IMPACT OF MATERNAL NUTRITIONAL STATUS ON OUTCOME OF PREGNANCY

BY

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I hereby declare that this dissertation
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CERTIFICATE II

This is to certify that the dissertation entitled "IMPACT OF MATERNAL NUTRITIONAL STATUS ON OUTCOME OF PREGNANCY" submitted by Ms.MADHAVI SHASHIKANT DANDEGAONKAR to the Marathwada Agricultural University in partial fulfilment of the requirements for the degree of MASTER OF SCIENCE (Home Science) in the subject of FOODS AND NUTRITION has been approved by the student's advisory committee after oral examination in collaboration with the external examiner.

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CONTENTS

INTRODUCTION

1. INTRODUCTION

Pregnancy is a period of physical changes and high nutritional demands. During pregnancy the mother has to meet her own needs and the needs of the growing foetus. The physical and mental health of the mother,before and during pregnancy has profound effects on the status of her infant in utereus and at birth.

An undernourished women is at increased risk for giving birth to a low birth weight baby who faces greater mortality risks. In India maternal mortality rates are 400 to 500 per cent 100,100 live births. There are "more deaths in India (from causes related to pregnancy and child birth) in one week than there are in the whole of Europe in one year" (WHO, 1990).

A number of factors have the influence on pregnancy outcome such as economic and educational status of mother, age of the mother, parity, spacing between pregnancy, weight gain during pregnancy, duration of gestation, weight and height of pregnant women, haemoglobin level of blood, obsteterical history and maternal nutrition. Perinatal mortality and morbidity are greater amoung high birth order infants of mothers whose pregnancies have come in rapid succession. The chances of having a low birth weight infant is also greater when past pregnancy performance is poor.

It is observed that the pregnant women belonging to poor educational level have low nutritional status (Agrawal *et al.*, 1980). A positive correlation between nutritional status of the pregnant women and income level of the family has also been reported by several workers, (Devadas *et al.*, 1978; Agarwal *et al.* 1980; Leela Ramen,1981).

Taller women tend to have babies who are larger than those delivered by shorter women (Niswander and Garden, 1972-73). Similarly among the women of similar height, the heavier mothers deliver babies who are larger than those of lighter mothers.

The relationship between maternal body mass and birth weight has been known for several decades (Beilly and Kulanol, 1945). However, only recently its importance to the outcome of pregnancy has been properly recognised. The maternal weight and weight/height^2 were the most sensitive indicators of interauterine malnutrition.

Adequate weight gain during pregnancy and normal weight are associated with adequate infant birth weight. The desirable weight gain throughout the gestation period is about 10 to 12 kg. But in India it is much less than that found in the developed countries. Most women belonging to the lower socio-economic strata gain around 3 to 5 kg as against 10 kg in the case of the more affluent women, which results in maternal mortality and low birth weight infant.

Anaemia is common during pregnancy. It is generally because of iron deficiency (Chanarin *et al.*, 1965; Sharma *et al.*, 1970). Pregnant women are more susceptible to develop anaemia, not only because of extra demand of the growing foetus, but also due to deficient diet, gastrointestinal disorders, pre-pregnant health status, infestation and disturbed metabolism. In India more than 50 per cent of women during the third trimester of pregnancy have a haemoglobin level of less than 11 g/dl. (WHO, 1990).

Diet during pregnancy is one of the most important factor in acihieving a successful outcome of pregnancy in terms of healthy baby and maintenance of her own health, various studies have revealed a direct relationship between maternal diet the nutritional status of the new born. (Ebbs *et al.*, 1941; Hanumanthrao, 1972; NIN, 1980).

The result of several nutritional studies indicated that the diet of pregnant women in India is inadequate both in quantity and quality (Prema, 1978; Devadas and Kaur *et al.*, 1982); Eshwaran 1986; . In many parts of India food fads and faulty food habits, such as craving and aversions are commonly experienced by pregnant women. All such things lead to inadequate diet which is harmful for the pregnant women, as it influences directly on the outcome of pregnancy.

A very meagre information is available on factors affecting the outcome of pregnancy of Marathwada region. Hence, the present study is undertaken to know the impact of maternal nutritional status on the outcome of pregnancy with following objectives.

Objectives:

1. To assess the health and nutritional status of selected pregnant women of third trimester by anthropometric measurements.
2. To estimate the haemoglobin level in blood of selected pregnant women of third trimester.
3. To find out pack cell volume and red blood cell count of the blood of selected pregnant women.
4. To evaluate the food and nutrient intake of the selected pregnant women of third trimester and
5. To find out the impact of maternal nutritional status on the outcome of pregnancy.

REVIEW OF LITERATURE

2 REVIEW OF LITERATURE

2.1 Studies on nutritional status of pregnant women

2.1.1 Anthropometry

Ghosh *et al.* (1977) reported 42.8 per cent incidence of low birth weight babies in mothers with height less than 140 cm. Even Bhati *et al.* (1985) noticed a relationship between low birth weight with maternal weight - height indices.

Meera Rao (1980) reported that the mean height of pregnant women was 153.1 cm. ranging from 143-163 cm. Most of the women were in the third trimester of pregnancy and weighed 46 to 60 Kg.

Jansen *et al.* (1984) conducted a study on 1739 rural African pregnant women. Mean height of pregnant woemen was 157.1 ± 5.5 cm. and weight gain between the three months and term was 5.8 kg.

Mameesh *et al.* (1985) carried out study on maternal anthropometric and socio-economic parameters associated with birth size, the result indicated that the maternal weight and height were significantly correlated to birth size of infant.

Ardhapurkar (1990) found that the mean values of body weight and height of pregnant women of above poverty line group was more than that of pregnant women of below poverty line group.

Naeye (1980) conducted a study on maternal body weight and pregnancy outcome, he found that perinatal mortality rates pregressively increased from 37 to 1000 in offspring of thin subjects to 121 of 1000 in the offspring of obese subject ($P < 0.001$), also found that nearly half of this mortality increase was due to preterm delivery perticularly before 31 weeks of gestation.

2.1.2 Biochemical examinations

Dabke *et al.* (1972) studied the 300 anaemic and 50 non anaemic mother's they found that serum iron, red blood cell count and haematological status of the newborn were not affected by maternal anaemia.

Devadas *et al.* (1978) conducted a study on the blood haemoglobin content of pregnant women. They found that the mean haemoglobin level of poorly fed group was 8.89 g. per 100 ml of blood. Among the group of poorly fed 76 per cent registered haemoglobin level less than 10 g. while only 24 per cent registered less than 10 g. in well fed group with mean value 10.8 g per 100 ml of the blood.

Kuizon *et al.* (1978) studied the biochemical assessment of the nutritional status of 252 pregnant Filipions and found that in the first, second and third trimestrs mean haemoglobin level was 12.28, 11.42 and 10.85 g. per 100 ml. of the blood respectively. 31.4, 31.1 and 50 per cent of pregnant women were anaemic in the

first, second and third trimester respectively. Difference in haemoglobin level was significant between all three trimester.

Nath and Girvani (1978) reported that the percentage incidence of all nutrient deficiencies was much hgiher in thrid trimester than the second trimester particularly anaemic.

Devi *et al.* (1980) stated that only 10 per cent of pregnant women had haemoglobin level 10 g., 3 percent women had serum iron level 5 ug per cent and 27.2 per cent subjects had pack cell volume above 100, these appair to suffer from magaloblastic anaemia.

Foreman (1981) found that the incidence of iron deficiency anaemia was most commonly encountered in pregnant women and the next most common was megaloblastic anaemia resulting from folic acid deficiency.

Kaur *et al.* (1982) reported that the average haemoglobin levels of sub-urban expectant mothers of low, middle and high incocme group were 8.61, 9.35 and 10.47 g. respectively. The haemoglobin level of expectant mothers of high income group was significantly higher ($P < 0.05$) than that of low and middle income group.

Vijayalakshmi and Deveki (1983) found that haemoglobin level in the expectant mother of low income group was only 9.94 g./100 ml. against 10.29 g./100 ml. registered by the middle income group.

Vijayalaskhmi *et al.* (1988) stated that the mean haemoglobin levels of pregnant women was 10.52, 10.74 and 10.86 g./100 ml. in low, middle and high income group respectively.

Ardhapurkar (1990) reported that the blood haemoglobin level of selected pregnant women of Parbhani city was varied from 5.49 - 13.07 g./100 ml. with mean of 8.76 g./100 ml. All the selected pregnant women were found to be anaemic as their blood haemoglobin level was <10g/100 ml.She also reported a positive correlation between family income and blood haemogobin level and educational level and blood haemoglobin level of the pregnant women.

A study conducted by Dudde (1990) revealed that more than 20 per cent of the selected rural pregnant women were anaemic. Family income and educational level of pregnant women were the two factors which have altered haemoglobin content in blood significantly.

Kadam and Rohini Devi (1990) studied the nutritional status of pregnant women during different trimester of pregnancy, when the haemoglobin level was compared between experimental and control group, it was observed that control group had significantly higher haemoglobin levels (12.99 ± 0.45%) as compared to those with first, second and thrid trimester of pregnancy (9.83

± 0.25 to 10.12 ± 0.25%). The variation in haemoglobin levels according to the trimester of pregnancy was not statistically significant.

Serfass and Liu (1983) found the mean values for haemoglobin, red blood cell count and pack cell volume in pregnant women were 10 per cent less than that of non-pregnant women ($P < 0.05$) in the last trimester of pregnancy.

Letsky (1985) reported that the normal blood volume of a non-pregnant women of 4000 ml gradually increased up to 5500 ml during pregnancy. These affected the constituents of blood of pregnant women and lead to anaemic condition.

Dutta (1987) reported that the red cell and plasma volume of pregnant women was increased to the extent of 18-20 and 40 per cent during pregnancy.

Kadam and Rohini Devi (1990) found that the red blood cell count in pregnant women (3.50 ± 0.16 to 3.54 ± 0.16 m/mm^3) and the pack cell volume in the pregnant women were in therange of 28.85 ± 0.80 to 30.24 ± 0.80 per cent which were significantly lesser than the volume reported in non-pregnant women (37.00 ± 1.46%).

2.1.3 Food and nutrient intake

Nayer (1970) indicated that the diet of pregnant women was deficient in almost all essential nutrients. The

mean intake of calories by the pregnant women was around 1771 k.cal. per day whereas the intake of protein, iron, riboflavin, and vitamin 'A' was 42.5 g., 26 mg., 0.8 mg., and 2359 I.U. respectively.

Kuizon *et al.* (1978) conducted a study on 252 pregnant women of Filipions and found that the intake of different nutrients in the I, II and III trimester was 2370, 2417 and 2000 kilo calories of energy, 79.4, 79.1 and 68.1 g. of protein, 13.35 and 11 mg of iron and 0.83, 0.70 and 0.47 g. of calcium per day respectively.

Nath and Geervani (1978) reported that the diet of pregnant women was grossly inadequate in protective foods. Major portion of the diet of pregnant women in low income group of urban areas consisted, only of cereals and legumes.

Six hundred and fifty expectant mother's in the third trimester of pregnancy were studied by Devadas *et al.* (1978) indicated that mean nutrient intake of the pregnant women of high income group was almost adequate, while it was grossly inadequate in low income group.

The annual report of NIN (1980) indicated that the diets of pregnant women belonging to low income group provided 1400 to 1600 kilo calories per day as compaired to the RDA of 2500 kilo calories per day.

Dietary intake of urban and rural 184 pregnant women, 95 lactating and 20 non-pregnant, non-lactating vegetarian women were studied by Bhatia *et al.* (1981) they found that the diet of pregnant women were inadequate in calories, calcium, retinol and riboflavin as compared to the RDA of ICMR recommendations.

Kaur *et al.* (1982) found that vegetable, pulses and energy giving foods were the most limiting food stuffs and energy was the real limiting nutrient in the diet of pregnant women. They also found that there was definite effect of family income on consumption of pulses, milk, and milk product, fats and oils sugar and jaggery as the family income of the pregnant women increased foood stuffs from above food group were consumed in large quantities. Income and educational status of spouse had a bearing effect on nutrient intake of pregnant women.

Vijayalakshmi and Shobana (1982) reported that the diet of expectant mothers were high in cereals and pulses, but they were low in protein rich and protective foods. The diet was also deficient in proteins, calories, iron, vitamin 'A' and folic acid.

Vijayalakshmi and Deviki (1983) stated that the diet consumed by the expectant mothers of the low income group were deficient in all the nutrients. The precentage of deficit was ranging from eight per cent to sixty three per cent.

Vijayalakshmi and Devadas (1985) studied 845 poorly fed and 691 well fed mother's. Result indicated that the nutrient intake was grossly inadequate with respect to all the nutrient, for the poorly fed mother's. While it was inadequate slightly (-5) only in energy in the well fed group.

Devadas and Eashwaran (1986) reported that the diet of pregnant women was 35 per cent deficient in energy, 30 per cent in iron and 38 per cent in protein. The diet was highest deficient in vitamin 'A' (62%).

The diet survey carried out among 38 per cent of pregnant women in rural Dharwad by Rao (1986) revealed that the intake of calories and all other nutrients except thiamin were found to be low in the diet of pregnant women as compaired to the recommended dietary allowances.

A study conducted by Rawtani and Varma (1989) reported that the diet of pregnant women was cereal based with small amount of milk, pulses, roots, tubers and other vegetables. Meat, fish, egg and leafy vegetables were were completely absent from their diet. They also found that consumption of calcium, carotein, niacin and ascorbic acid was inadequate in comparison to RDA of ICMR.

Ardhapurkar (1990) revealed that the intake of green leafy vegetables and energy rich foods like fats and oils, sugar and jaggery and cereals was markedly low in

the diet of pregnant women, also it was observed that the diet was deficient in important nutrient such as energy, protein, calcium, iron, riboflavin and niacin as compared to RDA (1989).

Dudde (1990) found that the wide variations in the intake of nutrients by the pregnant women of different trimesters. Energy, calcium and iron were the nutrients found to be grossly deficient in the diet of rural pregnant women as compared to the values of RDA of ICMR (1989).

Statistically significant difference was also noticed in the intake of different nutrients by the pregnant women of different socio-economic status.

Weigel *et al.* (1991) studied the dietary intake of pregnant women of third trimester in order to assess the effect of sociodemographic factors on food pattern and nutrient intake and the inter-relationships among prenatal nutrient intake. Result indicated that maternal educational was the factor, most strongly, followed by monthly per capita income.

Mean daily intake of energy, protein, phosphorus, ascorbic acid, retinol, thiamin, riboflavin and nicotinic acid met or exceeded the WHO recommended daily allowances. On the other hand, the intake of calcium and iron was below recommendations.

2.2 Studies on food fads and fallacies

Khanum and Umapati (1976) studied the food habits and belives among pregnant women in Mysore city, it was indicted that the primary foods avoided during pregnancy were papaya, eggs, sesamum and Jambo fruit, milk with Kasari was believed to improved babies complection hence, it was consumed as a special food druing pregnancy.

Vijayalakshmi and Devaki (1976) stated that nourishing food like groundnuts, jaggery, mango, fish milu, egg and fruits were avoided by expectant mother due to fear of absorption.

Vijayalakshmi *et al.* (1976) conducted a study on relationship between dit during pregnancy and nutritional status of new born. They found that non of the pregnant women included any special, food in the daily diet on the otherhand 25 pregnant women were perticular in avoiding certain foods like pumkin, ashgourd, jack fruit, cabbage, banana, blue baries for the following reasons.

Pumkin and ashgord were believed to be cold food, jack fruit, cabbage, banana and ashgourd were believed to be gas producing and blue baries as not good for the health of the baby.

Devdas *et al.* (1976) studied the food believes of well fed and poorly fed group of pregnant women. They found that the food believes of both the groups were more or less same. Barly water, saffron, fruit juice, milk and

flashy foods were the special food taken during pregnancy, Brinjal, gingelly seeds, egg, pineapple were the food avoided during pregnancy.

Agrawal *et al.* (1980) reported that 82.5 per cent of pregnant women were not avoided any food item during pregnancy while only 3.67 per cent avoided pumkin jack fruit, Bengal gram and peas because pain in abdomen.

Finely *et. al.* (1985) conducted a study on food choice of vegetarian and non vegetarian women during pregnancy and lactation. It was found that during pregnancy the intake of high protein foods, especially milk products was increased while the intake of coffee, tea and alcohol was decreased. The changes were perticularly based on food cravings.

2.3 Studies on factors affecting out come of pregnancy

2.3.1 Maternal age

Ghosh *et al.* (1970) reported that the per cent of infants with low-birth weight was more when the age of pregnant women was less than 20 years of age.

Mukherjee and Sethana (1970) stated that the mean birth weight of the babies was highest in the mother's age group of 40 + years and lowest in the 35-40 years of age group.

Taffells (1976) indicated that the poor outcome of pregnancy that is low-birth weight, high mortality and high morbidity was more frequent among teenager mother than among adult mother.

Idnani *et al.* (1979) reported that the incidence of low-birth weight babies (less than 2.5 Kg) was high in mother's below 20 years and above 36 years of age.

A study conducted by NIN (1980) revealed that the perinatal, neonatel and infant mortality rates were significantly higher in infants born to girls under 18 years of age both in urban and rural areas. Mortality rates were lowest among infants born to women between 20 to 29 years of age in urban women.

The study conducted by Aras *et al.* (1989) reported a direct relationship of low-birth weight with pregnancy at teenage ($P < 0.01$).

A study conducted by Simen *et al.* (1990) showed that children of pregnant women having a single pregnancy before the age of 20 were heavier as compared to the children born to the pregnant women who had more than one child during their adolescence.

2.3.2 Spacing between pregnancies

Mukherjee and Sethana (1970) conducted a study on 210 pregnant women of slum areas of Calcutta city. It was found that upto three years of spacing, the birth weight of infant was found to be increased. But when the interval between two pregnancies was >= 3 years the birth weight of the infants was found to be less when the spacing between pregnancies was less than 2 to 2 1/2 years.

Ghosh *et al.* (1977) indicated that the incidence of low-birth weight infant was least when the interval between two pregnancies was 2 and 3 years.

Nath and Geervani (1978) stated that the lack of spacing between children, increasing number of pregnancies and early pregnancy contributed to the poor nutritional status among pregnant women.

Ghai (1981) indicated that the incidence of low-birth weight infants was least, when spacing between the pregnancies was between 2 and 3 years.

Vijayalakshmi and Devadas (1985) found that the mean birth spacing between children inadequately fed group of mother's was only 11.2 months against 21.7 months in the well fed group of mother's.

Still births, miscarrages, neonatal death and infant mortality were more in the poorly fed mothers than that of well fed mothers.

2.3.3 Parity

Ghosh *et al.* (1970) reported that the per cent of low-birth weight infant was more among the primpara mothers than multipara mothers up to 6th parity.

Shah and Shah (1972) stated that the chances of delivering low-birth weight babies was increased in primipara mother's.

A study carried out by Puri *et al.* (1977) showed that increasing parity had better influence on birth weight, body length and chest circumference of new born upto third parity and after that retarding influence was observed.

Idnani *et al.* (1978) observed that the incidence of low-birth weight babies increases in the 5th para and above, and is also common in primipara.

Leela Raman (1981) reported that with increasing parity and income the average birth weight tends to increase. However in the upper income group, the difference between the birth weight in second, third and fourth parties were not significant.

2.3.4 Weight gain during pregnancy

Devada *et al.* (1970) revealed that, the poorly nourished pregnant women gained less body weight as compared to the better nourished pregnant women.

Swaminathan (1971) found that the mean gain in body weight during pregnancy in under nourished women ranged from 6.0 to 6.5 kg in India and other developing countries which is less than that (12.5 kg) reported for normal pregnant women in western countries.

Devadas *et al.* (1978) revealed that the total weight gain during pregnancy in the poorly fed and well fed groups of pregnant women was 6.8 kg. and 9.5 kg respectively.

Vijayalakshmi *et al.* (1978) reported that the weight gain during pregnancy in the low income expectant mother was 6.41 kg, while it was 7.33 kg and 8.33 kg among middle income group and high income group respectivley.

Naeye (1979) carried out a study on weight gain and the outcome of pregnancy. The women who were over weight at the begining of pregnancy had the fewest foetal and neonatal deaths, if they had a body weight gain of 16 pound at term. The optimum gain was for normally proportioned women 20 pound and for underweight women 30 pound. For all three groups perinatal mortality rates increased with body weight gain less or more than optimum.

Bhatt *et al.* (1979) conducted a study on the body weight gain of 476 vegetarian pregnant women in Bombay. They observed a significant relation between weight gain and birth weight of infant.

A longitudinal study on 357 pregnant women of Kenya in relation of outcome of pregnancy was studied by Kusin *et al.* (1979) revealed that the mean weight of pregnant women was 55.4, 55.5 and 57.6 kg at 3 to 4, 5 to 6 and 7 to 9 months of pregnancy respectively.

Shah and Shah (1979) observed that women low pre-pregnancy weight (238 kg) gain more weight during pregnancy eight (> 41 kg).

Prama (1981) indicated that the mean weight gain during pregnancy was 11 kg for women of upper income group. On the other hand, women from low income group gained body weight not more than 6 kg. during pregnancy.

The influence of weight gain during pregnancy underweight and at normal weight by Brown *et al.* (1981). The result indicatted that pregnancy weight status was not assiciated with the amount of weight gain during pregnancy. Under weight women as normal weight women delivered infants at a young gestational age and of lower birth weight and height. More than half of the infants born to under weight women failing to gain more than 9 kg during pregnancy weighed less than 2501 g.

Prama (1981) reported that in India, the upper income group of pregnant women weighed between 50-55 kg. Mean pregnancy weight gain was 11 kg. The mean birth weight of infant born to these women was 3.2 kg., while women from low income group weighted about 45 kg and gain no more than 6 kg weight during pregnancy. The mean birth weight of newborn in these group was 2.7 kg.

A study conducted by Vijayalakshmi and Shobana (1982) revealed that the pregnant women who were given folic acid and iron supplementation had gain the highest (5.68 ± 0.29) mean weight during pregnancy than that of controlled group of pregnant women (4.09 ± 0.22).

Gueri *et al.* (1982) indicated that the average increment of the weight during pregnancy was 20 per cent of the pre-pregnant weight. It was also observed that all the increments take more linearly during the second and third trimester of pregnancy.

Vijayalakshmi and Lakshmi (1985) reported that the pregnant women of high income group registered the highest weight gain of 10.87 kg as against 6.59 kg by middle income group and 4.43 kg by low income group.

Vijayalakshmi *et al.* (1988) found that the mean weight gain during pregnancy was 6.41, 7.37 and 8.33 kg in the pregnant women belonging to low, middle and high income group respectively.

Mitchell and Lerner (1989) revealed that there was a significant linear relationship between weight gain and birth weight in normal and over weight pregnancies. Birth weight of infants of overweight mothers were higher than those of normal weight women at each weight gain level. Sahani (1992) stated that the total weight gain in pregnant women from 3 to 9 months of pregnancy varied from 5 to 11 kg, with a mean value of 6.96 kg. Family income, pregnancy period and area exerted a marked effect on the weight gain in pregnancy.

MATERIALS AND METHODS

3. MATERIALS AND METHODS

The present study was undertaken to study the impact of maternal nutritional status on the outcome of pregnancy. The criteria chosen to assess the impact of maternal nutritional status were 1) measurement of anthropometric indices of pregnant women and new borns. 2) Biochemical examination of pregnant women. 3) Determination of maternal food consumption pattern and intake of food and nutrients per day.

3.1 Selecttion of sample

A total sample of one hunderd and fifty pregnant women of third trimester who were attending antenatal clinics at private nursing home from Parbhani town was randomly selected.

3.2 Collection of data

All selected pregnant women were personally interviewed by the investigator adminstering a pretested questionnaire to elicit the information regarding socio-economic status, obstetric history, ailments present during pregnancy, parity, maternal age, food consumption pattern and food avoide during pregnancy (Appendix I and II).

The pregnant women were grouped on the basis of their monthly family income in the three groups 1)Rs <= 2180 - < 3640 2) Rs. 3640 - 5100 3) Rs.>5100. This

grouping was based on calculated mean and SD values of family income of the pregnant women. First income group was done by deducting SD from mean value, second group and third group were formed wih mean value and mean plus SD value respectively.

3.3 Measurement of anthropomeric indices

The measurements were taken for heigh and weight of the selected pregnant women as per the standard procedure (Jelliff, 1966).

Height of the pregnant women was measured in standing position by means of a non-stretch steel tape to the nearest 0.1 cm.

A portable weighing machine was used to record the weight of the pregnant women to the nearest 0.1 kg (Appendix III).

Body mass index (BMI) of pregnant women was computed with the measurement of height in meter and body weight in kilograms using the formula

$$BMI = \frac{\text{Weight (Kg)}}{\text{Height cm}^2}$$

The height and weight of the new born were recorded to study the outcome of pregnancy. The weight of newborn was recorded in clinic with the help of beam type of scale and the height was recorded with the help of infantometer (Appendix IV).

3.4 Biochemical examination

3.4.1 Estimation of haemoglobin content of the blood

Haemoglobin content of the blood of all the selected pregnant women was estimated by Sahli's method.

3.4.2 Red Blood cell count of the blood

Red blood cell count of all the selected pregnant women was done by using haemocytometer (Hutchisen and Hunter, 1949).

3.4.3 Packed cell volume determination

Packed cell volume of all selected pregnant women of third trimester was determined by Wintrobe's method (Hutchinsen and Hunter, 1949).

3.5 Determination of food and nutrient intake

One tenth of the total sample (15 pregnant women) was randomly selected for assessing the food intake of the selected pregnant women. The food intake was assessed by "one day weighment method" (Marr, 1971). The weight of the raw edible food stuffs used to prepare the food for the family and the prepared foods were recorded for each meal in a prepared schedule (Appendix V).

All the items of a meal were weighed and served for each selected pregnant women on the day of assessment, the actual intake of cooked food for a day by the pregnant women was recorded and converted it into corresponding raw weights. The intake of different nutrients per day be the

pregnant women was then calculated from the food intake values using Nutritive Value of Indian foods (Gopalan *et al.*, 1989).

The average food/nutrient intake of the pregnant women per day was compared with recommended dietary allowances of (ICMR, 1981), and expressed in terms of per cent value of RDA.

3.6 Statistical analysis

Simple arithmetic means of percentage with standard deviation were calculated to interpret the results. Besides calculating the percentages, 'z' test was applied to find out the difference between two attributes (Panse and Sukhatme, 1985).

$$Z = \frac{x_1 - x_2}{\sqrt{\frac{(SD_1)^2}{n_1} + \frac{(SD_2)^2}{n_2}}}$$

Where,

x_1 = Mean for group I

x_2 = Mean for group II

SD_1 = Standard daviation for group I

SD_2 = Standard daviation for group II

n_1 = Number of observation of group I

n_2 = Number of observation of group II

Correlation regression analysis was done to find out the relation between maternal nutritional status and selected anthropometric measurements.

$$r = \frac{xy}{\sqrt{(x^2)(y^2)}}$$

Where,

x = Independent variable

y = dependent variable

RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

The present study was undertaken to find out the impact of maternal nutritional status on the outcome of pregnancy. Nutritional status of pregnant women of third trimester was assessed by recording anthropometric meaaurements, biochemical examination and by determining the intake of different foods and nutrients. The selected anthropometric measurements like weight (kg), height (cm) and head-circumference (cm) of infants were recorded to study the outcome of pregnancy. The collected data was analysed statistically and tabulated for discussion under various heads.

4.1 Socio-economic background of the selected pregnant women

Information regarding family income, educational level of pregnant women, type of family and food habits of selected pregnant women of third trimester is given in Table 1.

The surveyed pregnant women were divided into three groups on the basis of monthly income of the pregnant women.

Out of total samples of 150 pregnant women, 61 were belonged to the first income group (Rs. < 3640), 41 were grouped under second income group (Rs. 3640 to

Table 1. Socio-economic background of the selected pregnant women of third trimester

Socio-economic factors	Pregnant women	
	Number	Per cent
Family income		
1. Rs. <3640	81	54.0
2. Rs. 3640 - Rs.5100	41	27.3
3. Rs. >5100	28	18.7
Educational levels		
1. School education	94	62.6
2. College education	56	37.4
Type of family		
1. Joint	66	44.0
2. Nuclear	53	35.4
3. Extended	31	20.6
Food habits		
1. Vegetation	109	72.7
2. Non vegetation	41	27.3

Rs.5100) and the remaining 28 pregnant women were placed under third income group (Rs. > 5100).

Majority of the pregnant women (84) were school educated while 56 were college educated.

Among the selected pregnant women of third trimester 66 belonged to joint family and 53 and 31 belonged to nuclear and extended family respectively. According to food habits, 109 were vegetarian and the rest of them were nonvegetarians.

4.2 Ailments in the selected pregnant women

The ailments reported by the selected pregnant women of third trimester are presented in Table 2.

Body ache was the common ailment found in more than 60 per cent of the pregnant women, whereas, Jaundice (2.6%) was the ailment noticed to be present in the least number of pregnant women.

More than 50 per cent of pregnant women found to have high blood pressure and presence of infectious diseases. On the other hand, pain in calf muscle, odema, was reported by more than 40 per cent of pregnant women.

Other ailments such as sore mouth, loss of appetite, hyperacidity, constipation, burning feets were having 34, 39.3, 33.3, 33.3, 23.3,34.6 per cent respectively.

Table 2. Aliments of the selected pregnant women of third trimester

Aliments	Pregnant women	
	Number	Per cent
Odema	64	42.6
Sore mouth	51	34.0
Loss of appetite	59	39.3
Pain in calf muscles	63	42.0
Body ache	92	61.3
Hyper-acidity	50	33.3
Constipation	35	23.3
Burning feets	52	34.6
High blood Pressure	75	50.0
Presseence of infectious disease	78	52.0
Jaundice	4	2.6

These findings are in line with the result reported by Sahani (1992), who reported that body ache was the aliment reported by more per cent while Jaundice was the aliment found in least per cent of pregnant women of urban and rural areas of Parbhani city.

4.3 Obstetric history of the selected pregnant women

Obstetric history of the selected pregnant women of the third trimester is given in Table 3.

Out of the 150 pregnant women, 89 were a primigravida and the remaining 61 pregnant women were of multigravida.

The interval between two pregnancies was between 2 and 3 years in 49.9 per cent of the pregnant women. Only in 29.5 per cent of pregnant women, the interval between two pregnancies was more than 3 years, and in the remaining 21.6 per cent of pregnant women, the interval between pregnancies was less than 2 years.

Majority (75) of the pregnant women had > 20 years of age at first pregnancy and > 18 years of age at marriage.

Among the 150 pregnant women, 43 had the history of abortion and only four had the history of still birt babies. Caesarian delivery and histroy of bleeding during pregnancy was reported by 12 and four per cent of pregnant women respectively.

Table 3. Obstetrical history of the selected pregnant women of third trimester

Obstetrial history	Pregnant women	
	Number	Per cent
Primigravida	89	59.4
Multigravida	61	40.6
History of abortion	43	28.6
Still birth	4	2.6
Caesarian delivery	18	12.0
Intervals between : pregnancies		
a. < 2 years	13	21.6
b. 2 to 3 years	30	49.9
c. > 3 years	18	29.5
Bleeding during pregnancy	6	4.0

Out of total sample of 150 pregnant women 45 were having normal blood pressure of 120/80 m.m./Hg. While 30 were having blood pressure of less than normal level (Hypotension) and the remaining 75 were having blood pressure of above normal (Hypertension) level.

4.4 Anthropometric measurements of the selected pregnant women

Anthropometric measurements of the selected pregnant women of third trimester according to literacy level are given in Table 4 and depicted in figure 1.

Higher values were obtained for body weight (56 ± 5.4 Kg) and height (155 ± 4.9 cm) of the selected pregnant women belonging to collegee educated group, while a lower values for weight (54.9 ± 6.2 Kg) and height (153.5 ± 4.4 cm) of the pregnant women belonging to school educated group. In case of body weight of pregnant women statistical significant difference was obtained. The body mass index of the pregnant women of the school educated varied from 18.07 to 32 with an average value of 23 ± 2.2 while, in pregnant women belonging to college educated group the body mass index was 24 ± 3.1 with the range of 19.63 - 28.76. Body mass index in the pregnanant women of the college educated group (24.00) was significantly higher than that of the pregnant women of the school educated group (23.0).

Table 4. Anthropometric measurements of the selected pregnant women of third trimester according to literacy level

Anthropometric measurements	Literacy level of pregnant women				'Z' value
	School education		College education		
	Range	Mean ± SD	Range	Mean ± SD	
Height (cm)	140-165	153.5 ± 4.4	145-168	155 ± 4.9	1.8^{NS}
Weight (kg)	45-72	54.9 ± 6.2	39-65	56 ± 5.4	2.0*
Uterine height (cm)	28-34	31.5 ± 1.3	29-34	32 ± 1.1	2.6**
Body mass index (BMI)	18.07-32	23.0 ± 2.5	19.6-28.7	24 + 3.1	2.0*

* - Significant at 5%

** - Highly significant at 1%.

NS - Non significant

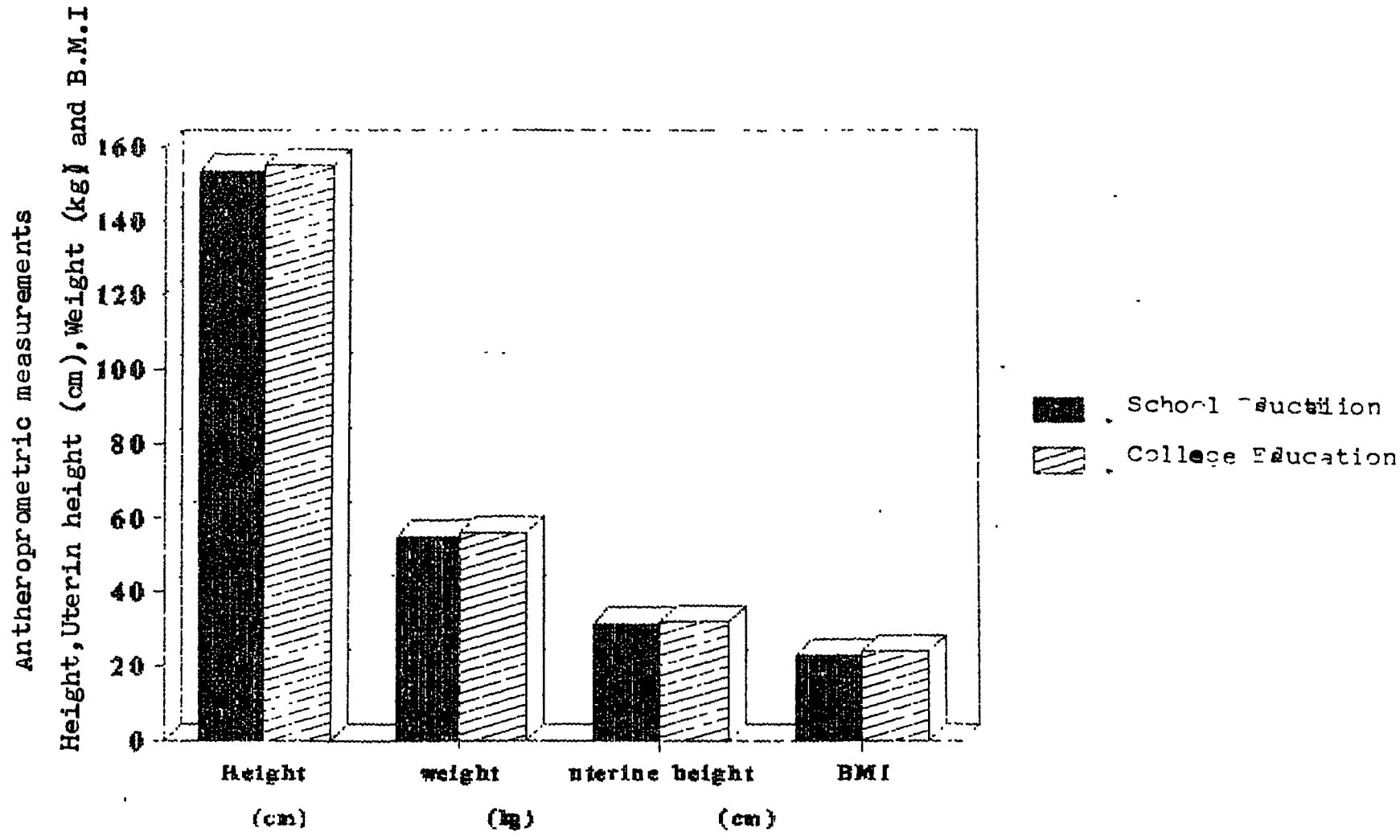


Fig.1 AVERAGE ANTHROPOMETRIC MEASUREMENTS OF SELECTED PREGNANT WOMEN ACCORDING TO LITERACY LEVEL

Uterine height of the pregnant women belonged to college educated was significantly higher than that of the pregnant women belonged to school educated group.

On the whole, it can be concluded from the result that the body weight, height, uterine height and body mass index of the pregnant women belonging to college educated group was more than that of school educated group.

From the result, it is evident that education level of the pregnant women exerted a marked effect on the body weight, uterine height and body mass index in the selected pregnant women of third trimester.

Anthropometric measurements of selected pregnant women according to income level are presented in Table 5 and figure 2.

A higher mean value for measurements like body weight, height and uterine height was noticed by the pregnant women belonging to thrid trimester income group than that of pregnant women of first income group. However, the difference was statistically not significant. In case of body mass index the values were higher in the pregnant women of third income group (23.9) than that of first income group (22.2) and second income group (23.8). Also the results were significant between first income group and third income group and first and tsecond income group of pregnant women.

Table 5. Anthropometric measurements of the selected pregnant women of third trimester according to income level

Anthropometric measurements	Income level					
	Group I (Rs. < 3640)		Group II (Rs. 3640 to Rs. 5100)		Group III (Rs. > 5100)	
	Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD
Height (cm)	140 - 160	153 ± 4.05	145 - 165	153.3 ± 4.30	148 - 168	155.7 ± 5.76
Weight (kg)	40 - 72	54.5 ± 6.61	39 - 65	54.0 ± 5.75	45 - 65	55.7 ± 6.0
Uterine height (cm)	28 - 34	31.4 ± 1.35	29 - 34	31.7 ± 1.35	29 - 34	31.9 ± 1.49
Body mass index (BMI)	17.9 - 32	22.2 ± 3.51	18 - 28.7	23.8 ± 2.34	19.3- 28.8	23.9 ± 3.00

Statistical comparisons between groups 'z' values

I vs II	0.24^{NS}	0.44^{NS}	1.04^{NS}	3.03^{**}
II vs III	1.5^{NS}	0.82^{NS}	0.20^{NS}	0.17^{NS}
III vs I	1.89^{NS}	0.93^{NS}	1.45^{NS}	2.56^{**}

* - Significant at 1%

** - Highly significant at 5%

NS - Non significant

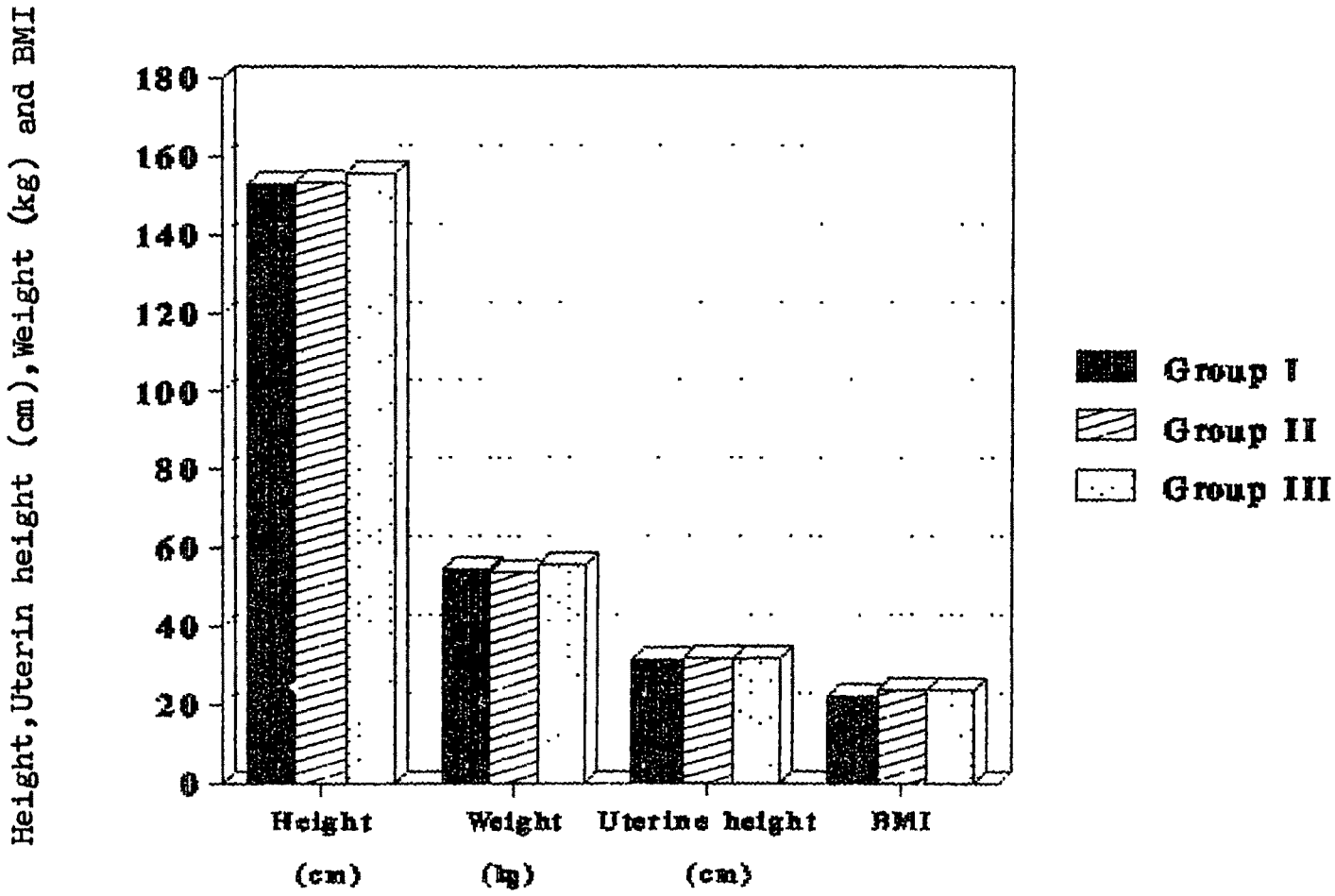


Fig.2 AVERAGE ANTHROPOMETRIC MEASUREMENTS OF SELECTED PREGNANT WOMEN ACCORDING TO INCOME LEVEL

The values recorded for uterine height of pregnant women by first, second and third income group were 31.4 ± 1.35, 31.7 ± 1.35, 31.9 ± 1.48 respectively. However, the difference was not significant.

From the above findings, it can be indicated that the income of the family exerted a significant effect only on body mass index of pregnant women in the present study. These findings are in line with the findings of Sahani (1992), who reported significant effect of family income on the body mass index of pregnant women of Parbhani districts.

4.5 Haemoglobin content in blood of the selected pregnant women

Mean blood haemoglobin level of the selected pregnant women according to literacy level is given in Table 6 and figure 3.

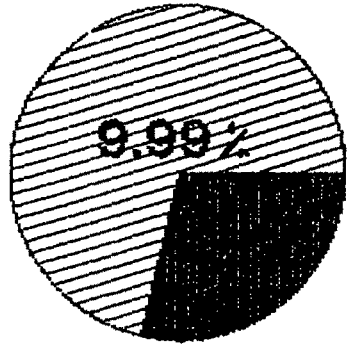
The haemoglobin content (g/dl) in blood of the pregnant women of school educated varied from 7 - 12.5 g/dl with mean value of 9.39 ± 1.4 whereas, the mean blood haemoglobin value in college educated pregnant women was 9.92 ± 1.6 g/dl with a range of 7 - 12.9 g/dl.

No significant difference was found between school educated and college educated pregnant women in blood haemoglobin levels.

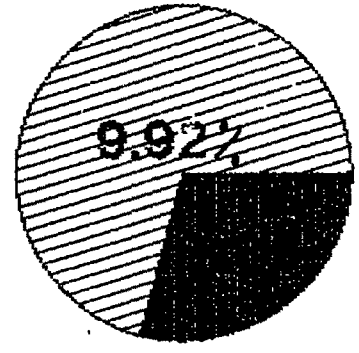
Table 6. Mean blood haemoglobin level of the selected pregnant women of third trimester according to literacy level

Literacy level	Number	Haemoglobin level in blood (g/dl)		't' value
		Range	Mean ± SD	
School education	94	7-12.5	9.39 ± 1.4	0.28[NS]
College education	56	7-12.9	9.92 ± 1.6	

NS = Not Significant



School Education



College Education

Fig.3 AVERAGE MEAN HAEMOGLOBIN LEVEL (g/dl) OF THE SELECTED PREGNANT WOMEN ACCORDING TO LITERACY LEVEL

In conclusion, it can be said that the haemoglobin content in blood of the pregnant women of school educated and college educated did not differe significantly. Even Sahani, (1992) did not find a significant difference in the haemoglobin content of pregnant women of different educational level.

Mean blood haemoglobin level of selected pregnant women according to income level is shown Table 7 and Figure 4.

Haemoglobin level in the blood of pregnant women of different income group varied widely from 7 - 12.9 g/dl. The average haemoglobin level of pregnant women was 9.38 ± 1.5 with a range of 7 - 12.5 g/dl. Mean haemoglobin value was 10.00 ± 1.4 and 10.20 ± 1.6 g/dl of pregnant women of second and third income group. The haemoglobin levels of blood in the pregnant women of first income group was significantly less than that in the blood of pregnant women belonged to second income group, also the haemoglobin levels in the blood of pregnant women of thrid income group was significantly higher than in the pregnant women of first income group.

On the whole, it can be said that the income of the family had significant effect on the haemoglobin content of blood. The results of this study are in line with the results of Kaur *et al.* (1982) and Sahani, (1992) who reported a significant difference in the haemoglobin content of blood of the pregnant women of high income group and low income group.

Table 7. Mean blood haemoglobin level of the selected pregnant women according to income level

Income group	Haemoglobin level in blood (g/dl)	
	Range	Mean ± SD
1) Group I (Rs. < 3640)	7 - 12.5	9.88 ± 1.5
2) Group II (Rs.3640 to 5100)	8 - 12.5	10.00 ± 1.4
3) Group III (Rs. > 5100)	7 - 12.8	10.20 ± 1.6

Statistical comparisons between groups ('z' value)

I vs II	2.29^{*}
II vs III	0.54^{NS}
III vs I	2.41^{*}

* - Significant at 1 %

NS - Non significant

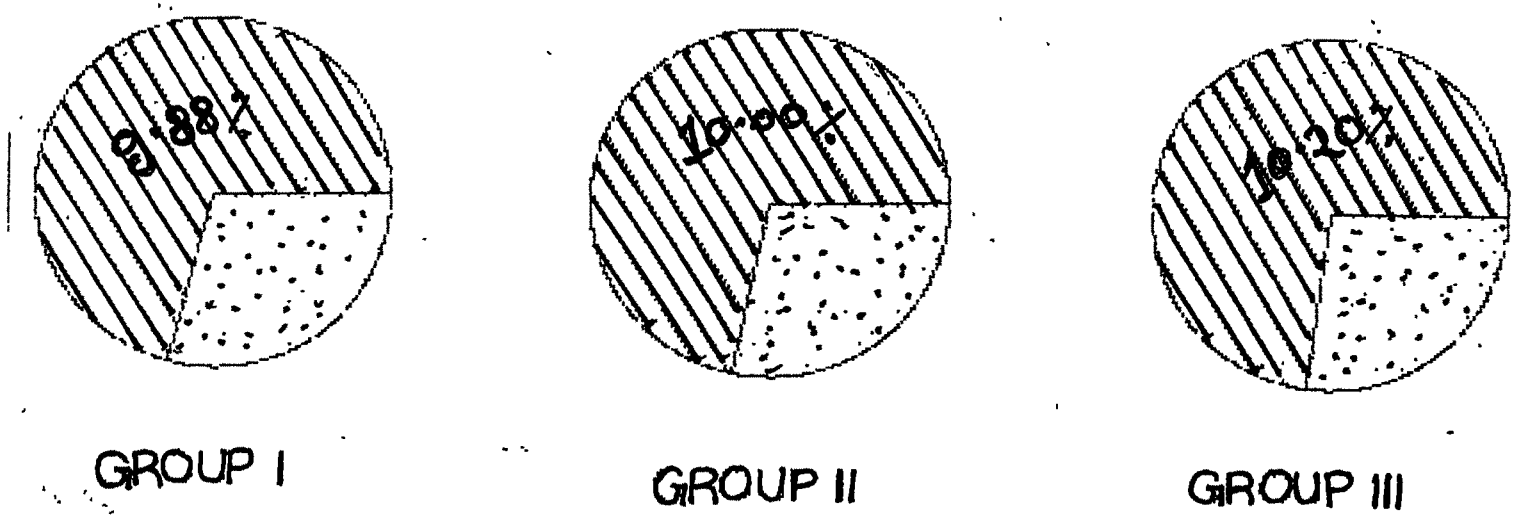


Fig 4. Average Haemoglobin Level of Selected Pregnant Women According To Income Level

4.6 Prevalence of anaemia among the selected pregnant women

The mean values of selected constituents of blood of pregnant women is presented in Table 8.

The mean haemoglobin level of blood of selected pregnant women of third trimester was ranging from 7 to 12.9 g/dl with a mean value of 9.61 ± 1.5 g/dl. The obtained values for haemoglobin was found less than that of normal haemoglobin level of pregnant women.

Mean pack cell volume (%) and red blood cell count (millimicron/cu.m.m.) of selected pregnant women was 34.70 ± 7.6 and 4.45 ± 0.43 respectively. The value for packed cell volume recorded was below the normal values while the red blood cell count was more than that of normal values.

On the whole it can be indicated that the haemoglobin and pack cell volume of selected pregnant women was less in comparison with normal values. On the other hand, the red blood cell count was more than that of normal values of pregnant women.

Prevalence of varying degrees of anaemia among the selected pregnant women is presented in Table 9 and figure 5.

More than 50 per cent of pregnant women had moderate degree of anaemia while 21.3 per cent of pregnant women had mild degree of anaemia. None of the selected

Table 6. The mean values of selected constituents of blood of pregnant women

Blood constituents	Range	Mean + SD	Normal values
Haemoglobin (g/dl)	7-12.9	9.61 ± 1.5	> 11
Packed cell volume (%)	20-54	34.70 ± 7.6	37 - 47
Red blood cell count (mili micron/cu mm)	3.2 - 5.6	4.45 ± 0.43	4 - 5.5

Table 9. Prevalence of varying degrees of anaemia among the selected pregnant women of thrid trimester

Sr. No.	Degree of anaemia	Pregnant women	
		Number	Per cent
1	Normal (> 11)	40	26.7
2	Mild (< 11 to 10)	32	21.3
3	Moderate (< 10 to 7)	78	52.0
4	Severe (< 7)	-	-

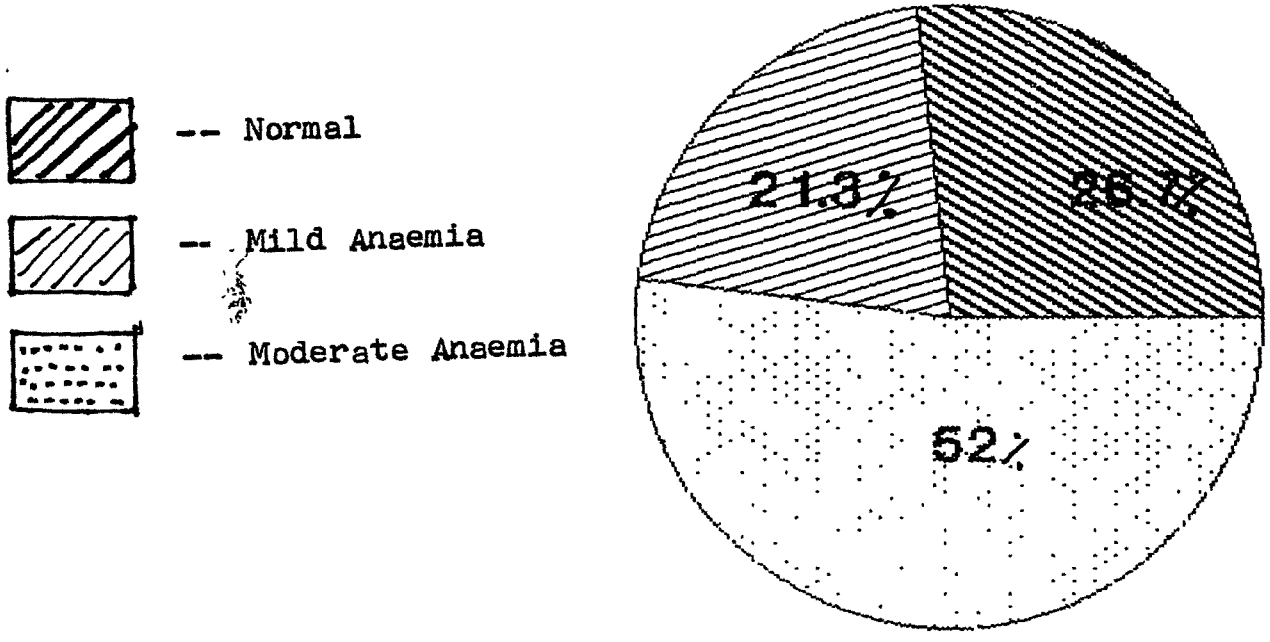


Fig.5 PREVALENCE OF VARYING DEGREE OF ANAEMIA AMONG PREGNANT WOMEN ACCORDING TO HAEMOGLOBIN CONTENT IN BLOOD (g/dl).

pregnant women had severe degrees of anaemia, this may be due to intake of iron supplementation during pregnancy. As it was found in present study that more than 90 per cent of pregnant women were taking iron supplement.

It is evident from the result, that about 75 per cent of pregnant women had some or other degrees of anaemia.

The surveys carried out in various parts of India revealed that 60 to 70 per cent of pregnant women were having anaemia in third trimester of pregnancy (NIN, 1975). In the present study 75 per cent of pregnant women were anaemic.

4.7 Dietary pattern of the selected pregnant women

Meal pattern of the selected pregnant women is given in Table 10.

Number of meals in a day consumed by the pregnant women of the present study, varied from 2 to 4 per day.

Majority (65.4%) of the pregnant women were following three meal pattern. On the other hand, 17.3 per cent each were following two meal pattern and four meal pattern respectivelly.

All surveyed pregnant women were generally consumed poha, upma, usal,bread, sheera and tea or milk for breakfast, chapati or Jowar roti and rice with vegetable, dhal and salad for lunch and dinner.

Table 10. Meal pattern of selected pregnant women of third trimester

Sr. No.	Meal pattern	Pregnant women	
		Number	Per cent
1	Two meal pattern	26	17.3
2	Three meal pattern	98	65.4
3	Four meal pattern	26	17.3

The pregnant women were having mixed cereals (wheat and rice) in their diet. These findings are in line with findings reported by Vijayalakshmi and Lakshmi (1982), Dudde, (1990) and Sahani, (1992).

4.8 Food and nutrient intake of the selected pregnant women in thrid trimester

Average food intake of different foods per day by the selected pregnant women is recorded in Table 11 with SD values and shown in figure 6.

Consumption of pulses, other vegetables, roots and tubers, milk and milk products, fats and oils by the pregnant women was more than the values of recommended dietary allowances of ICMR (Gopalan *et al.*, 1981). On the other hand, the intake of cereals, sugar and jaggery and leafy vegetables was less than the values of recommended dietary allowances.

From the above result, it is evident that the diet of the pregnant women was inadequate in the intake of energy rich foods and protective foods like cereals, pulses and leafy vegetables respectively.

The values obtained in the present study for the intake of different foods were found to be higher than that reported by Ardhapurkar (1990), and Sahani (1992), of pregnant women of Parbhani city.

Table 11. Average food intake (g) of the selected pregnant women of third trimester

Sr. No.	Food stuffs (g)	Mean ± SD	Food intake as Per cent of RDA
1	Cereals	345 ± 48.4	77
2	Pulses	61 ± 13.3	111
3	Leafy vegetables	85 ± 28.4	85
4	Other vegetables	87.3 ± 21.4	218
5	Roots and tubers	51 ± 23.2	102
6	Milk and milk products	240 ± 74.2	120
7	Sugar and jaggery	21.2 ± 4.5	53
8	Fats and oil	51.2 ± 14.2	256

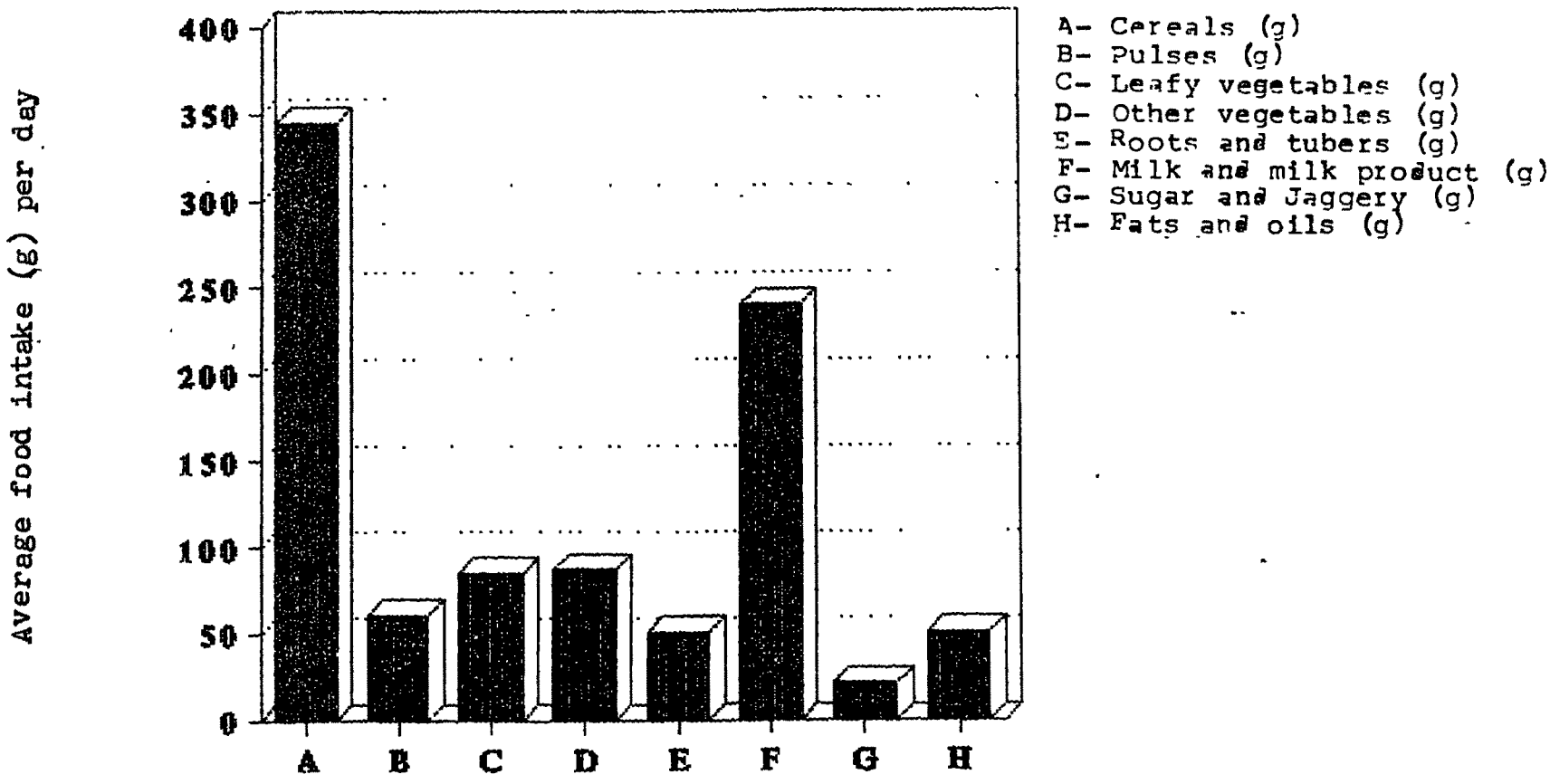


Fig.6 AVERAGE FOOD INTAKE PER DAY BY THE SELECTED PREGNANT WOMEN

Average nutrient intake of different nutrients per day by the selected sedentary working pregnant women is presented in Table 12 with SD values and depicted in figure 7 in comparison to the recommended dietary allowances of ICMR (1981).

Dietary intake of calories (k.cal), protein(g), calcium (mg) and iron (mg) by the pregnant women was 1985 ± 350, 55 ± 9.3, 817 ± 160 and 15.4 ± 7.4 respectively.

Consumption of calories, protein, calcium and iron by the pregnant women was found to be less than the values of recommended dietary allowances. But the intake of vitamins, like B carotein, thiamin, riboflavin and vitamin 'c' were consumed in more amount than the recommended dietary allowances.

Among the nutrients the iron was noticed to be deficient to a great extend.

On the whole, it was found that the intake of important nutrients like calcium and iron was inadequate in the diet of the selected pregnant women. The results are in line with the findings reported by Madhunath and Geervani,(1978); Hereberg *et al.* (1987) and Ardharpurkar, (1990). Information regarding foods avoided during pregnancy is presented in Table 13.

More than 50 per cent of pregnant women were avoiding some or other foods for various reasons.

Table 12 .Average nutrient intake of the selected pregnant women of third trimester

Sr. No.	Nutrients (g)	Mean ± SD	Nutritional intake as per cent of RDA
1	Calories (k.cal)	1965 ± 350	78
2	Protein (g)	55 ± 9.3	73
3	Calcium (mg)	817 ± 160	82
4	Iron (mg)	15.4 ± 7.4	40
5	B carotin (ug)	3117 ± 2340	130
6	Thiamin (mg)	1.61 ± 0.7	12
7	Ribofluvin (mg)	1.52 ± 0.4	101
8	Niacin (mg)	17.6 ± 4.2	110
9	Vitamin `C' (mg)	48.7 ± 6.3	122

Table 13. Reasons for avoiding foods during pregnancy by the selected pregnant women of third trimester

Sr. No.	Food stuffs	Reasons for avoiding	Per cent pregnant women
1	Milk	Nausea and vomiting	10 (15)
2	Oily foods	Nausea and heavy for digestion	6.6 (10)
3	Banana	Cold and cough	13.3 (20)
4	Egg	Hot food	6.6 (10)
5	Papaya	Abortion and hot food	30 (45)
6	Leafy vegetables	Nausea and intolerence	6.6 (10)
7	Sweet foods	Heavy for digestion	10 (15)
8	Meat and meat produots	Hot food	8 (12)
9	Curd	Cold and cough	10 (15)
10	Spicy food	Hot and acidic food	6.6 (10)

Figures in parentheses indicates the number of pregnant women.

A higher per cent (30) of pregnant women avoided the consumption of papaya during pregnancy because it leads to abortion and also it was considered as hot food.

Consumption of curd and banana was avoided by 10 and 13.3 per cent of pregnant women because of fears of geting cough and cold.

Ten per cent of pregnant women were found to avoid milk and sweet foods as it leads to nausea, vomitings and heavy digestion.

Oily foods, leafy vegetables, spicy foods, egg were avoided (6.6) by similar percentage of the pregnant women because it was considered as hot food, and heavy for digestion and also leads to nausea and acidity.

On the whole, it can be said that more than 50 per cent of the pregnant women in the present study were found to avoid some or other foods for various reasons.

Similar findings are reported by Kahanum and Umapati, (1976) of pregnant women of Mysore city.

4.9 Correlation between maternal factors and outcome of pregnancy

Out of the 150 pregnant women majority of pregnant (125) women had normal delivery. Only 25 had caesarian delivery.

The mean weight (kg), height (cm), and head-circumference (Cm) of infant of 150 pregnant women were 2.57 ± 0.73, 43.68 ± 4.31, and 28.69 ± 2.09 respectively. The correlation and regression coefficient of family income with selected anthropometric parameters of infant of selected pregnant women is given in Table 14.

The mean weight of infants of pregnant women of three income groups was 2.50, 2.79 and 2.84 kg., respectively. It was found that as income increased weight of the infant also increased. Statistically it was observed that there was a positive correlation between family income and weight of the infant. The regression analysis revealed that with an increase of Rs. 509.25 in the family income the weight of the infant was increased by one kg.

The mean height of infants of pregnant women belonging to three income levels was 43.21, 44 and 45.45 cm., respectively. The corresponding values for head-circumference was 28.40, 28.46 and 28.65 cm. Though there was slight elevation in the height and head-circumference of infant with an increase in the family income of pregnant women, statistically it was not significant.

On the whole, it can be said that the weight of the infant of pregnant women slightly increased with the raise in the family income, similar positive correlations have been observed by Mukherjee and Sethna (1970).

Table 14.Correlation and regression coefficient of family income with selected anthropometric parameters of infants of selected pregnant women

Parameters	Monthly income level (Rs.) of families of pregnant women			
	Rs.<3640	3640-5100	> 5100	'r' value
	Mean	Mean	Mean	
Weight of infant (kg)	2.50	2.79	2.84 ($\hat{y}$=2378.81 + 509.25x)	0.25*
Height of infant (cm)	43.21	44.00	45.45	0.11
Head-circumference of infant (cm)	28.40	28.46	28.65	0.10

Equation in parentheses indicates regression analysis

Effect of maternal literacy level on selected anthropometric measurements of infants is present in Table 15.

It is observed that the mean values of all the selected anthropometric measurements of infants of college educated mothers were more than that of infants of school educated mothers. However, no significant difference was found between weight (kg.), height (cm.) and head-circumference (cm) of infants and educational status of mother.

Effect of spacing between two pregnancies of pregnant women on the anthropometric measurments of infants is presented in Table 16.

The mean weight of infants of pregnant women belonging to three groups of spacing was 2.48, 2.54 and 2.60 kg. respectively.

There was a slight elevation in the weight of infant with an years of spacing between pregnancies, but statistically it was not signficant.

The mean height of the infants of three groups was 44.2, 45.08 and 47.73 cm. respectively. A statistically significant difference was notice between first and third groups of pregnant women. Also in case of head-circumference significant difference was found between pregnant women belonging to first and third group of spacing.

Table 15 Effect of maternal literacy level on the selected anthropometric measurements of infants

Parameters	Maternal educational status		'z' value
	School Mean + SD	College Mean + SD	
Weight of infant (kg)	2.49 ± 0.79	2.88 ± 0.73	0.15^{NS}
Height of infant (cm)	43.72 ± 4.32	44.09 ± 4.45	0.50^{NS}
Head-circumference of infant (cm)	28.28 ± 2.06	28.63 ± 2.10	1.78^{NS}

NS - Not Significant

Table 16. Effect of spacing between two pregnancies on the selected anthropometric measurement of infants

Sr. No.	Intervals between pregnancies	Weight of infant (kg.) Mean±SD	Height of infant (cm.) Mean±SD	Head-circum-ference (cm.) Mean±SD
1	1 to 2 yrs.	2.48 ± 0.86	44.2 ± 4.71	28.2 ± 2.26
2	2 to 3 yrs.	2.54 ± 0.97	45.08 ± 4.74	29.08 ± 1.83
3	> 3 yrs.	2.60 ± 0.88	47.73 ± 3.82	30.09 ± 2.08
Statistical analysis between groups 'z' values				
	I vs II	1.21^{NS}	0.57^{NS}	1.29^{NS}
	II vs III	0.23^{NS}	1.74^{NS}	1.65^{NS}
	I vs III	0.40^{NS}	2.24^{*}	2.39^{*}

NS - Not signficant

* - Significant at 1 %

On the whole, it can be said that significant difference was found in height and head-circumference of infants of pregnant women who was having one to two years and more than three years spacing between two pregnancies. The results are in line with the findings of Mukherjee and Sethna, (1970).

Correlation and regression coefficient of gestational age, parity and maternal age with selected anthropometric parameters of the infants of selected pregnant women are given in Table 17.

The mean weight of infants of pregnant women with gestational age below and above 38 weeks was 2.60 and 2.82 respectively.

Statistically it was observed that there was a positive correlation between gestational age and weight of the infant, which indicates that as the gestational age increased the weight of the infant also increased. The regression analysis revealed that with an increase in 0.81 weeks of gestational age the weight of the infant was increased by one kg.

The mean height of infantsof pregnant women of gestational age below and above 38 weeks was 43.26 and 45.66 cm respectively. As the gestational age increased the height of the infant was also increased. A positive correlation between height of the infant and gestational

Table 17 : Correlation and regression coefficient of gestational age, parity and maternal age with selected anthropometric parameters of the infants of pregnent women.

Parameters	Gestational age			Parity			Maternal age		
	>or=38 weeks mean	<38 weeks mean	value	Primepara mean	Multipara mean	value	<20 years mean	>=20 year mean	value
Weight of infant (kg)	2.6	2.82	0.40*	2.59	2.68	0.04	1.89	2.84	0.28* $\hat{y}$=19.11+0.03x
Height of infant (cm)	43.26	45.66 $\hat{y}$=35.8+0.04x	0.23*	43.61	45.06	0.04	42.51	45.26	0.07
Head-circumference of infant (cm)	28.71	28.79	0.10*	28.61	28.79	0.04	27.77	28.86	0.15* $\hat{y}$=19.11+0.06x

Equation in parantheses indicates regression analysis.

age was observed. The regression analysis revealed that with an increased of 0.04 weeks in gestational age the height of the infant was increased by one cm.

The mean values of head-circumference of infants of pregnant women of gestational age below and above 38 weeks was 29.71 and 28.78 cm., respectively.

The mean values of weight, height and head-circumference of the infants of multipara mothers was slightly more than that of the infants of primipara mothers. However, the difference was statistically not significant.

The mean weight of infants of pregnant women aged below and above 20 years was 1.89 and 2.64 kg., respectively. It was found that as the maternal age increased the weight of the infant was increased. Statistically a positive correlation was found between maternal age and weight of the infant. The regression analysis showed that an increase of 0.03 years of maternal age, weight of the infant was increased by one kg. The mean height of infants of two groups of pregnant women was 42.51 and 45.26 cm, respectively. However there was stastically no correlation between maternal age and height of infants.

The mean value of head-circumference of infants of between two groups of maternal age was 27.77 and 28.86 respectively. A positive correlation between maternal age

and head-circumference of the infant was noticed. The regression analysis indicated that with an increased of 0.06 years of maternal age head-circumference of infant was increased by one cm.

From the above findings it can be inferred that there was variation in weight, height and head-circumference of infant with varying gestational age. The results are agreement with the results of Ghosh *et al.* (1970), Mukherjee and Sathana (1970), and Idnani *et al.* (1979) who reported that meternal age has significant effect on weight and height of infant. Pachuri and Malwaha (1971) who reported that parity was least important in its effect upon the birth weight.

Correlation and regression coefficient of maternal weight, height and haemoglobin levels with selected anthropometric parameters of the infant of selected pregnant women are presented in Table 18.

The weight (kg) and head-circumference (cm) of infants was positively correlated with maternal weight and height. Regression analysis revealed that an increase of 2.43 kg maternal weight increased the weight of the infant by one kg.

An increase of 0.10 kg of maternal weight increased the head-circumference of infants by one cm. The weight of the infant was increased by one kg. with increase of 0.46 cm maternal height. The head-circumference of infants was increased by one cm with the increased of 0.27 cm in maternal height.

Tabel 18 : Correlation and regression coefficient of maternal weight and height and haemogolbin level with selected anthropometric parameters of the infants of selected pregnent women.

Parameters	Maternal weight		Maternal height		Maternal haemoglobin levels Groups			
	Mean	'r' value	Mean	'r' value	>=11 mean	<11 to 10 mean	<10 to 7 mean	'r' value
Weight of infant (kg)	2.65	0.29 $\hat{y}$=44.2+2.53x	2.65	0.20* $\hat{y}$=133.8+0.46x	2.92	2.60	2.46	0.33* $\hat{y}$=7.6+0.70x
Height of infant (cm)	43.78	0.11	43.78	0.29*	46.21	43.27	40.27	0.001
Head-circumference of infant (cm)	28.51	0.15* $\hat{y}$=44.2+0.10x	28.51	0.22* $\hat{y}$=133.8+0.27x	28.64	28.45	28.28	0.21* $\hat{y}$=7.6+0.08x

Equation in parantheses indicates regression analysis.

The height of the infant was not correlated with maternal weight while, it was positively correlated with maternal height. The regression analysis showed that the height of the infant was increased by one cm. with an increased of 0.25 cm in maternal height.

The maternal haemoglobin level was categorised in to three groups. First group was > 11 g/dl, second and third group considered of < 1-10 g/dl and < 10-7 g/dl respectively.

The mean weight and height of infants of maternal haemoglobin levels group I,II and III were 2.92,2.60 and 2.46 kg and 64.21, 43.27 and 40.27 cm. respectively. The corresponding values for head-circumference of infants was 28.64, 28.45 and 28.28 cm. It was also found that as the haemoglobin level of mother decreased the height of the infant also decreased. A positive correlation between weight and head-circumference of infant with maternal haemoglobin level was recorded. Regression analysis indicated that one kg weight of infant was increased with an increased of 0.70 mg of maternal haemoglobin level. The head-circumference of infants was increased by one cm. with an increased of 0.089 g/dl of maternal haemoglobin level. However, the height of the infant was not correlated with the maternal haemoglobin.

On the whole, it can be said that the weight, height and head-circumference of infants were influenced by maternal weight, height and haemoglobin level. These results are in line with the results of Kapur *et al.*,

(1970) who reported that birth weight and brith length of the baby are influenced by mother's stature. Prema *et al.* (1981) reproted that prevalence of low-birth weight infants were higher in anaemic women.

SUMMARY

5. SUMMARY

The present study was undertaken to study the impact of maternal nutritional status on outcome of pregnancy. A total sample of 150 pregnant women of third trimester belonging to different income levels were selected from Parbhani city for this study. Nutritional status of the pregnant women was assessed by anthropometric measurements biochemical examination and determining the intake of food and nutrients. The outcome of pregnancy was studied by recording selected anthropometric measurements of infants.

Among the selected pregnant women of third trimester 66 belonged to joint family and 53 and 31 belonged to nuclear and extended family. Majority of the pregnant women (94) were school educated while 56 were college educated. About 72 per cent of pregnant women were vegetarian. Body ache was the common ailment (60%) and jaundice (2.6%) was the rare ailment found in the pregnant women.

Out of the 150 pregnant women 89 were primigravida and the remaining 61 pregnant women were of multigravida. About 50 per cent of pregnant women had 2 to 3 years interval between pregnancies. Majority (75) of the

pregnant women had > 20 years of age at first pregnancy and > 18 years years of age at marriage. Simolar per cent (40) of pregnant women had history of abortion and hypertension.

Higher values were obtained for body weight (56 + 5.4 kg) and height (155 + 4.8 cm) of the selected pregnant women beloning to college educated, while a lower values for weight (53.5 + 4.4 kg) and height (153.5 + 4.4cm) of the pregnant women, belonging to school educated. In case of body weight of pregnant women statistical significant difference was obtained. Body mass index in the pregnant women of the college educated group (24.00) was significantly higher than that of the pregnant women of school educated group (23.00). Uterine height of the pregnant women belonged to college educated was significantly higher than that of the pregnant women belonged to school educated group. Significant effect of family income on the body mass index of pregnant women was observed.

The blood haemoglobin level of selected pregnant women was found to be vary from 7 - 12.9 g/dl with mean of 9.61 $\pm$ 1.5 which is consider as anaemic level. A positive correlation was found between blood haemoglobin level of the pregnant women and family income. Maximum percentage (73%) of the pregnant women had some or other degrees of anaemia. The packed cell volume of selected pregnant women was less in comparison with normal values

prescribed for pregnant women,.on the other hand, red blood cell count was more than that of normal values of pregnant women.

Majority (65.4%) of the pregnant women were following three meal pattern. The food intake of pregnant women was inadequate in the intake of energy rich foods and protective foods like cereals, pulses and leafy vegetables respectively. (ICMR, 1981).

The intake of vitamins, like β carotene, thiamin, riboflavin and vitamin `C' were consumed in more amount than the recommended daily allowances (ICMR, 1991). But the diet of pregnant women was found to be inadequate in important nutrient like calcium and iron. More than 50 per cent of pregnant women were avoiding some or other foods for various reasons. Papaya, banana, curd, oilyfoods, eggs were the commonly avoided foods in the diet of pregnant women.

A positive correlation was noticed between income of the family and selected anthropometric measurements of the infants. However, significant difference was not found between educational level of mother and selected anthropometric measurements of infants. Significant difference was found in height and head circumference of infants of pregnant women who was having 1 to 2 years and > 3 years interval between two pregnancies. A significant correlation was found between maternal age and weight of the infant.

The mean values of weight, height and head circumference of infants of multipara mothers were slightly more than that of infants of primipara mothers. However, the difference was statistically not significant. Statistically also it was found that there was a positive correlation between maternal age and weight and height of the infant.

In conclusion, the diet of the selected pregnant women was inadequate in the supply of important nutrients like calcium and iron. More than 50 per cent of pregnant women were avoiding some or other foods for various reasons. Mejority of the pregnant women were found to be suffering from varying degrees of anaemia. The birth weight and height of the new born were influenced by certain factors like family income, spacing between pregnancies gestational age, maternal age, maternal stature and haemoglobin levels of the selected pregnant women of third trimesters.

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APPENDIX I

Personal interview schedule to study the socio-economic background of the selected pregnant women

1. Name of the subject

a) Address Place :

b) Age in years Date :

c) Occupation

d) Income of the family : Rs. / month

2. Composition of family

a) Type : Joint / Nuclear / Extended

b) Food habits : Vegetarian / Non-vegetarian

c) Religion :

d) Educational status : School / College

APPENDIX II

Personal interview schedule to study the general information of the selected pregnant women

1. Age at marriage
2. Age at first pregnancy
3. Gestational age
4. Presence of:

   Odema / Ankle odema / Jaundic / Sore mouth / High blood prssure / Body aches / Loss of appetite / Hyder acidity / Constipation / Burning feets / Presence of infectious disease / Diabetis mellitus / Pain of calf muscles / Anyother

5. Obstetrical history
   a. Purity
   b. History of abortion
   c. Still births
   d. Caesrian delivery
   e. Intervals between pregancies
   f. History of bleeding during pregencies
6. Do you take any supplementation of nutrients : Yes / No

   If yes L folic acid / Iron / Calcium
7. Did you take tetanous vaccine : Yes / No

   If yes when,

APPENDIX III

Personal interview schedule to study the nutritional status of the selected pregnant women

1. Anthropometry :

   Height cm

   Weight cm

   Uterine height cm

2. Biochemical analysis on:

   1. Haemoglobin level in the blood g/dl
   2. Blood group
   3. Blood pressure mm/hg
   4. RBC count in blood ... milmicron / cu.mm
   5. PCV in blood %

APPENDIX IV

Personal interview schedule to study the selected anthropometrly of infants

a) Weight of infant kg

b) Height of infant cm

c) Head circumference of infant cm

APPENDIX V

Diet survey schedule to assess the food intake of selected pregnant women pere day by one day weighment method

Meal	Name of the preparation	Name of the food stuff	Weight of raw foods	Weight of cooked food.	Amount of cooked food consumed by the pregnant women	Amount of raw food consumed by the pregnant women
Breakfast						
Mid-morning						
Lunch						
Snacks						
Dinner						

ANNEXURE I

Selected anthropometric measurements of the selected pregnant women and their infants

Form No.	Maternal Height (cm)	Maternal Weight (kg)	Infant Weight (kg)	Infant Height (cm)	Head circumference (cm)
1	150.00	45.00	1.50	32.50	28.00
2	158.00	65.00	2.00	48.00	32.00
3	156.00	50.00	3.00	45.00	28.00
4	156.00	55.00	3.50	42.00	28.00
5	154.00	55.00	3.00	41.50	29.50
6	150.00	50.00	2.50	43.50	28.00
7	140.00	43.00	1.50	40.00	26.50
8	150.00	50.00	2.50	45.00	30.00
9	150.00	48.00	1.50	43.50	28.60
10	158.00	49.00	3.50	48.60	30.50
11	154.00	45.00	2.50	45.00	29.00
12	148.00	53.00	3.50	43.50	30.00
13	168.00	50.00	2.00	48.00	28.50
14	150.00	59.00	3.50	40.00	26.50
15	150.50	48.00	2.50	42.00	30.00
16	150.00	55.00	2.50	36.00	24.00
17	150.60	50.00	2.50	40.00	28.00
18	150.00	57.00	3.50	48.00	30.50
19	150.40	72.00	1.50	40.00	26.70
20	150.00	48.00	2.40	48.00	29.50
21	156.00	55.00	3.20	45.60	28.00
22	156.00	50.00	3.40	48.50	29.00
23	160.00	45.00	2.40	43.00	28.70
24	156.50	65.00	2.50	49.60	27.00
25	158.00	50.00	2.50	46.70	29.00
26	158.00	50.00	1.50	42.50	26.30
27	156.00	53.00	3.20	47.50	28.50
28	150.00	47.00	2.50	46.50	26.20
29	156.00	39.00	1.50	44.00	26.00
30	154.00	50.00	1.50	49.50	29.00
31	160.00	60.00	2.50	48.50	29.50
32	154.00	50.00	3.20	48.50	28.50
33	156.00	68.00	3.50	48.00	27.50
34	158.00	55.00	2.50	43.50	26.50
35	154.00	59.00	3.20	46.50	28.50
36	150.00	49.00	2.50	43.50	28.00
37	150.00	55.00	2.50	46.50	26.00
38	159.00	55.00	3.50	48.00	28.00
39	158.00	55.00	1.50	42.50	26.50
40	145.00	45.00	1.50	46.50	26.00

contd...

contd...

Form No.	Maternal Height (cm)	Maternal Weight (kg)	Infant Weight (kg)	Infant Height (cm)	Head circumference (cm)
41	152.00	50.00	3.20	47.50	28.50
42	152.00	53.00	2.40	39.50	26.00
43	160.00	60.00	3.50	49.20	29.00
44	154.00	55.00	3.20	44.50	27.00
45	154.50	56.00	2.50	47.50	27.00
46	150.00	50.00	2.50	48.00	28.00
47	160.00	60.00	1.50	45.00	26.00
48	145.00	41.00	1.50	47.50	26.50
49	150.00	42.00	1.50	48.50	28.50
50	150.00	52.00	2.80	46.50	27.00
51	156.00	65.00	2.20	46.50	26.00
52	150.40	50.00	3.50	49.50	28.00
53	150.00	50.00	2.50	38.50	26.00
54	150.50	60.00	2.50	46.50	26.00
55	156.00	60.00	2.50	50.00	28.50
56	156.00	58.00	2.60	39.50	28.00
57	150.00	58.00	3.20	48.00	27.50
58	156.00	59.00	3.00	45.50	28.00
59	150.00	48.00	3.20	47.50	26.50
60	150.00	60.00	2.50	48.00	24.80
61	148.00	45.00	3.20	46.00	26.80
62	150.00	45.00	1.50	45.00	26.00
63	150.00	45.00	2.50	47.50	29.50
64	152.00	60.00	3.20	48.70	28.50
65	156.00	60.00	2.50	38.50	25.00
66	150.00	58.00	2.20	46.60	26.00
67	156.00	60.00	3.20	49.50	28.00
68	150.00	58.00	3.40	38.90	27.60
69	150.00	45.00	1.50	35.50	25.30
70	156.00	56.00	1.50	38.50	28.00
71	160.00	60.00	2.50	39.70	29.00
72	156.00	50.00	2.40	37.50	26.50
73	150.00	65.00	3.20	43.40	27.50
74	156.00	65.00	2.50	48.50	28.50
75	156.00	55.00	3.20	38.60	27.00
76	150.00	50.00	1.50	38.50	27.00
77	156.00	55.00	2.20	45.50	26.50
78	150.00	50.00	2.50	38.50	27.00
79	150.00	50.00	1.50	36.50	27.00
80	156.00	55.00	2.20	38.00	26.00
81	150.00	55.00	2.50	36.70	26.50
82	158.00	55.00	1.50	42.70	30.00
83	157.00	55.50	2.20	48.50	28.60

contd...

contd...

Form No.	Maternal Height (cm)	Maternal Weight (kg)	Infant Weight (kg)	Infant Height (cm)	Head circumference (cm)
84	158.00	60.00	1.50	38.00	27.00
85	156.00	60.00	3.00	48.50	28.70
86	160.00	60.00	2.20	43.10	28.00
87	160.50	60.00	3.40	44.60	27.00
88	152.00	53.00	2.20	43.50	31.50
89	150.00	48.00	2.40	48.90	29.00
90	155.00	55.00	3.40	44.70	32.00
91	160.00	60.00	3.00	47.60	31.50
92	156.00	60.20	1.50	38.90	26.60
93	150.00	45.00	2.20	48.90	29.00
94	150.00	45.00	2.20	45.00	30.00
95	150.00	60.00	3.20	39.70	29.50
96	156.00	55.00	2.20	43.50	28.00
97	160.00	45.00	3.40	46.50	29.70
98	154.00	46.00	4.00	48.60	29.00
99	162.00	65.00	3.00	48.00	29.00
100	154.00	50.00	2.20	48.90	31.00
101	150.00	56.00	3.40	36.50	32.00
102	167.00	65.00	3.40	48.90	31.00
103	149.00	50.00	2.40	45.00	29.00
104	150.00	45.00	2.50	39.50	30.00
105	165.00	65.00	3.90	49.60	32.50
106	157.50	65.20	2.40	43.60	28.90
107	155.50	55.00	3.00	44.70	28.60
108	160.00	65.00	2.40	47.70	28.60
109	156.00	55.00	2.40	38.60	28.00
110	154.00	55.00	3.40	39.60	28.50
111	156.00	45.00	2.40	39.00	29.00
112	150.00	56.50	3.40	48.00	30.50
113	160.00	55.00	1.50	34.50	26.00
114	154.00	53.50	3.40	38.60	28.70
115	148.00	52.50	1.50	36.50	27.00
116	155.00	55.00	3.40	48.00	32.00
117	160.00	65.00	3.00	44.60	30.00
118	150.00	53.00	1.50	36.70	28.00
119	149.00	51.00	4.00	39.90	28.50
120	148.00	52.50	2.40	46.50	31.60
121	160.00	60.00	2.40	39.00	27.00
122	159.00	65.00	3.00	47.80	29.60
123	155.00	60.50	4.20	48.00	33.40
124	158.00	45.00	2.50	48.50	31.70
125	150.00	55.00	3.20	39.50	30.00

contd.

contd...

Form No.	Maternal Height (cm)	Maternal Weight (kg)	Infant Weight (kg)	Infant Height (cm)	Head circumference (cm)
126	154.00	62.00	3.20	47.70	32.00
127	154.00	52.00	3.20	47.70	31.60
128	150.00	52.00	3.20	46.60	31.50
129	159.00	52.00	3.20	44.00	31.50
130	148.00	48.00	2.40	37.50	20.00
131	160.00	60.00	4.00	45.00	31.50
132	148.00	55.00	2.50	38.20	29.80
133	152.00	50.00	2.20	38.80	29.50
134	150.00	51.00	3.40	36.40	30.30
135	162.00	62.50	4.20	49.60	31.20
136	150.00	58.00	3.40	46.80	29.80
137	168.00	53.00	3.20	49.20	31.60
138	165.00	50.00	2.40	47.60	29.00
139	153.00	62.00	2.40	37.70	32.30
140	152.00	55.00	2.20	37.70	32.30
141	148.00	51.00	2.20	37.80	29.30
142	154.00	55.80	1.50	42.20	26.50
143	150.00	53.00	4.00	46.60	29.60
144	155.00	68.50	3.20	38.40	29.80
145	153.00	55.00	1.50	36.40	28.00
146	158.00	46.00	2.40	36.50	28.50
147	157.00	60.50	3.90	48.60	31.40
148	153.00	55.00	3.50	38.90	28.00
149	162.00	63.50	3.40	49.70	32.00
150	149.00	58.00	2.50	38.60	29.90

ANNEXURE II

Estimated blood constituent of the selected pregnant women of third trimester

Form No.	Haemoglobin (g/dl)	RBC count (mu/cu.m.m.)	Pack cell volume (%)
1	10.00	4.52	44.00
2	10.50	4.66	40.00
3	12.50	5.12	48.00
4	11.00	4.98	45.00
5	8.00	4.32	37.00
6	11.00	4.90	45.00
7	8.00	4.22	27.00
8	10.50	4.58	32.00
9	10.00	4.68	27.00
10	12.50	5.12	48.00
11	11.50	5.08	45.00
12	8.00	4.28	24.00
13	10.50	4.60	43.00
14	8.00	4.12	24.00
15	11.00	4.90	42.00
16	10.50	4.40	32.00
17	12.00	5.04	48.00
18	8.50	4.22	26.00
19	7.00	4.02	20.00
20	7.00	3.70	24.00
21	8.50	4.14	28.00
22	10.00	4.77	38.00
23	11.50	5.12	45.00
24	10.50	4.26	36.00
25	7.50	3.92	28.00
26	8.50	4.18	29.00
27	11.50	4.82	44.00
28	10.00	4.28	35.00
29	12.50	5.46	54.00
30	7.00	3.72	18.00
31	7.00	3.44	21.00
32	10.00	4.16	34.00
33	7.50	3.98	24.00
34	10.00	4.40	40.00
35	9.50	4.08	32.00
36	10.00	4.20	39.00
37	11.00	4.60	40.00
38	8.50	4.00	25.00
39	11.00	4.66	41.00
40	10.50	4.32	38.00

contd...

contd...

Form No.	Haemoglobin (g/dl)	RBC count (mu/cu.m.m.)	Pack cell volume (%)
41	7.50	3.80	20.00
42	8.50	4.20	29.00
43	11.00	4.66	34.00
44	11.00	4.67	32.00
45	8.50	3.98	20.00
46	10.00	4.31	42.00
47	9.50	4.01	36.00
48	8.00	4.22	39.00
49	10.00	5.12	44.00
50	11.00	5.24	48.00
51	8.00	4.02	29.00
52	7.50	3.70	24.00
53	11.00	5.02	46.00
54	10.00	4.79	40.00
55	7.50	4.04	28.00
56	9.50	4.34	37.00
57	9.00	4.11	34.00
58	10.00	4.87	40.00
59	11.00	5.12	49.00
60	8.50	4.61	38.00
61	7.50	4.01	25.00
62	8.50	4.38	35.00
63	7.00	4.00	28.00
64	8.50	4.64	38.00
65	9.00	4.11	34.00
66	11.00	5.18	49.00
67	10.00	4.68	38.00
68	9.50	4.32	34.00
69	7.00	3.66	20.00
70	8.50	4.42	36.00
71	9.00	4.18	37.00
72	10.00	4.80	12.00
73	9.00	4.14	35.00
74	8.00	4.10	30.00
75	10.50	4.78	43.00
76	10.00	4.20	39.00
77	8.50	4.00	25.00
78	9.50	4.26	30.00
79	8.00	4.50	32.00
80	9.50	4.26	30.00
81	10.00	4.78	40.00
82	11.00	5.62	46.00
83	10.00	5.00	40.00

contd...

contd...

Form No.	Haemoglobin (g/dl)	RBC count (mu/cu.m.m.)	Pack cell volume (%)
84	9.00	4.51	40.00
85	11.00	4.91	40.00
86	12.50	5.31	47.00
87	12.00	5.02	46.00
88	9.00	4.09	40.00
89	8.50	4.01	32.00
90	9.50	4.16	29.00
91	10.00	4.22	30.00
92	11.00	4.67	32.00
93	8.00	4.23	28.00
94	8.50	4.51	30.00
95	11.00	4.67	32.00
96	9.50	4.08	36.00
97	8.00	4.20	29.00
98	12.00	4.67	32.00
99	11.00	4.68	40.00
100	8.00	3.98	20.00
101	10.50	4.00	40.00
102	9.00	4.26	44.00
103	10.00	3.90	32.00
104	8.00	5.69	27.00
105	12.50	4.19	40.00
106	9.40	4.09	42.00
107	12.00	4.16	37.00
108	8.50	4.67	43.00
109	11.00	4.50	40.00
110	12.50	3.98	28.00
111	9.00	4.32	32.00
112	8.00	4.11	20.00
113	8.00	3.70	27.00
114	11.50	4.38	32.00
115	11.00	4.70	35.00
116	12.00	4.32	33.00
117	8.50	5.12	20.00
118	8.50	4.58	33.00
119	11.50	4.28	25.00
120	9.50	4.90	28.00
121	9.50	4.91	32.00
122	11.00	3.71	41.00
123	11.00	5.12	33.00
124	8.00	4.90	28.00
125	10.50	4.22	29.00
126	12.50	4.32	29.00
127	10.50	5.12	31.00

contd...

contd...

Form No.	Haemoglobin (g/dl)	RBC count (mu/cu.m.m.)	Pack cell volume (%)
128	10.50	4.66	32.00
129	11.00	4.78	37.00
130	11.00	3.90	31.00
131	9.50	4.12	29.00
132	10.50	5.12	25.00
133	7.50	4.18	32.00
134	8.00	3.71	40.00
135	9.50	3.91	49.00
136	11.00	4.31	34.00
137	10.50	4.80	24.00
138	12.00	4.32	25.00
139	12.00	3.81	32.00
140	9.50	4.01	41.00
141	8.50	4.43	30.00
142	7.50	4.51	25.00
143	12.50	4.01	42.00
144	10.00	4.98	35.00
145	7.50	4.04	32.00
146	10.00	4.00	32.00
147	8.70	4.15	34.00
148	9.00	4.30	30.00
149	11.00	4.52	43.00
150	12.00	4.32	49.00