considerations, bolstered by some experience in attempting to document the Zn status of the various populations based survey of human Zn status that have been performed and reliability of the estimates of prevalence of deficiency are limited. The literature contains few studies of this type leaving us to assess the community epidemiology of Zn deficiency prevalence.

METHODOLOGY

For the purpose of the study pregnant women in their 3rd trimester were selected on every alternative day from Government, Maternity Hospital and Private Nursing homes located in Tirupati town. The family income of above Rs. 2500/- per month were considered as high income group and less than 1500/- per month were considered as low income group (Hudco 1985). A total of 80 pregnant women (3rd trimester)

were studied out of which 40 each from high and low income groups.

The data was collected from each pregnant woman by means of an interview schedule. General information on type and size of family, educational status, source of income and type of work were collected. The questions pertaining to food likes and dislikes, frequency of food consumption, order of pregnancy, parity, age at pregnancy were also included. Food intake was collected by using 24 hour dietary intake and recall method, and standardisation of foods was done in the laboratory before collecting the data, and the nutritive values of diets was calculated (Gopalan et al 1989). Information regarding anthropometric data, general health status and complication during pregnancy were also collected. 3-5 ml of blood samples were drawn from each pregnant women at the time of interview, to assess the serum zinc levels by using a standard procedure described by Butrimovitz and Purdy (1977).

The collected information was statistically analysed by applying suitable tests such as Z test, coefficient of correlation (r).

RESULTS AND DISCUSSION

The increased requirements for most nutrients that are imposed by pregnancy may add to the risk of trace elements deficiencies, but with the exception of iron, data on the trace element nutritional status during pregnancy are limited. Hence, a study has been undertaken to determine the Zn status of pregnant women.

Hindus comprise a large percentage in this study. Out of 80 pregnant women 84% were Hindus and remaining were Muslims (12%) and Christians (4%), 62% of the women were living in joint family system with more than 6 members in the family, 50% of the sample was from high income group with an average family income of above Rs.3,500/- per month and the remaining sample was from low income group having an average family income of Rs: 850/- per month.

In case of women from the low income group (LIG), 80% of the income was spent for food whereas women from high income group (HIG) spent 49% of their income on food.

The increase in number of pregnancies has an affect on the nutritional status of the pregnant women. From the present sample, it was noted that average number of pregnancies were more (3) in LIG pregnant women. Large percentage (64%) of pregnant women from HIG were in the first or second order of pregnancy. It was found that still births and abortions were more in the LIG pregnant women. This may be due to poor food intake and heavy work even during the third trimester of pregnancy.

FOOD CONSUMPTION PATTERN

Rice was the staple food for the women from both income groups. Consumption of protein rich foods and protective foods by the women were less than the requirement in both the groups. Intake of cereals, pulses and vegetables by the women from LIG was 200g, 15g and 50g / day respectively, whereas the intake of above foods by the women from HIG was 250g, 45g, and 125g. The consumption of zinc rich foods such as meat, egg, dhal, nuts were better in the latter group than the former group.

Along with the consumption of poor quality diet, the prevailing food beliefs had a strong hold on the nutritional status of the pregnant women. Food like egg, guava, chicken, papaya, certain green vegetables are not consumed by the pregnant women, due to the fear of abortion, fits, heat and cold in the body. The beliefs were not income based and observed in both the groups.

NUTRIENT INTAKE

Pregnant women are considered to be a vulnerable group of the population, hence attention of the present study has been focussed on the nutrient of these women.

Table 1 reveals the nutrient intake of the pregnant women in relation to their income. The nutrient intake of both groups were below the recommended values. Though the diet is mainly cereal based, the percent deficit of calories on an average for both income groups was 41%. Due to low consumption of protein rich and protective foods, the essential nutrients for fetal growth such as proteins, iron, calcium, zinc, Vit.A, Vit.C are much below the requirement. In case of pregnant women from HIG except for proteins and calcium where the percent deficit was only 10% for all the other nutrients the deficit was above 60%. Whereas for the pregnant women from LIG, except for protein (34%), the percent deficit for all the nutrients was above 65%. Many factors like social, economic and cultural play an important role in determining the nutrient intake of these women. Data suggested that almost 70-80% of their diet was cereal based, and 70-74% of total calories were from carbohydrates. Therefore, almost all the pregnant women, irrespective of their income, are consuming protein and protective foods less than the requirements. The studies of Mittal et al (1982) are in

Table 1
Average nutrient intake of the pregnant women in
relation to income groups

S.No.	Nutrient	High income	Low income	RDA	Percent deficit (%)	
					High income	Low income
1.	Calories (KCal)	1945±137	1569+128	3000	35.16	47
2.	Proteins (g)	49±4	36±3	55	10.9	34
3.	Calcium (mg)	0.9±0.2	0.3±0.15	1.0	10	70
4.	Iron (mg)	10.5±2.1	10±2.3	30	66	66
5.	Zinc (mg)	8±1.2	6±1.1	20	10	70
6.	Carotene (ug)	1642±348	1165	4600	64	74
7.	Vit.C (mg)	105±11.3	63±9.8	50	-	-
8.	Fiber	3.6±1.7	2.9±1.2	25	83	86

accordance with the results of the present study.

ZINC STATUS OF THE PREGNANT WOMEN

There is increasing evidence that maternal zinc deficiency is teratogenic (Hurley, 1968). Studies indicate that children born to mothers with low serum Zn levels showed low birth weight. Hence, serum Zn status of the

vegetarians, whereas the values were 5.9 mg% and 53.67 ug% in pregnant vegetarians; though they did not differ significantly. The above results suggest that the Zn status was affected by pregnancy more than by ovalacto vegetarian dietary habits. These findings were also supported by King et al (1984).

It was also observed that dietary Zn intake is lower than the recommended intakes

Table II
Average serum Zn values in the pregnant women

S.No.	Income	Observed value (ug/100 ml)	Normal Value (ug/100 ml)	Percent deficit
1.	High	67.49 + 8.65	140	51.9
2.	Low	57.95 + 8.84	140	58.6

pregnant women in their 3rd trimester was estimated by using atomic absorption spectrometer.

The serum Zn levels of LIG pregnant women was 57.95 ug/100 ml and HIG pregnant women was 67.5 ug/100 ml serum (Table II). The serum Zn levels were less than normal value 140 ug/100 ml. The percent deficit for both groups was 51.9 and 58.6 respectively.

The comparison of the dietary and serum Zn levels amongst pregnant women of the two income groups consuming vegetarian and non vegetarian foods revealed that dietary and serum Zn values were 7.01 mg% and 63.24 ug% respectively in pregnant non-

and it correlates highly with the serum Zn levels. When the dietary Zn intake was 5.95 mg% the serum Zn level was 52.95 ug% and similarly when the dietary Zn intake was 7.85 mg%, the serum Zn level increased to 67.49 ug%. Hence, supplementation of Zn to the pregnant women improves the serum Zn levels and thereby fetal growth and pregnancy outcome.

When the coefficient of correlation was applied to find out relationship between dietary nutrients and serum Zn levels. The serum Zn level were positively correlated with the nutrients like calories, zinc, iron and Vit.C and negatively correlated with calcium and fiber content in the diet. Swanson

and King (1983) also reported similar findings and found that decreased serum albumin levels and increased serum calcium level were associated with low serum zinc levels.

ANTHROPOMETRIC DATA OF THE PREGNANT WOMEN

The pregnancy being an important period for both mother and foetus, comparison of weight for age values with regional standards will help to determine the degree of under-weight in a community.

The mean weights and heights of the pregnant women were given in Table III. The Anderson's formula was used to calculate weight from height an index of nutritional status.

According to Gopalan (1984) 20-35% of women in their active reproductive age (20-30 years) weigh less than 38 kg and 12 to 25% of women were shorter than 145 cm. Though in the present sample, women in the 3rd trimester had the body weights of 55 kg (HIG) and 47 kg (LIG). The pregnant women irrespective of income group were below the ideal body weight due to inadequate food intake which inturn results in low serum albumin, iron and Zn levels during critical stage of pregnancy.

Anemia, hypertension, edema, anorexia were the major health problems in the pregnant women irrespective of their socio-economic

Table III
Average heights, weights and ideal body weights of the pregnant women.

S.No.	Income	Mean height (cm)	Mean weight (kg)	Ideal body weight	Number of Pregnant			Percent deficit (%)
					Normal I.B. (kg)	Below I.B. (kg)	Above I.B. (kg)	
1.	High	165	55	69	19	17	4	20.3
2.	Low	155	47	59	32	38	-	20.4

From the table, it is clear that the majority (38) of the LIG pregnant women were below the ideal body weight with the percent deficit of 20. In case of HIG pregnant women, 17 were below the ideal body weight with the percent deficit of 20 and the remaining were maintaining the body weight. The results suggest that large number of LIG pregnant women were suffering from different grades of malnutrition.

status. 66% of high and 80% low income pregnant women were suffering from anemia due to ignorance and inadequate food intake.

CONCLUSION

In conclusion, the greatest health risks the women face are in their reproductive years. In developing countries, they face the problem of illiteracy, ignorance, poverty and low birth weight of infants. Hence,

this study further strengthens the need for supplementation of Zn during pregnancy which lessens the incidence of abortions, still births, anemia and poor fetal outcome.

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