
UNIT 2 MATERNAL NUTRITION IN PREGNANCY AND LACTATION

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2.0 OBJECTIVES

After reading this unit, you should be able to:

- 1 counsel on dietary intake during pregnancy and lactation;
- 1 list pregnancy outcome with poor maternal nutrition;
- 1 describe the relation between dietary intake, physical activity and maternal nutritional status;
- 1 enumerate factors associated with deterioration in maternal nutritional status;
- 1 describe health consequence of adolescent pregnancies;
- 1 counsel adverse effect of conception during lactation;
- 1 describe the role of contraception in maternal nutrition; and
- 1 take preventive measures and treat micronutrient deficiencies.

2.1 INTRODUCTION

From time immemorial it has been recognized that the pregnant and lactating women form one of the most nutritionally vulnerable segments of the population; the ill effects of maternal under nutrition affect not only the mother but also her offspring. In this unit, you will read about the nutritional requirements of women during pregnancy and lactation, the adverse consequences of under-nutrition and the intervention strategies aimed at minimizing if not eliminating these adverse effects. You may be already aware of the adverse nutrition and health consequences of “too early, too close, too many and too late” pregnancies on the mother child dyad. Contraceptive care is as an indirect effective intervention to improve

maternal and child nutrition. While under nutrition is a major problem, there is a progressive increase in obesity especially among the urban middle and upper income group population.

Infections are an indirect cause of under nutrition. Maternal care providers continue to tackle the increased infections in undernourished and anaemic women. There is an association between urinary tract infection, chlamydial infection and low birth weight. With the advent of HIV epidemic in India in the eighties, it is inevitable that over the next decade there will be an increase in the severe undernutrition associated with HIV in pregnancy and adverse impact of maternal HIV infection on the infant. Screening for these infections and their management will have to become a part of antenatal care.

Micronutrient deficiencies are widespread and coexist with chronic energy deficiency in pregnant and lactating women. Anaemia is one such micronutrient and its adverse impact on mother child dyad has been very well recognized. The magnitude and health hazards associated with anaemia, iodine and vitamin A deficiency during pregnancy and lactation are well established. National programmes to combat these micronutrient deficiencies are being implemented with varying degree of success. In recent years Vitamin D deficiency in pregnancy in the middle and upper income groups in some parts of the country has reemerged.

Defining the problems and evolving national programmes for tackling them with relatively inexpensive simple interventions with the goal that substantial improvement in health and nutrition will be achieved by the year 2000 AD was a powerful motivation for the nutritionists and health professionals to face and overcome the hardships in the earlier years. The new century has brought greater challenges of increasing variety and complexity and even maintaining the current levels of health and nutritional status would require redoubled efforts. In view of wide spectrum under and over nutrition due to variety of causes, you will have to assess each pregnant and lactating woman carefully and provide appropriate advice regarding diet, exercise, infection prevention and control and prevention detection and management of micronutrient deficiencies to improve health and nutritional status.

2.2 NUTRITION DURING PREGNANCY

This section deals with maternal requirements, its association with pregnancy outcome, the factors that bring about the deterioration in maternal nutritional status and relation between dietary intake and physical work on nutritional status. In our country, girls are married young and start their pregnancies during adolescence. You will also learn about nutrition and its effect on adolescent pregnancies.

2.2.1 Nutritional Requirements During Pregnancy

In this section, you will learn about energy requirements during pregnancy. Energy requirement is defined as the amount that will balance energy expenditure of the individual (as determined by body size, composition and physical activity) consistent with long-term good health. This amount will allow for maintenance of economically necessary and socially desirable physical activity. In pregnant/ lactating women, energy requirement will include energy needed for deposition of tissue and secretion of milk at the rate consistent with good health. All estimates of requirement are based on habitual intakes; though these are expressed as daily intake, it is not implied that these amounts must be consumed on daily basis. Actual intakes and expenditure of people of same age, sex, similar body size and physical activity are used to compute average energy requirement for the groups. The recommended intake of energy of a group is equal to the average energy requirement of individuals of the group. Both lower and higher energy intake are associated with health hazards. This is in contrast to other nutrients.

Energy needs of women for different activity levels computed on the basis of recommendations made by a Joint Expert Consultation of WHO/FAO/UNO in 1985 and by an Expert Committee constituted in 1988 by the ICMR are shown in Fig. 2.1. The ICMR's RDA is higher than those recommended by the WHO/FAO/UNO.

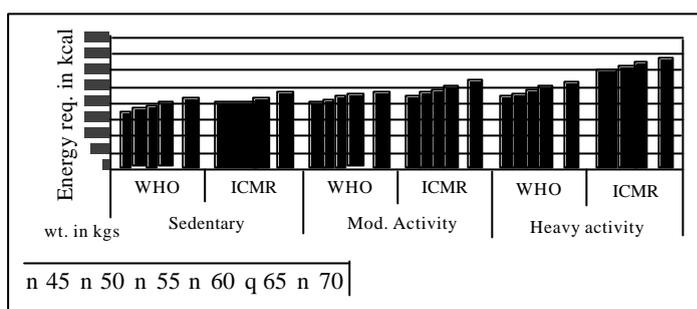


Fig 2.1: Daily average energy requirement in women aged 30-60 years

Basal Metabolic Rate (BMR) of Indians is about 5% lower than BMR predicted on the basis of WHO/FAO/UNO equations. The possible causes of lower BMR in Indians include:

- 1 Under nutrition with low body weight and low Body Mass Index;
- 1 Under nutrition resulting in lower protein turn over (protein turn over account for 20% of BMR);
- 1 Difference in proportion of muscle and viscera;
- 1 Lower oxygen supply to the muscle.

However, energy cost of work done computed in terms of basal energy cost or physical activity ratios are similar. For computing RDA, ICMR has taken body weight of “reference man” as 60 kg and that of woman as 50 kg. Average weight of Indian men is 52 Kg and women 44 kg. In view of all these it is likely that energy requirement of Indians is likely to be substantially lower than the current ICMR recommendations (Table 2.1).

Table 2.1: RDA for Energy comparison between Reference Body Weights and Actual Body Weights

| Sex | Ref. Body weight | Actual body weight | Energy RDA | | | |
|-------|------------------|--------------------|-------------------|----------------------|------------------------|---------------------|
| | | | Activity category | For Ref. Body Weight | For Actual body weight | Per cent difference |
| Man | 60.0 | 52.0 | Sedentary | 2425 | 2115 | 13 |
| | | | Moderate | 2875 | 2492 | 13 |
| | | | Heavy | 3800 | 3293 | 13 |
| Woman | 50.0 | 44.0 | Sedentary | 1875 | 1740 | 12 |
| | | | Moderate | 2225 | 1958 | 12 |
| | | | Heavy | 2925 | 2594 | 11 |

Source: Dr.B.S.Narasingha Rao Gopalan Oration 2001

Both the ICMR and the WHO Expert Groups recommended additional intake for pregnant and lactating women. This is shown in Table 2.2.

Table 2.2: Additional requirements for pregnancy and lactation

| | ICMR | WHO |
|-----------------|---|-------------------------------|
| Pregnant Women | 300 Kcal during second and third trimester. | 300 Kcal throughout pregnancy |
| Lactating Women | 550 Kcal during first 6 months 400 Kcal during 7-12 months | 500 Kcal during first year |

You must have observed that over the last few decades there has been a reduction in the physical activity and hence reduction in the energy needs in all the age and weight categories. You might have observed that obesity rates in all age groups are increasing.

This is mainly because of the reduction in physical activity without concomitant reduction in energy intake.

2.2.2 Dietary Intake, Nutritional Status and Outcome of Pregnancy

Indian studies on effect of low dietary intake and maternal under-nutrition on the pregnancy outcome have shown that the weight gain in Indian low income group is lower (Fig. 2.2). The dietary intake in different socio-economic group in India is mentioned below.

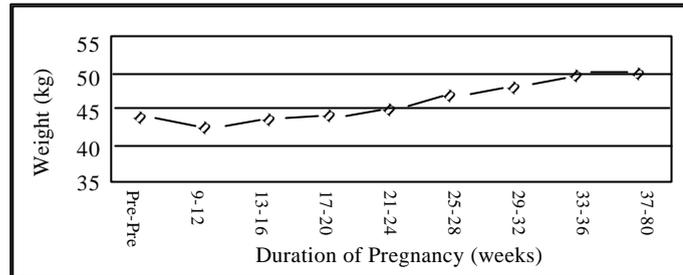


Fig. 2.2: Changes in body weight during pregnancy: Urban low income group

a) Upper Income Group

Women from the upper income group consume 2000 to 2500 kcal per day during pregnancy. In this group pregnant women do not perform hard physical labour during pregnancy and work activity shows a reduction during pregnancy. The pre-pregnancy weight in this population group ranges between 45-55 kg and the mean pregnancy weight gain is about 11 kg. The mean birth weight of infants is 3.1 kg. These findings are similar to those reported from women in developed countries (Table 2.3).

Table 2.3: Birth Weight and socio-economic Status

| | No. | Age (Yrs.) | Parity | Height (Cms.) | Weight (Kg.) | Hb (g/dl) | Birth wt. (kg) |
|---------------|------|------------|--------|---------------|--------------|-----------|----------------|
| Low Income | 1468 | 24.1 | 2.41 | 151.5 | 45.7 | 10.9 | 2.70 |
| Middle Income | 108 | 24.3 | 1.61 | 156.3 | 49.9 | 11.1 | 2.90 |
| High Income | 63 | 27.8 | 1.61 | 156.3 | 56.2 | 12.4 | 3.13 |

b) Low Income Group from Urban Area

Dietary intake of the low-income group, urban women in India ranges from 1200-1600 kcal per day. There is no increase in dietary intake during pregnancy. However, pregnant women continue to look after the household and other activities and remain moderately active throughout pregnancy. These women weigh on average 43 kg prior to pregnancy and gain 6 kg during pregnancy. The mean birth weight of infants is 2.7 kg. There is no obvious deterioration in the maternal nutritional status during pregnancy or following repeated pregnancies provided the inter birth interval is longer than 24 months (Table 2.3).

c) **Low Income Group from Rural Area**

In rural India, dietary intakes of women from the low income group are essentially similar to the dietary intakes of urban women. However, rural women have to spend more energy in daily household chores. For instance, they have to fetch drinking water from sources which may be one to two kilometers from home, gather and bring firewood from the forest miles away. Most rural women from the low income group also help their husbands in agricultural activities, especially during weeding, replanting and harvesting seasons. Therefore, these women weigh about 1 to 2 kg less than their urban counterparts and their fat-fold thickness is only half that of urban women. These women gain about 5 kg during pregnancy and the mean birth weight of their infants is 2.7 kg. In rural communities also there is no significant deterioration in the maternal nutritional status during pregnancy and after repeated pregnancies, provided the inter-birth interval is longer than 24 months. Data from several other developing countries indicate a similar trend.

d) **Pregnancy Outcome in Low Income Group**

Foetal wastages — abortion, intrauterine deaths and stillbirths — occur in about 20 percent of conceptions in the poorer segments of the population in developing countries. The mean birth weight of infants born to these women is 2.7 kg. Perinatal mortality in such communities varies between 50-70 per thousand live births. It has been observed that women from these segments of population suffer from several pregnancy-associated problems such as anaemia and pregnancy-induced hypertension. Combining adequate antenatal care with effective food supplementation programmes is likely to result in substantial improvement in outcome of pregnancy in undernourished communities.

2.2.3 Factors Associated with Deterioration in Maternal Nutritional Status

Adaptive measures prevent deterioration in the nutritional status in the pregnancy and lactation in spite of continued low habitual dietary intake. When the adaptive mechanism fail, the situations become associated with deterioration in maternal nutrition and reproductive performance. They are:

- 1) Reduction in the dietary intake below the habitual level.
- 2) Increase in the physical activity above the habitual level.
- 3) Combination of low dietary intake and increased physical activity.
- 4) Pregnancy in an adolescent girl.
- 5) Pregnancy in lactating women.
- 6) Pregnancy within two years of last delivery.

These situations can readily be identified by the community, family and the health care workers and appropriate remedial measures could be initiated.

2.2.4 Dietary Intake, Physical Work and Nutritional Status

A combination of reduction in dietary intake to below habitual levels and simultaneous increase in physical activity causes a “breakdown” of adaptive processes and results in deterioration of the maternal nutritional status and poor intrauterine growth of the foetus. In agricultural communities when dietary intakes are lowest and physical activity is highest, pregnancy weight gain is very poor, the mean birth weights are lower and prematurity rates are higher. When food is available in abundance and work is less, the dietary intake improves and with this there is a marked increase in pregnancy weight gain, so that the earlier reduction in weight gain is more or less compensated.

The crucial factor that determines the maternal nutritional status and outcome of pregnancy is neither the dietary intake nor the physical work done during pregnancy, but the energy deficit due to the gap between energy intake and energy expenditure.

The calorie gap could be diminished by either one of the following:

- a) by reducing the energy expenditure
- b) by increasing dietary intake.

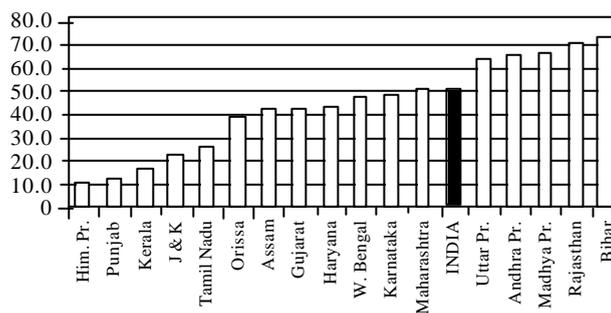
2.2.5 Nutrition and Health Consequences of Adolescent Pregnancies

India is poised to witness the largest ever increase in adolescent population. The number of adolescents (10-19 years) will increase from 20 crore in 1996 to 21.53 crore in 2016. Adolescents gain up to 30% of their adult weight and more than 20% of their adult height during the period between 10 and 19 years. In adolescent girls, early marriage and pregnancy will perpetuate both maternal and child under-nutrition.

Currently there is a need to combat both under-nutrition and over-nutrition. The adolescents suffer from micronutrient deficiencies. With onset of menstruation, girls in this age group are vulnerable to anaemia and all its adverse consequences.

Data from NFHS –2 indicate

- 1 that median age at marriage of girls in India is 16 years;
- 1 61% of all girls were married before they are 18 years.



Source : NFHS, 1998-99

Fig. 2.3: Per cent of women ages 20-24 married before age 18 years

- 1 There are large inter-state variations in age at marriage (Fig. 2.3).
- 1 The mean age at first birth is 19.2 years.
- 1 2.4% of the married adolescent girls aged 15-19 years have undergone sterilization indicating that they have already had two or more children in their teens.

It is hardly surprising that under-nutrition and anaemia are common in adolescent girls. If left undetected and untreated, anaemia will inevitably lead not only to increased morbidity in the mother but also to high low birth weight and perinatal mortality. In addition infants born to these girls have high morbidity and under-nutrition because of poor child rearing practices.

Appropriate nutrition and health education, for all adolescents, advocacy for delay in age at marriage, optimum health and nutrition interventions during pregnancy in adolescents are some of the inter-sectoral initiatives to break this vicious cycle.

Pregnancy in the early teens before 16 years is associated with an adverse effect on maternal nutrition, birth weight and survival of the offspring. The extra nutritional requirements of pregnancy coming close after the nutritional requirements for adolescent growth spurt might be the major factor responsible for the observed poor nutritional status of girls who conceived before they are 16 years of age.

Both in urban and rural area, reasons for low mean birth weight, higher perinatal mortality (PNM), neonatal mortality (NNM) and infant mortality rate (IMR) in teenage pregnancy are:

- 1 lower maternal body weight,
- 1 lower pregnancy weight gain, and
- 1 higher prevalence of anemia and
- 1 possibly pregnancy-induced hypertension among girls who conceived before they were 16 yrs.

High IMR may be due to:

- 1 the higher low-birth weight rates
- 1 obvious deficiencies in child-rearing practices of these young girls, and
- 1 poor availability and utilization of health care services, especially in rural areas,

Undoubtedly, there is a very urgent need to:

- 1 create awareness regarding adverse consequences of early teenage conception
- 1 mobilize social support for strict implementation of laws regarding age at marriage.
- 1 consider pregnancies in early teenage, as of a very high-risk group and provided with adequate nutritional and health care;
- 1 provide her infant also appropriate health care.
- 1 sensitize the health personnel to the needs of this very vulnerable group who are unlikely to seek or utilize available health care that they urgently require.

2.2.6 Effect of Food Supplementation During Pregnancy

You are already aware that food supplementation for pregnant mother are given through Anganwadis in our country. You will read about the effect of food supplementation in this section.

Women form a major part of the national workforce and for social and economic reasons

Care During Pregnancy

cannot be discouraged from working outside the home. Since it would appear that among the poorer segments of populations in developing countries, physical work during pregnancy cannot be reduced without serious social, economic and domestic sequelae, attention has been focussed on investigating whether food supplements, given to pregnant women to reduce the energy gap, could mitigate some of the adverse obstetric consequences of undernutrition in these women.

Studies on the effect of food supplementation to undernourished women on the course and outcome of pregnancy show that:

- 1 food supplements during pregnancy result in improvement in birth weight and reduction in prematurity rate.
- 1 calories form the critical components of dietary supplements, in relation to improvement in birth weight.
- 1 though dietary supplements throughout pregnancy is the most effective, food supplements even over shorter periods during any trimester exert some beneficial effect.

During the nineties there has been a progressive increase in the economic constraints. In view of their high cost and limited impact it might not be possible to sustain the food supplementation programs for all pregnant women in the country. Under these circumstances those who need food supplementation are:

- 1) Reduction in habitual dietary intake (drought / preharvest season)
- 2) Increase in work (newly inducted manual laborers)
- 3) Combination of both the above
- 4) Adolescent pregnancy
- 5) Pregnancy in a lactating woman
- 6) Pregnancy occurring within two years after last delivery.

Check Your Progress 1

- 1) Write the calorie requirements during pregnancy and lactation recommend by ICMR based on actual body weight for various activity category.

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- 2) List the ways the energy gap can be reduced.

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- 3) What are the situations that may cause deterioration in maternal nutritional status?

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- 4) List ways to tackle adolescent pregnancy and problems.

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2.3 NUTRITION DURING LACTATION

This section deals with nutritional requirements during lactation and also the effect on maternal and foetal outcome when the mother conceives again during lactation.

2.3.1 Nutritional Requirements During Lactation

You are aware that the importance of breast-feeding in infant nutrition and survival has long been recognized. The recognition that lactation may have profound effect on maternal nutrition and fertility is of more recent origin. Maternal nutrition may affect lactational performance and lactation may have some effect on the maternal nutrition and return of fertility after delivery. The advent of the next pregnancy, or contraceptive measures used to avoid this, may have an effect on lactation and maternal nutritional status.

Successful prolonged breast-feeding for 18-24 months is the traditional practice among the poorer segments of the population in India. The recognition of the importance of breast-feeding on infant survival, growth and nutrition in the poorer segments of the population in developing countries like India has resulted in sustained efforts to protect and strengthen the existing practice of prolonged lactation in these segments of the population. Lactation involves considerable nutrient expenditure for the mother; the estimated calorie expenditure varies between 400-700 kcal/day. Available information suggests that, unlike well-nourished women from developed countries, in undernourished women there is no deposition of body fat during pregnancy to meet the extra energy needs during lactation.

The majority of lactating women from the poorer sections of the population subsist on diets which provide 1,200-1,800kcal/day (Table 2.4). Their dietary intakes provide no more than half of the recommended dietary allowances with respect to calories. Even assuming that they secrete no more than 500-600 ml of milk per day and assuming that the calorie cost of milk production is 80kcal/100 ml, the calorie expenditure involved in milk production per se is about 450-500 kcal per day. The net energy thus available for a moderately active lactating mother is only 800 kcal/day. Under normal circumstances such a large energy deficit is likely to result in weight loss of about 1.5-2 kg per month.

Table 2.4: Dietary intakes during lactation

| Group | No. | Protein (gms) | Calories (kcal) | Iron (mg) | Thiamine (mg) | Riboflavin (mg) | Body weight(kg) |
|------------------------------------|-----|---------------|-----------------|-------------|---------------|-----------------|-----------------|
| 1. Lactating women | 38 | 26.3 ± 1.93 | 1110 ±73.4 | 12 ± 0.809 | 0.53± 0.047 | 0.39± 0.035 | 42.9 ± 1.13 |
| 2. Nonpregnant non lactating women | 34 | 30.2 ±2.68 | 1125 ±73.9 | 11.4± 0.058 | 0.53± 0.058 | 0.4 0± 0.035 | 44.4 ±1.1 |

Values are mean ± SE

Studies of anthropometric indices in lactating women indicate that the mean body weight, mid-arm circumference and skin-fold thickness at triceps showed a progressive fall with increasing duration of lactation until 18 months in women whose infants were mainly on breast milk. However, with the introduction .of supplements to the breast-fed infant there was some improvement in the maternal nutritional status even though her dietary intake

remained unaltered. The mean body weight of women whose infants were mainly on solid food but who received two or three breast-feeds a day was higher than that of women whose infants were mainly breastfed. If there was no intervening pregnancy these women regained their body weight once lactation waned.

Obviously, there are some exquisitely sensitive but ill-understood adaptive changes which bring about energy balance and ensure maintenance of maternal nutrition and satisfactory lactation in spite of widely varying habitual dietary intakes well below the RDA. It has been suggested that efficiency of energy utilization increases under such circumstances. The fact that there are adaptive mechanisms to ensure that the mother and her infants are protected against deterioration in nutritional status is a measure of the importance of these mechanisms in the survival of mankind. Specific efforts should be made to ensure that these made adaptive mechanisms are not compromised by further stress.

2.3.2 Nutrition and Health Consequences of Conception During Lactation

In your practice, you might have heard some women saying that they will not conceive as long as they breast feed. Global studies have demonstrated that lactation prolongs postpartum amenorrhoea and provides some protection against pregnancy, especially during the first few months. However, with introduction of complementary feeds to the infant and increasing duration of lactation, the contraceptive effect of lactation wanes. In India, among traditional urban and rural low-income group women, prolonged lactation for about two years is quite common. Contraceptive use is not widespread. Available data indicate that under these circumstances, about one-third of all pregnancies occur in lactating women. Some women stop breast-feeding as soon as they realize that they are pregnant. This tradition might have been evolved to protect the women from the dual stress of pregnancy and lactation. But such an abrupt cessation of breast-feeding may, however, have some adverse effect on infant/child nutrition. Many women continue to breastfeed their infants during pregnancy and face the nutritional and health consequences of the dual stress.

Available data suggest that conception during the first year of lactation is relatively uncommon in India and occurs usually in working women and those who introduce supplements to the infant early, i.e. before six months of age; majority of the conceptions in lactating women occur during the second and third year of lactation (Fig 2.8).

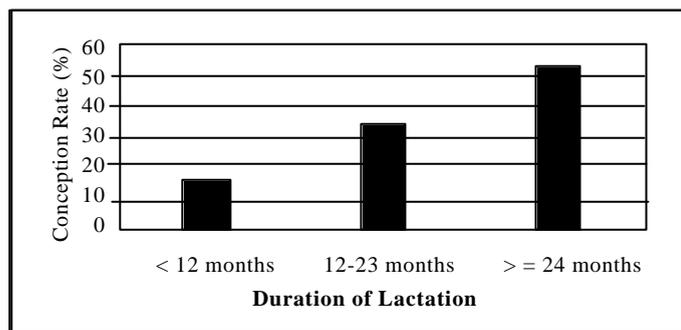


Fig. 2.4: Conception during lactation

Studies on dietary intake of women who had conceived during lactation have shown that their dietary intake is essentially similar to the dietary intake of non-pregnant women from similar income groups. The average calorie intake is not more than 1200-1600 kcal/day; the diet is inadequate with respect to all nutrients. Obviously the dual stress of pregnancy and lactation leads widening of the already existing gap between actual dietary intakes and nutrient requirements. Investigations undertaken by the National Institute of Nutrition, Hyderabad, indicate that irrespective of the duration of lactation, women who conceived during lactation weighed less in all the trimesters of pregnancy than those who conceived after lactation. The difference in body weight was more marked in the third trimester especially in the small group of women who had conceived during the first six months of lactation. Birth weight of neonates born to women who conceived during lactation was also lower.

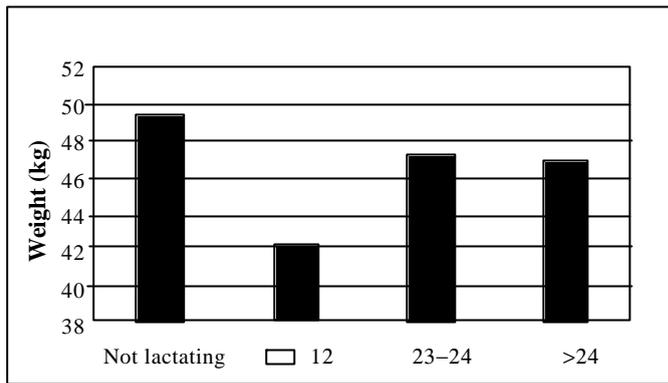


Fig. 2.9: Maternal nutritional status and duration of lactation

Table 2.6: Effect of Conception during Lactation on Birth Weights of infants

| | Interpregnancy Interval (months) | | |
|-----------------------------------|----------------------------------|-------|--------|
| | < = 12 | 13-24 | > = 25 |
| | Birth Weight (kg) | | |
| Pregnant | 2.62 | 2.82 | 2.80 |
| Pregnant women who were lactating | 2.58 | 2.80 | 2.78 |

Women who conceived in the first six months of lactation fared worst because:

- i) they did not have any time to recover from the stress of the previous pregnancy,
- ii) the volume of milk secretion and nutrient loss in milk are greater in the first year of lactation, and
- iii) many of these women were working outside home and, therefore, has to face energy needs for work outside the house.

It is obvious that conception during lactation does have an adverse effect on the maternal nutritional status during pregnancy. Ensuring contraceptive care to lactating women would, therefore, constitute a non-nutritional intervention for reducing the magnitude of maternal under-nutrition during pregnancy.

Check Your Progress 2

1) How does maternal nutrition affect lactation?

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2) Write the effect of lactation on maternal nutritional status

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- 3) Write effect of lactation on fertility.

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2.4 NUTRITIONAL STATUS AND REPRODUCTIVE PERFORMANCE OF WOMEN GAINFULLY EMPLOYED OUTSIDE HOME

You realise that women are participating more and more in economically productive activities outside home. Women have long been working along with their menfolk in the fields in addition to carrying household work to support and sustain the family. Mankind has developed adaptive processes to ensure that this type of work, in or outside the home, has no adverse effect on the maternal nutritional status.

It is estimated that women constitute one-third labor force in the world, are responsible for two-thirds of the hours of work and receive 10% of the world's income. At the end of the day they own 1% of the world's property. Women work for the wellbeing of their family and hence they have borne the low monetary return with fortitude. Increasing economic constraints have made employment outside home a necessity for women. Both in urban and rural areas women are seeking employment not only in the traditional occupations but also in newer avenues because of socioeconomic and other considerations.

It is estimated that in India working women constitute about 20 per cent of the total population and there is a trend towards increasing employment of women. The income generated by them might very well be a crucial factor in maintaining or improving nutritional status of the members of the family. However, the woman herself may be facing physical and mental stress and time constraints due to dual employment at home and at work.

The type of work a woman does outside the house. The availability of domestic help and economic factors might determine the impact of such employment on her. In some situations, dual stress and conflicting demands of work in and outside the house have been shown to have an adverse effect on maternal and child health and nutritional status. On the other hand, employment outside the house may bestow upon the working woman and her family such benefits as increase in purchasing power and standard of living, with consequent improvement in the nutritional status. Working women may have easier access to MCH care and family welfare facilities, with opportunities to utilize them more effectively. The net impact of such beneficial and adverse effects of women working outside the house, might vary in different communities depending upon the prevailing conditions of work and home environment. Data from studies conducted to explore the impact of work outside home, on the family formation patterns, and nutritional and health status of working women in urban and rural areas indicate that:

- a) Gainful employment of urban women outside the house in jobs requiring only moderate physical activity is associated with (i) improved financial status in urban high and middle income groups, (ii) improved maternal nutritional status in the lower middle-income group, and (iii) prevention of deterioration of nutritional status due to poverty in the urban low-income group.
- b) Rural working women are undernourished and overworked . It is not possible for them to refrain from working outside the house because, if they do so, their families would have a still lower economic status and purchasing power. Intervention programs aimed at augmentation of their income and ensuring sustained employment throughout the year might result in mitigation of the observed adverse effect of work outside the house on nutritional status of women. Attempts should also be made to explore the

provision of drinking water facilities near home, biogas plants and other energy-saving, drudgery-reducing measures that would help these overworked women.

Table 2.7: Nutritional status of rural women from low income group

| Group | | Height (cm) | Weight (kg) |
|-------------|---------------------|----------------|----------------|
| Nonpregnant | Working Women (469) | 149.9 ± 5.26 | 41.5 ± 5.76 |
| | Housewives (426) | 151.3 ± 5.84 | 43.4 ± 7.62 |
| Pregnant | Working Women (325) | 150.1 ± 5.33 | 43.5 ± 3.17 |
| | Housewives (348) | 150.9 ± 5.93 | 45.6 ± 6.35 |
| Lactating | Working Women (392) | 149.4 ± 6.37 | 41.1 ± 3.82 |
| | Housewives (321) | 150.8 ± 5.52 | 42.9 ± 7.05 |

Note: Figures in parentheses indicate number of women

- c) A very large number of the urban low-income group of women are employed in the unorganized sectors of various industries. Majority perform unskilled heavy manual work such as building, construction, road repair and stone cutting. In these situations women have to continue to do heavy manual work throughout pregnancy in order to earn wages and buy food. Working conditions often leave much to be desired. For instance, in hot tropical countries, road building works inevitably imply heavy thermal stress. These women are also exposed to asphalt fumes in heavy concentration. What is the impact of a combination of thermal stress, exposure to hydrocarbons, heavy manual labor and inadequate dietary intake during pregnancy? We do not have any information to answer these questions. The urban woman workforce is growing at a very rapid rate in all developing countries. It is necessary to investigate and find out the effect of this nontraditional manual work on reproductive performance, so that necessary remedial measures could be taken up before the problem becomes too big to cope with.
- d) In recent years several small scale industries such as *Beedi*, *agarbathi*, match and coir are employing predominantly women. Since women working for wages is inevitable due to economic pressure, many advocate employment in such industries for women in the belief that moderate activity does not entail large energy expenditure and is not harmful. It is true that work in these industries involves only moderate physical activity, but most often wages are based on output of products. As the activity is not physically very taxing, these women tend to work for longer hours.
- e) Depending upon the work and the home conditions, work outside home might be an important factor that improves the health and nutritional status of the entire family; overwork and reduction in dietary intake may on the other hand have disastrous consequences on maternal and infant health and nutrition. There is an urgent need to use innovative, inexpensive technologies to reduce the burden of work at home and at work. The technologies introduced at work should be labour saving but not overstep the boundary and become labour eliminative. In view of the known vulnerability of the pregnant women and young children to a variety of physical and chemical insults, it is important to see that they do not enter those occupations where there is a risk of exposure to hazardous agents.

2.5 CONTRACEPTION AND NUTRITION

You have often heard or talked about the need for limiting the family size by accepting contraception. You will read more about it in this section.

Rapid decline in mortality rates due to improvement access to effective in health care and a slower decline fertility rates is responsible for the population growth during the last five decades. Till now the fruits of the green revolution have kept the country self-sufficient in foodgrains and seen to it that there is no deterioration food grain availability in spite of the

fact that population has reached one billion. However continued population growth can become an important cause of under-nutrition. In this context improved acceptance of contraception and small family norm might become an important determinant of nutritional status of the Indian population.

Economists have observed global association between poverty and high fertility to suggest that socioeconomic development is the best contraceptive. The fact that Sri Lanka and Kerala in India have achieved low mortality and low fertility with an almost zero population growth in spite of the low per capita income and low expenditure on health indicate that the facile assumption of the economists may not be true for all developing countries. Fertility regulation using proven effective safe contraceptives may prove to be the most important tool for developing countries to escape from poverty and the most important nonnutritional intervention to improve health and nutritional status of not only women and children but also the entire population in our country.

Rapid population growth seen during the second half of the twentieth century is not sustainable within the global resources and has to be brought down to sustainable levels with increased acceptance of contraception. During the transition phase it is essential to ensure that the existing abundant human resource is not treated as a burden. The existing population should be treated as an asset and resource, to be channelized and effectively utilized to fuel rapid socioeconomic growth and development.

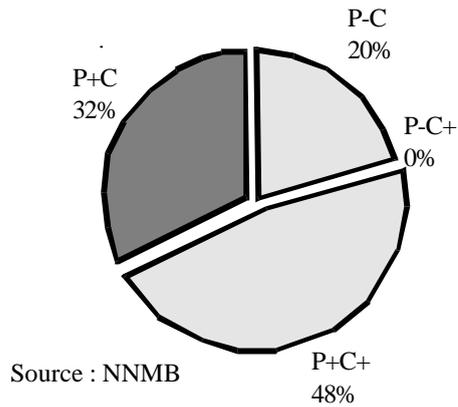
2.6 NUTRITION-INFECTION INTERACTIONS

In the nineties, HIV infection has emerged as a major cause of severe forms of undernutrition both in men and women belonging to the reproductive age group and in children in many parts of the world including the USA and sub-Saharan Africa. The vicious cycle of infection leading to undernutrition and undernutrition increasing the susceptibility to infections ending in death, so familiar to physicians in the preantibiotic era is again being witnessed by physicians during the management of AIDS cases. The disease has wiped out improvement in infant and child mortality achieved by three decades of toil; AIDS is likely to increase the quantum and severity of undernutrition both in adults and in children both in developed and developing countries. India has the unique distinction of being the first country in the world that initiated a nationwide serosurveillance for HIV infection in its silent phase and started a well-defined National AIDS Control Program early in the HIV epidemic before many AIDS cases were reported in the country. At present most of the HIV infected persons in India are asymptomatic and are apparently healthy. However, in the next decade HIV infection may become one of the important causes of severe malnutrition.

You have realised by now the urgent need to control the spread of HIV infection in the mother and infant.

2.7 EMERGING PROBLEM OF OVEREATING AND OBESITY

Over the last three decades there have been substantial changes in socio-economic status, some increase in the dietary intake of men and women especially of the rural and urban affluent segments; ready availability of fast foods, ice creams and other energy rich food items at affordable costs have resulted in increased energy consumption. The distribution of households according to protein-energy adequacy status is presented in Fig 2.10. About 47% of the households consumed more than adequate amount of both protein and calorie, while 20% of households consumed inadequate amounts of both the nutrients. With the cooking gas, piped water supply and labour saving gadgets and transport there had been a substantial reduction in the physical activity pattern and energy expenditure especially in middle and upper income group. Data from NNMB repeat surveys indicate that there has been some reduction in undernutrition and some increase in obesity over the last two decades. Data from NFHS confirms that currently both undernutrition and obesity are problems. There are massive inter-state differences in undernutrition and over nutrition



P = Protein
C = Calorie

Fig. 2.10: Protein & Calorie Adequacy and Inadequacy Status 1996-97

rates ; only 10.7 % of women in Arunachal Pradesh are undernourished but 48.0% of women in Orissa are undernourished. Only 3.7 % of women are overweight in Bihar but no less than 33.8% women in Delhi are over weight. The country will, therefore, have to gear up to prevent, detect and tackle the problems of both under-nutrition and over-nutrition in the next two decades.

Table 2.8: Nutritional Status of Ever married Women age 15-49

| | BMI < 18.5(kg/m²) | BMI > 25(kg/m²) |
|-----------|--|--------------------------------------|
| All India | 35.8% | 10.6% |

Source: NFHS, 1998-99

Women belonging to middle and higher-income groups seek antenatal care. They read books and are exposed to health education through the mass media. From all these sources they hear that pregnant and lactating women should eat more to meet their own and their offspring's nutritional needs. Additional energy rich food given traditionally to pregnant and lactating women as well as modern "balanced nutritious food" according to RDA are being given to these women by their families and are consumed. They, however, do not really require additional dietary intake and hence tend to gain weight excessively. The, problem is often aggravated further by a reduction in physical activity during pregnancy. As a result these women may have a net weight gain from 5 to 10 kg at the end of one pregnancy and lactation. Subsequent efforts at weight reduction may prove to be inadequate and ineffective. After two pregnancies these women may face the problem of obesity in their thirties with all its attendant health problems from then onwards.

In the current decade it is, therefore, essential that medical practitioners and dieticians dealing with pregnant and lactating women belonging to middle and upper-income groups who are well nourished, modify their advice regarding diet during pregnancy and lactation suitably. They should also advocate the need for continuing physical activity during this period. A careful watch for undue weight gain should be kept and appropriate corrective steps should be initiated if not during pregnancy at least during the lactation period so that these women do not become overweight and incur subsequent long-term health hazards.

2.8 PREVENTION AND MANAGEMENT OF MICRONUTRIENT DEFICIENCIES

Anaemia in Pregnancy is dealt separately, in unit 3. In this section, we will discuss regarding the difference? iron and vitamins. This is dealt in detail in Unit 3. Programmes aimed at control of anemia in pregnancy in India

Vitamin A Deficiency in Pregnancy and Lactation

It has been estimated that between 1-5% of all pregnant women have symptoms and signs of Vit A deficiency. Subclinical deficiency may be more widespread but remains undetected. Unlike anaemia, Vit A deficiency in pregnancy is not associated with any major health problem or adverse obstetric outcome.

Till now detection and management of Vit A deficiency has not been a major component of antenatal care. Night blindness and Bitot's spot are readily identifiable clinical entities and therefore diagnosis and management of these during pregnancy should form a part of antenatal care. With improved ante-natal coverage it will be possible for individual woman having this deficiency to be identified by the ANM and 10,000 IU of Vit A administered daily for the next four weeks. Sub clinical Vitamin A deficiency would, however, remain undetected throughout pregnancy and lactation.

In an attempt to further improve Vit A status of the vulnerable lactating mother and her infant the WHO/UNICEF/IVACC Task Force has recommended that a single dose of 200,000 IU Vitamin A may be administered to the lactating women within 8 weeks of delivery.

Administration of massive dose Vitamin A to lactating women would result in a transient sharp rise in serum Vitamin A level during lactation. So, those who conceive within the first three months (2% of pregnancies) will incur the risk of exposure to potentially teratogenic levels of Vit A. It would therefore appear that "routine supplementation" may not be the appropriate method to improve the Vit A status of the pregnant and lactating women in India.

As use of green leafy vegetables are as the chief source of micronutrient including Vitamin A, iron and folic acid it is more likely to be sustainable. Efforts to promote cultivation and consumption of micronutrient rich vegetables might therefore be the most appropriate strategy for improving the Vit A status of the entire community.

Vitamin B Complex Deficiency

Biochemical evidence of Vit. B complex deficiency is fairly wide spread among pregnant women from poorer segments of population in many states. Prevalence of clinical signs of B complex deficiency such as glossitis and angular stomatitis are higher in pregnant women. They respond readily to therapy. So far there is no clear-cut evidence of adverse consequences associated with Vit. B complex deficiency during pregnancy. Efforts to promote cultivation and consumption of micronutrient rich vegetables might therefore be the most appropriate strategy for improving the Vit. B status during pregnancy.

Iodine Deficiency Disorders

Deficiency of Iodine occurs when the daily intake of this micronutrient from food and water fall below the requirement. In India it is estimated that 270 million people are at risk of IDD, 79 million have goitre and 2.2 million suffer from cretinism. Goitre is the most well recognised visible manifestation of the iodine deficiency. However the most damaging effect of the deficiency is on the unborn foetus. The association between maternal IDD and higher abortion rate, higher still birth, cretinism and infant mortality rate have been well documented.

Even though the technology for the elimination of IDD has been available for half a century and the National Goitre control Programme was initiated as early as 1962, it is only in the Nineties that the Universal iodisation of salt has been taken up on a nationwide basis. The earlier bottlenecks in production have been overcome; the current problems in packaging, quality control and transport are being addressed. If adequate attention is devoted,

universal availability of iodised salt of appropriate quality is possible. It has been reported that in remote areas and among poorer segments of the population use of noniodised salt continues due to lack of access and cost differentials. Making iodised salt available through the TPDS and if necessary subsidising of the iodised salt so that the economic reason for purchase of the non iodised salt is eliminated may be some of the innovative steps that might ensure that at least we have eliminated this micronutrient deficiency from the country.

Vitamin D Deficiency in Pregnancy

In the early decades of the century the problem of Vit D deficiency and associated problems in pregnant women were reported in the northern part of the country. Subsequent reports suggested that this is no longer a major public health problem and the interest in looking for this waned. Reports during the nineties have indicated that this may emerge as a clinical problem in women from middle and upper income group whose life style reduces their exposure to the abundant sun light in the country. Hence, increasing attention may have to be paid to this micro nutrient, so as to spot potential areas where the deficiency may become prevalent and initiate appropriate interventions to prevent the adverse consequences associated with it.

Check Your Progress 3

- 1) List the factors that have reduced the physical activity pattern and energy expenditure in middles and upper income group.

.....
.....
.....
.....

- 2) Write the disadvantages of single dose of 2,00,000 IU Vit A prophylaxis within 8 weeks of delivery.

.....
.....
.....
.....

- 3) Fill in the blanks :

- a) Clinical signs of Vitamin B complex deficiency are (i) (ii)
- b)deficiency may re-emerge as a clinical problem in women with lifestyles which reduces their exposure to sunlight.

2.9 LET US SUM UP

You learnt in this unit that pre-pregnancy weight and maternal weight gain during pregnancy are important determinants of birth weight of the infant. There is an adaptive machanism to ensure that there is no deterioration in maternal nutritional status in women subsisting on habitual dietary intake. In well nourished women, optimum weight gain and good obstetric outcome can be achieved with habitual diets without any increment in dietary intake during pregnancy. You also read about the high risk situations which cause deterioration in maternal nutritional status and they can be targeted for food supplementation. The effect of maternal nutritional status on lactation, the effect of lactation of maternal nutritional status and fertility has also been dealt in this unit. The problems of adolescent pregnancy and the ways to tackle the problem has been described. You also read about the newer problems of overeating and obesity and the need, prevention and management of micronutrient deficiency.

2.10 KEY WORDS

| | |
|---------------|--|
| AIDS | : Acquired Immunodeficiency Syndrome |
| ANM | : Auxillary Nurse Midwife |
| BMI | : Body Mass Index |
| BMR | : Basal Metabolic Rate |
| CED | : Chronic Energy Deficiency |
| FAO | : Food and Agriculture Organisation |
| HIV | : Human Immunodeficiency Virus |
| ICMR | : Indian Council of Medical Research |
| IDD | : Iodine Deficiency Disorders |
| IFA | : Iron and Folic Acid |
| IMR | : Infant Mortality Rate |
| LBW | : Low Birth Weight |
| MCH | : Maternal and Child Health |
| NCD | : Non Cummunicable Diseases |
| NFHS | : National Family Health Survey |
| NNM | : Neonatal Mortality |
| NNMB | : National Nutritional Monitoring Bureau |
| PDS | : Public Distribution System |
| PHC | : Primary Health Centre |
| PNM | : Perinatal Mortality |
| RDA | : Recommened Dietary Allowance |
| SD | : Standard Deviation |
| SE | : Standard Error |
| TPDS | : Targeted Public Distribution System |
| UNICEF | : United Nations Children’s Fund |
| UNO | : United Nations Organisation |
| WHO | : World Health Organisation |

2.11 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

- 1) ICMR has recommended for a non pregnant women weighting 44 kg.
Sedentary - 1740 Kcal
Moderate work - 1958 Kcal
Heavy work - 2594 Kcal

Add 300 Kcal during pregnancy - 2nd and 3rd trimesters

500 Kcal during lactation - up to 6 months

400 Kcal during lactation - 7-12 months

- 2) Energy gap is reduced by:
 - i) Increasing energy intake (caloric intake)
 - ii) Reducing energy expenditure (Reducing Physical work)
- 3) Situation causing deterioration in maternal nutritional status:
 - i) Reduction in habitual dietary intake (drought, preharvest season)
 - ii) Increase in work (Newly inducted manual labourers).
 - iii) Combination of both the above
 - iv) Adolescent pregnancy
 - v) Pregnancy during lactation
 - vi) Pregnancy occurring within 2 years after last delivery
4. To tackle adolescent pregnancy:
 - i) to create awareness in the community about consequences of adolescent pregnancy
 - ii) mobilise social support to implement laws regarding age at marriage
 - iii) to consider adolescent pregnant mother as highrisk group, provide adequate nutritional and health care
 - iv) appropriate care for infants of adolescent mothers
 - v) sensitise health care providers to the needs of this group.

Check Your Progress 2

- 1) Satisfactory lactation is possible inspite of varying habitual dietary intake well below RDA possibly because of the increase in efficiency of energy utilisation
- 2)
 - i) With increasing duration of lactation, progressive fall in maternal body weight, midarm circumference and skin fold thickness.
 - ii) With some dietary intake, supplementation to breastfeeding improves maternal nutrition
 - iii) With no intervening pregnancy, women regain body weight as lactation wanes.
- 3)
 - i) Exclusive breast feeding for first 6 months provides good contreception
 - ii) Available data shows that conception during first year of lactation is relatively uncommon.

Check Your Progress 3

- 1)
 - i) Availability of cooking gas
 - ii) Piped water supply
 - iii) Labour saving godgets
 - iv) Transport

Care During Pregnancy

- 2)
 - i) One third of mothers introduce supplements to breastfed infants by 3 months of age. Hence these infants may not get adequate Vit A through breast milk.
 - ii) Women conceiving within 3 months of delivery (2%) incur the risk of exposure to teratogenic levels of Vit A.
- 3)
 - a) Glossitis and angular stomatitis
 - b) Vitamin D

2.12 FURTHER READINGS

Gopalan, C and Kaur, S. (edn.) *Women and Nutrition in India* (1989), Nutrition Foundation of India, Special Publication No. 5, New Delhi.

Sachdeva HPS and Choudhary (edn.), *Nutrition in Children : Developing Country Concerns* (1995).