UNIT 9 MEAL PLANNING FOR PREGNANT AND LACTATING WOMEN

Structure

9.1 INTRODUCTION

In this Unit we will discuss the nutrient needs of pregnant and lactating women and the factors to keep in mind while planning meals and diets for them. In pregnancy, the woman's diet must provide nutrients in adequate amounts to support the growth of the foetus and her own tissues. On the other hand, in lactation, maintaining the tissues necessary for milk production and secreting milk influence nutrient needs. We will discuss these aspects and their relationship to meal and diet planning in this Unit.

Objectives

After studying this Unit, you will be able to

- discuss the reasons for increased needs of certain nutrients in pregnancy and lactation
- explain the influence of increased nutrient needs and physiological changes on meal planning for pregnant and lactating women
- suggest balanced diets for pregnant and lactating women

9.2 INFLUENCE OF PREGNANCY ON NUTRIENT NEEDS

As you went through Unit 6 of Course 1, you would have noted the very rapid rate of growth of the foetus from a tiny, single cell to a fully grown 3 kg. infant in a period of nine months. Associated with this, changes take place in the mother's body as well. The placenta, uterus and other organs such as the breast increase in size. Blood volume increases and more fat is deposited. This growth of the foetus and maternal tissues contributes to the weight gain in pregnancy. Adequate weight gain during pregnancy is, therefore, a good indicator of the health of the baby (Figure 9.1).

Due to the rapid growth in the foetal tissues and maternal tissues, basal metabolic rate or BMR also goes up. In simple terms this means that the chemical reactions going on inside the body cells proceed at a faster pace. The word "basal" refers to the state of the normal body when at complete rest but not sleeping. Basal metabolic rate is best measured early in the morning when the person has just woken up.

The increase in basal metabolic rate or BMR is one of the reasons why **energy** requirements go up sharply from the second trimester of pregnancy. Other reasons are:

i) that growth itself is a process requiring high levels of energy, and

ii) that energy is stored in the body in the form of fat.

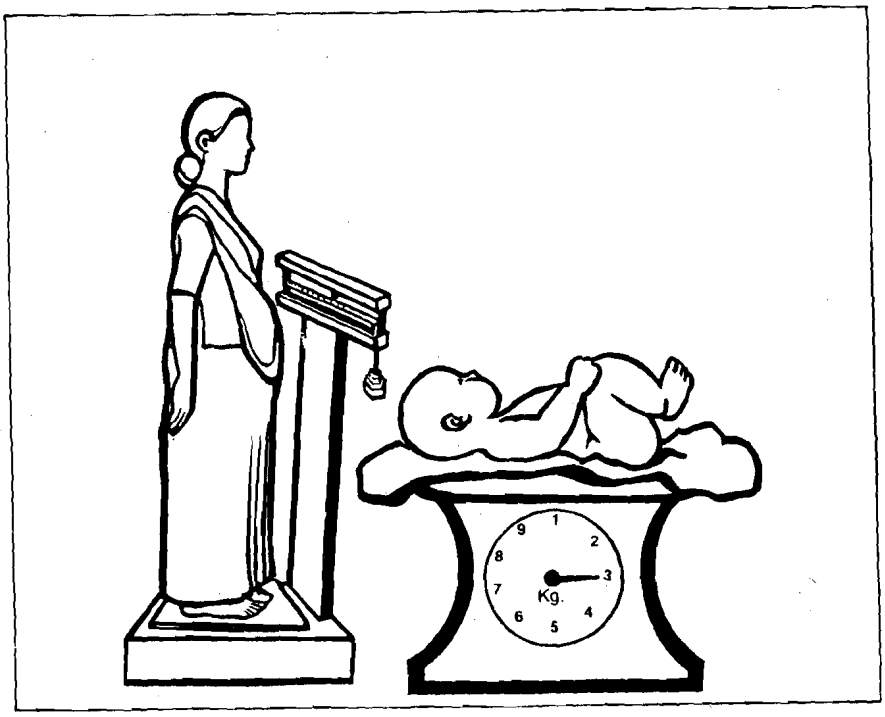

Fig. 9.1: Adequate weight gain during pregnancy ensures healthy infant at birth

Now, you are aware that protein is required for body-building. So, in a high growth phase like pregnancy, what would happen to **protein** needs? Yes, they would go up sharply in order to sustain the process of rapid growth of both foetus and maternal tissues. The growth of both foetal and maternal tissues becomes substantial from the second trimester onwards.

Linked to the increased needs for energy, are the increased needs of the **B vitamins** from the second trimester. You have already studied in Unit 7 that B vitamins such as thiamine, riboflavin and niacin form part of coenzymes involved in helping to release the energy locked into molecules of carbohydrate or fat. The case of folic acid is a little different. Coenzymes synthesized from folic acid play an important role in the process of cell multiplication which, as you know, is part of the process of growth. Hence folic acid requirements go up sharply for this reason.

Requirements for **iron** and **calcium** also go up substantially from the second trimester onwards. Iron is needed for synthesis of haemoglobin. This forms a part of the several new red blood cells formed in the mother's bloodstream as well as in that of the foetus. In addition, stores of iron are accumulated in the foetus to last through the first three to four months of life after birth. This further raises the iron requirement. Calcium is deposited in large amounts in the bones of the developing foetus. This is the reason why calcium needs go up in pregnancy.

Have you heard of the problem of **iodine** deficiency in infants due to low intake of iodine by the mother? Iodine deficiency results in cretinism — a condition associated with mental retardation, poor physical growth and defects such as squint and deafness. Intake of adequate iodine by the pregnant woman is therefore crucial to ensure proper regulation of physical and mental development of the foetus.

We earlier mentioned that the requirements for certain nutrients go up sharply from the second trimester onwards. Can you think of a reason for this? The reason is that in the first trimester (0-3 months) the foetus is small and its nutritional needs are not significant. The associated changes in the organs and tissues of the mother also remain insignificant.

It must be emphasized here that the nutrient requirements for the growth and development of the foetus are met by the mother's diet. Can you think of what would happen if the diet is inadequate? If the diet does not supply nutrients in essential amounts, the mother's own tissues would be broken down. You can imagine the effect on the health of an already malnourished woman in pregnancy if she does not consume a proper diet!

This should suggest to you the crucial importance of entering pregnancy in good nutritional status. The diet of the girl during adolescence is crucial in preparing the body for pregnancy. However, many of the adolescent girls in our country do not get a chance to complete their growth and they remain undernourished. In fact, many girls in our country go through pregnancy before reaching adulthood. This imposes a heavy strain on the girl, pushing up nutrient needs very high. She faces the burden of meeting the increased nutrient needs required for supporting her own rapid growth in adolescence as well as the increased nutrient needs imposed by pregnancy. Very often these increased needs cannot be met. The result? The girl may become severely malnourished and the baby is born too small. Neither mother nor infant may survive. We will discuss the heavy price of malnutrition in greater detail in Section 9.9.

Several studies have shown that a well nourished woman with adequate nutrient reserves is better equipped for a successful pregnancy. In other words, diet before pregnancy is important so that nutrient reserves or stores are available in the body. However, this must be followed up with a good diet during pregnancy to prevent the mother and infant becoming malnourished.

Check Your Progress Exercise 1

1) Why do the needs for the following go up in pregnancy?

a) Energy

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b) Protein

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c) Iron

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d) Calcium

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2) In which trimester do nutrient needs in pregnancy increase substantially?

First ☐ Second ☐ Third ☐

Why?

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3) a) Why is an adolescent girl who becomes pregnant under great risk of becoming malnourished?

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b) If you were talking to a group of adolescent girls, what would you tell them about the importance of a good diet?

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9.3 RECOMMENDED DIETARY INTAKES FOR THE PREGNANT WOMAN

In the previous Section we looked at the reasons why the need for certain nutrients goes up in pregnancy. Now we will consider the RDIs laid down by the Indian Council for Medical Research (ICMR) for the pregnant woman for energy and protein. An additional intake of 300 Kcal is recommended for energy and 15 g for protein or in other words +300 Kcal and +15 g protein.

As we mentioned in our discussion on RDIs in Unit 8 (Block 3) of this Course, the plus sign ('+') indicates that we have to add the figure mentioned to the RDI for that nutrient of the woman depending on her activity level.

In order to make this clearer, let us calculate the RDIs for a sedentary pregnant woman.

	RDI FOR SEDENTARY NON-PREGNANT WOMAN	RDI FOR SEDENTARY PREGNANT WOMAN
Energy (Kcal)	1875	1875 + 300 = 2175
Protein (g)	50	50 + 15 = 65

Check Your Progress Exercise 2

1) Complete the following table for RDIs for energy and protein for a moderately active woman who is pregnant, and for one who is not.

NUTRIENT	RDI FOR MODERATE WORKING NON-PREGNANT WOMAN	RDI FOR MODERATE WORKING PREGNANT WOMAN
Energy (Kcal)		
Protein (g)		

9.4 MEAL PLANNING FOR THE PREGNANT WOMAN

Our earlier discussion on RDIs has shown that needs for energy, protein, iron and calcium as well as the B vitamins show a sharp increase. Based on your knowledge of the food sources of these nutrients, which specific foods would you like to select from the three food groups for including in the diet of a pregnant woman?

ENERGY-GIVING GROUP	BODY BUILDING GROUP	PROTECTIVE/ REGULATORY GROUP

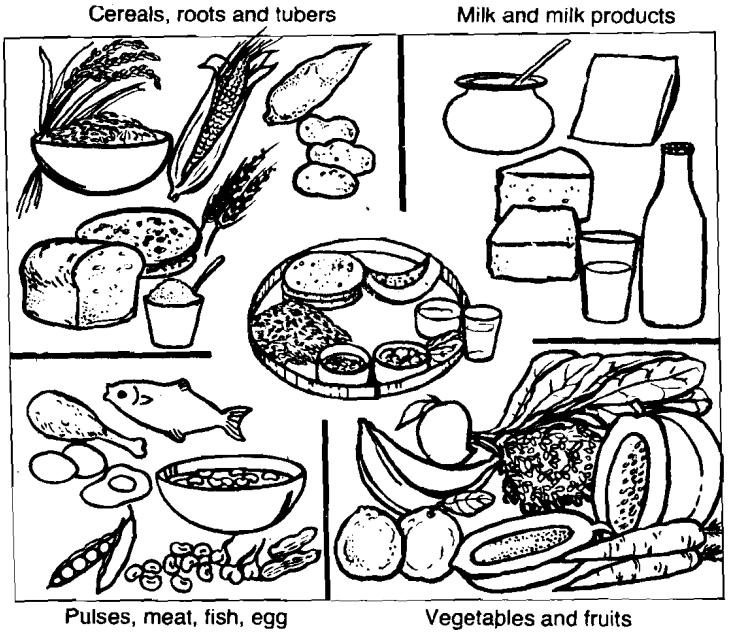

Fig. 9.2: Foods to emphasize in pregnancy

Figure 9.2 gives you an idea of the foods to emphasize during pregnancy. If you notice, milk and milk products are given special importance. Milk is a complete food supplying protein, B vitamins such as riboflavin and calcium in good amounts. The following charts give you an idea of food sources of iron and calcium — you can choose one or more of the items when you plan the menu for the pregnant woman. We will talk about this in more detail in the next Section.

CHART 1 : SOURCES OF IRON		
Liver	Rice flakes	Horse gram
Mutton (muscle)	Bajra	Bengal gram
Mustard leaves	Soyabean	Raisin
Bathua	Moth beans	Dates (dried)
Amaranth leaves (tender)	Cowpea (Lobia)	Apricot (dry)
	Lentil	Phalsa
Mint	Peas	

Usually pregnant women are prescribed iron-folic acid tablets since iron intake through the diet may not be sufficient. (Fig. 9.3)

Fig. 9.3: Give iron and folic acid tablets during pregnancy

CHART 2 : SOURCES OF CALCIUM		
Ragi	Agathi	Cow's milk
Bengal gram (whole)	Amaranth	Buffalo milk
Horse gram (whole)	Fenugreek leaves	Cheese
Rajmah		Khoa
Gingelly seeds		Fish e.g. hilsa, rohu

Can you prepare a similar chart for rich sources of B vitamins?

CHART 3 : SOURCES OF B VITAMINS

If you have difficulty in recalling them, turn to Unit 6, Block 2 of this Course.

We mentioned the ill effects of iodine deficiency earlier. Consuming iodized salt is a must in areas where iodine deficiency is prevalent.

Adequate intake of fluid is vital in pregnancy. Water and other drinks/beverages such as milk, butter milk, coconut water, lime juice should be taken in plenty between meals. Intake of at least 6-8 glasses of water is considered essential.

In addition to meeting nutrient needs, other considerations also become important in selecting foods for a pregnant woman. During the early weeks of pregnancy, nausea and/or vomiting is common especially early in the morning. This is called morning sickness. If this is a problem, eating a dry, carbohydrate-rich food is helpful (such as rusk, toast or biscuits). In addition, foods which have a strong odour and flavour could be avoided. Constipation is a common problem in late pregnancy. It can be prevented by taking plenty of fibre-rich foods and water. Green leafy vegetables, whole grain cereals and pulses are rich sources of fibre.

Certain foods may be poorly tolerated by some pregnant women because they cause a gas or flatulence problem e.g. black gram (urad) and cauliflower. These need to be avoided if they are not tolerated well.

As pregnancy progresses, it becomes difficult for the woman to eat heavy meals. A feeling of fullness or heaviness is common and there may also be a feeling of "heartburn". The solution to this is to provide small, frequent meals and also to avoid too many fatty, fried or rich foods. It is a good practice to introduce nutritious snacks in between the main meals e.g. midmorning or midafternoon. You may be aware of traditional food preparations commonly served to pregnant women in your region. Can you list some of them?

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Usually traditional preparations which are considered suitable in pregnancy are made from cereals, pulses, nuts, oilseeds and special herbs. Seri, for example, is a Gujarati dish prepared from wheat flour or bengal gram flour, ghee, jaggery and spices. Such preparations supply high amounts of energy as well as in many cases protein/vitamins/minerals. A particular preparation could be further improved by introducing minor modifications if people find it acceptable.

You may also have heard of dietary restrictions placed on the pregnant woman. Some studies have shown that foods commonly avoided during pregnancy include papaya, pineapple, jaggery and fried foods. There is considerable variation in beliefs from region to region. The local beliefs about the intrinsic qualities of food e.g. cold or hot foods or association of foods with abortion are often the deciding factor.

Table 9.1 summarizes some salient points to remember regarding diet in pregnancy, which would help you in giving practical advice. In Unit 6, DECE-1 you were introduced to the ill effects of smoking, alcohol consumption and taking strong drugs and narcotics during pregnancy. We have already discussed the diet related points in detail in this Unit.

Table 9.1: Points to Remember Regarding Diet in Pregnancy

	DO'S		DON'TS
1)	Check on weight gain during pregnancy	1)	Avoid serving too much food at one time (one meal)
2)	Include more of cereals, milk and milk products, pulses, nuts, fruits and vegetables such as green leafy vegetables in the diet.	2)	Avoid the consumption of foods with strong flavours if the woman finds them difficult to tolerate.
3)	Give iron and folic acid tablets from second trimester onwards.	3)	Restrict the use of fried and fatty foods if poorly tolerated. Very spicy food may also be restricted for the same reason.
4)	Use iodized salt.	4)	Discourage the pregnant woman from consuming alcoholic beverages, smoking and taking drugs without medical advice.
5)	Give small but more frequent meals during the day.	5)	Avoid serving too much of tea or coffee.
6)	Provide nutritious snacks in between meals.	6)	Avoid excessive weight gain during pregnancy. This can lead to complications.
7)	Serve biscuits, rusk or any other carbohydrate rich food item early in the morning to prevent morning sickness.	7)	Even if the pregnant woman is overweight or obese, do not restrict the diet since this can affect the foetus.
8)	Serve water or other beverages between meals		
9)	Include fibre-rich foods particularly in last trimester to avoid constipation.		
10)	Encourage the woman to take adequate rest after each meal. This helps in better utilization of food.		

Check Your Progress Exercise 3

1) Pinni is a preparation (common in the North) served to pregnant women. The preparation is made of wheat flour, sugar (powder), khoa, ghee, raisins and nuts. Wheat flour is first roasted in ghee to a golden colour. Khoa is added and roasting continued for a few minutes. The powdered sugar along with raisins/nuts is then added and mixed. The mixture is allowed to cool and made into balls.

   a) Does Pinni supply energy, protein, iron and calcium in good amounts assuming that quantities included of each ingredient are adequate? Explain in brief.

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b) Would Pinni be a suitable snack for a pregnant woman to consume in between meals? Give reasons for your answer.

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2) List any six considerations to be kept in mind while planning meals for the pregnant woman.

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9.5 INFLUENCE OF LACTATION ON NUTRIENT NEEDS

In the period immediately following delivery, the woman secretes a fluid called colostrum for a few days. Colostrum is rich in vitamin A and protein. Breast milk is secreted from the third or fourth day after delivery. Breast milk meets all the nutrient needs of the infant upto the fourth to fifth month. Even after that breast feeding should be continued because milk adds valuable nutrients to the baby's diet.

These points would indicate to you how important it is for the infant that the mother be able to secrete enough milk with adequate amount of nutrients. It is the mother's diet which is the source of all these nutrients. Table 9.2 gives you an idea of the nutrient composition of breast milk and therefore indicates the nutrients whose requirements go up in lactation.

Table 9.2: Nutrient Composition of Breast milk

NUTRIENT	AMOUNT IN BREAST MILK (PER 100 ML)
Energy (Kcal)	65
Protein (g)	1.1
Carbohydrates (g)	7.4
Fats (g)	3.4
Calcium (mg)	28
Iron (mg)	—
Carotene (µg)	137
Thiamine (mg)	0.02
Riboflavin (mg)	0.02
Niacin (mg)	—
Vitamin C (mg)	3

Source: Nutritive Value of Indian Foods by C. Gopalan, B.V. Rama Sastri and S.C. Balasubramanian, revised and updated by B.S. Narasinga Rao, Y.G. Deosthale and K.C. Pant, National Institute of Nutrition (1989).

A well nourished lactating woman usually secretes about 500 ml of milk per day in the first month. This amount increases to about 1 litre per day by the fifth month. On an average, a well nourished lactating woman secretes about 850 ml milk/day during the first six months. Subsequently the amount starts decreasing. But there usually are individual variations.

Now let us try to predict the nutrients whose needs go up in lactation. The following nutrients are secreted as part of breast milk in substantial amounts as you can see from Table 9.2:

- Energy (carbohydrates and fats)
- Protein
- Calcium
- Vitamin A
- B Vitamins (Thiamine, riboflavin, niacin)
- Vitamin C

If the mother's diet does not provide enough of these nutrients, the stores of nutrients available in her body or breakdown of her own tissues would compensate to a certain extent. After all the reserves in the mother's body are exhausted, the composition of breast milk changes and nutrient levels drop and total amount of breast milk secreted decreases. So you would realize that both the diet and the nutritional status of the mother are crucial during lactation. The amount of breast milk secreted also depends on how frequently and how strongly the infant sucks at the breast. Sucking is essential in maintaining lactation. You would find details on this in Unit 12 of the next Block.

From our earlier discussion you would have realised that energy needs go up in lactation because carbohydrates and fats are secreted as part of breast milk. Energy needs also increase for the reason that basic metabolic rate (BMR) increases sharply in lactation. We discussed the meaning of the term BMR in Section 9.2 in the case of pregnancy.

Now let us study the RDIs in lactation.

9.6 RECOMMENDED DIETARY INTAKES FOR THE LACTATING WOMAN

As you studied in the previous Section, requirements of several nutrients increase in lactation. This is obviously reflected in Table 9.3 which gives you the recommended dietary intakes in lactation for energy and protein.

Table 9.3: Recommended Dietary Intakes for the Lactating Woman

NUTRIENT	RDIs	
	0-6 months of lactation	6-12 months of lactation
Energy (Kcal)	+ 550	+ 400
Protein (g)	+ 25	+ 18

Source: Nutrient Requirements and Recommended Dietary Intakes for Indians, ICMR (1990)

Do you notice the decrease in RDIs from 0-6 months of lactation to 6-12 months of lactation? Why are nutrient needs not as high in the latter part of lactation as compared to the former? The reason for this is that the amount of breast milk secreted steadily increases during the first 6 months of lactation and reaches a peak. After that it falls gradually. Obviously nutrient needs would follow the same pattern.

9.7 MEAL PLANNING FOR THE LACTATING WOMAN

In the previous Sections you were introduced to the fact that the need for certain nutrients shows a sharp increase in lactation e.g. energy, protein, calcium, vitamin A and vitamin C and the B complex vitamins. You would also have noticed that the requirement for energy and protein during the first six months of lactation is much higher than during the next six months of lactation.

So, how would this influence selection of foods? We would have to take particular care to include foods rich in the nutrients we have just mentioned. The recommendations for planning nutritionally adequate meals during lactation are :

- Include at least one food item from each of the three groups i.e. energy giving, body building and regulatory/protective in each meal.
- Include rich sources of the following nutrients

  Energy (cereals, nuts and oilseeds, fat, sugar)

  Protein (milk, pulses, meat/fish/egg, nuts and oil seeds)

  Vitamin C (amla, citrus fruits, guava, sprouted pulses)

  Vitamin A (green leafy vegetables, carrots, mango, papaya)

  Calcium (milk and milk products, gingelly i.e. til seeds, green leafy vegetables, fish such as rohu).

  B vitamins (whole cereals and pulses especially sprouted).

Figure 9.4 indicates the foods to emphasize during lactation.

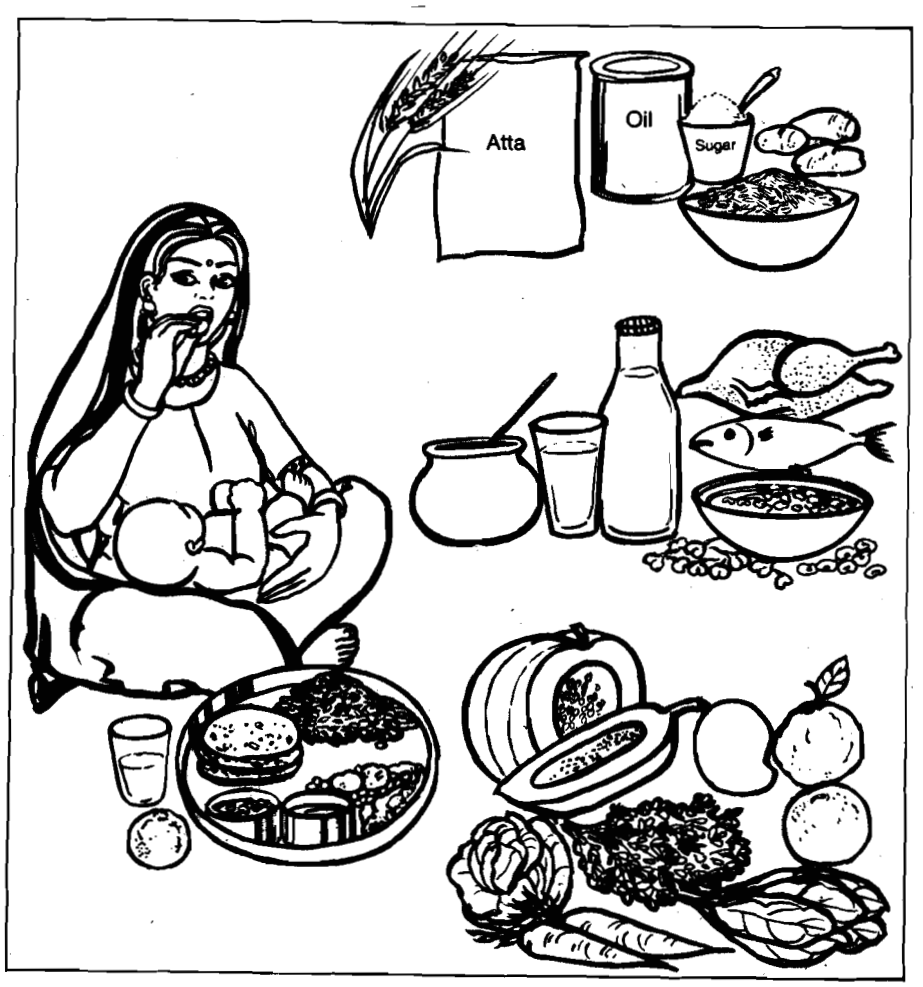

Fig. 9.4: Foods to emphasize in lactation

Along with the increased food intake, the fluid intake should also increase during lactation. The lactating woman must consume about 3 litres of fluids every day. Increased fluid intake is recommended so as to help in maintaining an adequate supply of breast milk. Liquids in the form of fruit juice, vegetable soup, tea, milk/milk-based beverages, water of the green coconut should be provided in between meals or whenever desired. Plenty of water (at least 4-6 glasses daily) should also be provided.

Use of foods which may be poorly tolerated by the mother could be avoided. If a particular food is suspected of causing some discomfort to the infant, that particular food can be eliminated from the diet.

Now let us consider the aspect of meal patterns. Much of what we discussed in relation to pregnancy would be applicable in the case of lactation as well. The main points, if you recall, are:

- Include nutritious snacks in between main meals e.g. mid morning, mid afternoon, tea time.
- Adopt a 5-6 meal pattern.

What is the reason for this? The RDIs for energy and protein are very high in lactation particularly in the 0-6 months period after delivery. Therefore the total amount of food that must be consumed is also large. It is easier for the mother if she takes five to six smaller meals than two or three large ones. Nutritious snacks play a vital role in this case just as they do in pregnancy. In addition to making valuable contributions of nutrients, they help to "take the load off" the main meals such as lunch and dinner.

As we discussed in the Section on pregnancy, local beliefs, taboos, attitudes and practices are of great importance in determining foods included in the diet of the lactating woman. Foods such as milk, dry fruits, sugar or jaggery are usually given emphasis. Tamarind, garlic, cumin seeds and ajwain are supposed to have special properties in promoting lactation. However, we have no scientific explanation for any of these practices. It is, of course, harmful for the mother if she stops consuming foods such as curds, green leafy vegetables and some other vegetables as is the practice in some communities.

The points to remember regarding diet in the lactation period have been summarized in Table 9.4.

Table 9.4: Points to Remember Regarding Diet During the Lactation Period

DO'S	DON'TS
1) Include plenty of milk, citrus fruits, sprouted pulses, green leafy vegetables in the diet.	1) Discourage the lactating woman from consuming alcoholic beverages or smoking.
2) Provide plenty of water and other fluids (about 3 litres) to maintain adequate supply of breast milk.	2) Do not give drugs except when prescribed by the doctor.
3) Continue iron supplementation for a few months after childbirth to make up the losses during delivery.	3) Avoid serving foods which are poorly tolerated by the mother or to which the infant shows an adverse reaction.
4) Increase the meal frequency to 5-6 meals a day.	4) Discourage the lactating woman from breast feeding if she is suffering from chronic illness such as cardiate disease, tuberculosis, severe anaemia or kidney disorders.

5) Increase the quantity of food eaten at one time.

6) Provide nutritious food preparations/snacks in midmorning or midafternoon in between the main meals.

7) Provide sufficient rest to the mother particularly after meals. This helps in better utilization of food by the body.

8) Encourage frequent sucking to produce enough milk for the baby's needs.

9) Provide emotional support so that the mother is happy and relaxed.

Check Your Progress Exercise 4

1) Mention any three factors which can help promote successful lactation.

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2) Why are sprouted and fermented foods particularly recommended in lactation?

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3) What is the importance of nutritious snacks in the diet of the lactating woman? Mention two salient points.

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ii) .....

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9.8 PLANNING BALANCED DIETS FOR PREGNANT AND LACTATING WOMEN

Mohini is a sedentary woman who is in the second trimester of pregnancy. Table 9.5 gives you an idea of a balanced diet for Mohini in the second trimester and compares it with a balanced diet for her when she was not pregnant.

Now, may be the weights do not give you such a good idea of how much to include. We could use standard cups and spoons to make this simpler. We have provided you with these items in the practical kit. The kit consists of the following items:

Measuring glass	:	1
Measuring cups	:	1 cup, 1/2 cup, 1/3 cup, 1/4 cup
Measuring spoons	:	Tablespoon, 1 teaspoon, 1/2 teaspoon, 1/4 teaspoon.

The Practical Manual of this Course will give you details about how to use those standard measures and how these standard measures relate to weight of foodstuffs. We would be discussing amounts of foods in terms of these standard measures later in Table 9.7.

Table 9.5: Balanced Diets for Mohini

FOODS	AMOUNT (IN GRAMS)	
	Before pregnancy	During pregnancy
Cereals	200	220
Roots and tubers	60	120
Sugar/Jaggery	25	25
Fats and oils	35	35
Milk	500 ml	500 ml
Pulses	60	60
Meat/fish/poultry/eggs	—	50
Green leafy vegetables	100	200
Other vegetables	160-200	160–200
Fruits	160-200	160-200
Total energy (Kcal)	**1885**	**2175**
Total protein (g)	**56**	**69**

If you examine the diets before and during pregnancy carefully, you would notice that the following foods have been increased/added in pregnancy.

Cereals	:	20 g
Roots and tubers	:	60 g
Sugar/jaggery	:	10 g
Meat/fish/poultry/egg	:	50 g
Green leafy vegetables	:	100 g

Can you think of reasons for this? Since Mohini requires more energy, the foods which form part of the energy-giving food group are increased. In other words, the amounts of cereals, roots and tubers, sugar/jaggery are increased; some of the additional energy is also supplied by meat/fish/poultry/egg added to the diet.

The additional protein required is mainly supplied by meat/fish/poultry/egg added though some proportion is also provided by the cereals/roots and tubers.

The extra amount of green leafy vegetables provides valuable additional amounts of minerals such as iron and calcium.

Now let us distribute the foods mentioned in Table 9.5 over the day's meals. Let us assume that Mohini belongs to the middle income group and is a housewife. We could decide on a five meal pattern for her. If you remember, we mentioned in the previous Section that it is better to give small, frequent meals to the pregnant woman. We also talked about the benefit of adding nutritious snacks to the diet. Mid morning is usually a good time so that the woman feels satisfied until lunch time.

Table 9.6 gives you the distribution table for Mohini's diet based on Table 9.5.

Table 9.6: Distribution of Foods Over Day's Meals for Mohini's Diet

	BREAKFAST	MID-MORNING	LUNCH	TEA	DINNER	TOTAL
Cereals	40	40	60	20	60	220
Roots and tubers	—	—	60	—	60	120
Sugar/jaggery	5	12.5	10	7.5	—	35
Fats and oils	7.5	7.5	10	—	10	35
Milk	250 ml	—	125 ml	62.5 ml	62.5 ml	500 ml
Pulses	—	30	—	—	30	60
Meat/fish/ poultry/egg	50	—	—	—	—	50
Green leafy vegetables	—	100	—	—	100	200
Other vegetables	40-50	—	80-100	—	40-50	160-200
Fruits	80-100	—	—	80-100	—	160-200

Now let us see how we can convert all these figures into the magic of menus. We will take each meal one by one in Table 9.7. In this table, you would notice that we have indicated amounts in standard measures or size and number of different foods.

You must remember that we are referring to amounts of raw foods — not cooked foods.

Table 9.7: Deciding on Menu Based on Distribution of Foods Over Day's Meals

FOODS	FOODS ALLOCATED FOR MEALS	MENU
BREAKFAST		
Cereals	40 g (Two medium sized bread slices)	
Sugar/ jaggery	5 g (One teaspoon)	• Mango milk shake
Fats & Oils	7.5 g. (1 $^1/_2$ teaspoon)	• Buttered toast
Milk	250 ml (One glass)	• Omelette with tomato-onion filling
Eggs	50 g (One egg)	
Other vegetables	40-50 g (Half small onion, half small tomato)	
Fruit	80-100 g (Half a medium sized tomato)	

MID MORNING		
Cereals	40 g (Little more than 1/3 cup atta)	• Sherbet
Sugar/jaggery	12.5 g (2 1/2 teaspoons)	• Laddoos with atta, besan and groundnuts
Fats and oils	7.5 g (1 1/2 teaspoons)	
Pulses	30 g (Little less than 1/4 cup)	

LUNCH		
Cereals	20 g atta (Little less than 1/4 cup atta)	
	40 g rice (Little more than 1/4 cup rice)	• Chapati
Roots & tubers	60 g (Half small potato)	• Rice with mixed vegetables
Sugar/jaggery	10 g (Two teaspoons)	• Palak aloo subzi (Spinach potato vegetable)
Fats and oils	10 g (Two teaspoons)	• Plain custard
Milk	125 ml (Half glass)	
Green leafy vegetables	100 g (Three cups leafy vegetable chopped fine)	
Other vegetables	80-100 g (Two to three pieces beans, small carrot)	

TEA		
Cereals	20 g (One small bun)	• Light tea
Sugar/jaggery	7.5 g (1 1/2 teaspoon)	• Bun stuffed with home made orange jam/marmalade
Milk	62.5 ml (One fourth glass)	
Fruits	80-100 (One medium sized orange)	

DINNER		
Cereals	60 g ($^1/_2$ cup atta)	• Aloo parantha
Roots and tubers	60 g (Half small potato)	• Rajmah curry
Fats & oils	10 g (Two teaspoons)	• Curd
Milk	62.5 ml ($^1/_4$ glass)	• Coriander chutney with tomato and onion
Pulses	30 g ($^1/_4$ cup rajmah)	
Green leafy vegetables	100 g (Loosely filled with finely cut vegetable)	
Other vegetables	40-50 g (Half small onion, half small tomato)	

We have so far planned a diet for a pregnant woman. By following the same process we could suggest a diet for Asha, a sedentary lactating woman in the 6 month period after delivery. As in the case of Mohini, let us indicate the amount of foods to be offered over the entire day and the menus.

Table 9.8: Balanced Diet for Asha

FOOD	AMOUNT (IN GRAMS)	
	When not pregnant or lactating	During lactation (0-6 months)
Cereals	200	240
Roots and tubers	60	120
Sugar/jaggery	25	40
Fats and oils	35	40
Milk	500 ml	625 ml
Pulses	60	60
Meat/fish/poultry/egg	—	50
Green leafy vegetables	100	200
Other vegetables	160-200	240-300
Fruits	160-200	160-200
Total energy (Kcal)	**1885**	**2435**
Total protein (g)	**56**	**77**

If you compare the diet for Asha when she was not pregnant or lactating with that when she is lactating, the following foods have been increased or added in the lactation period:

Cereals	:	40 g
Roots and tubers	:	60 g
Sugar/jaggery	:	15 g
Fats and oils	:	5 g
Meat/fish/poultry/egg	:	50 g
Green leafy vegetables	:	100 g
Other vegetables	:	80-100 g

Can you think of reasons for this? Write your answer in the space given.

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Let us now distribute the foods mentioned in Table 9.8 over the day's meals. Asha belongs to the middle income group and does not leave the home for work. As in the case of Mohini, we could decide on a five meal pattern for her as well.

Table 9.9 gives you an idea of how foods can be distributed over the day's meals for Asha's diet.

Table 9.9: Distribution of Foods Over Day's meals for Asha's diet

	BREAK-FAST	MID-MORNING	LUNCH	TEA	DINNER	TOTAL
Cereals	60	20	60	40	60	240
Roots and tubers	—	60	—	—	60	120
Sugar/jaggery	10	5	10	15	—	40
Fats and Oils	5	5	10	10	10	40
Milk	250 ml	—	250 ml	—	125 ml	625 ml
Pulses	—	15	15	15	15	60
Meat/fish poultry/eggs	50	—	—	—	—	50
Green leafy vegetables	—	—	100	—	100	200
Other vegetables	—	40-50	80-100	—	120-150	240-300
Fruits	80-100	—	—	—	80-100	160-200

Now let's convert these figures into a menu for Asha.

Table 9.10: Deciding on Menu Based on Distribution of Foods Over Day's Meals

FOODS	FOODS ALLOCATED FOR MEALS	MENU
BREAKFAST		
Cereals	60 g (Three slices of bread)	• Milk
Sugar/ jaggery	10 g (Two teaspoons)	• Buttered toast with home made guava jam
Fats and Oils	5 g (One teaspoon)	• Boiled egg slices
Milk	250 ml (One glass)	
Eggs	50 (One egg)	
Fruits	80-100 g (One medium sized guava)	
MID MORNING		
Cereals	20 g (About $^1/_4$ cup suji)	• Tea
Roots and tubers	60 g (One potato)	• Upma with mixed vegetables and sprouted pulses
Sugar/jaggery	5 g (One teaspoon)	
Fats and oils	5 g (One teaspoon)	
Pulses	15 g (Half of $^1/_4$ cup)	
Other vegetables	40-50 g (One small onion)	
LUNCH		
Cereals	60 g ($^1/_4$ cup atta $^1/_4$ cup rice)	• Rice • Chapati • Curry made from peas and cottage cheese
Sugar/jaggery	10 g (Two teaspoons)	• Besan spinach layered burfi
Fats and oils	10 g (Two teaspoons)	
Milk	250 ml (One glass milk made into paneer)	
Pulses	15 g (Half of $^1/_4$ cup)	
Green leafy vegetables	100 g (Three cups leafy vegetable chopped fine)	
Other vegetables	80-100 g (Peas from 10-15 pods one small onion, tomato)	

TEA		
Cereals	40 g (About $^1/_3$ cup atta)	• Tea
Sugar/jaggery	15 g (Three teaspoons)	• Laddoos made of atta, besan, til seeds
Fats and Oils	10 g (Two teaspoons)	
Pulses	15 g (Half of $^1/_4$ cup)	

DINNER		
Cereals	60 g ($^1/_4$ cup atta) ($^1/_4$ cup rice)	• Rice • Chapati
Roots and tubers	60 g (One potato)	• Mixed vegetable with carrots, spinach, potato, onion, tomato
Fats and oils	10 g (Two teaspoons)	
Milk	125 ml (Curd from $^1/_2$ glass milk)	• Raita with sprouted pulse
Pulses	15 g (Half of $^1/_4$ cup)	• Chikoo
Fruits	80-100 g (One large chikoo)	
Green leafy vegetables	100 g (Three cups leafy vegetable chopped fine)	
Other vegetables	120-150 g (Medium sized carrot, small onion, tomato)	

9.9 THE HEAVY PRICE OF MATERNAL MALNUTRITION

A woman who is malnourished even at the beginning of pregnancy would be at great risk because of the additional burden of nourishing the foetus through the period of pregnancy. This assumes even more significance when we look at the fact that many women in our country do not consume a better diet during pregnancy or lactation. Surveys have shown that the diet of women may provide as low as 1500-1600 Kcal during pregnancy and lactation. The women surveyed were doing household work and agricultural labour! This means that their daily diets were supplying 800-1000 Kcal less than their need.

What is the effect of pregnancy on an already malnourished woman? As you would expect the woman would get weaker and develop deficiencies such as iron deficiency and B complex deficiencies. This can result in the mother getting infections easily and she can become very ill.

The consequences of maternal malnutrition could be very severe for the foetus. As you know, the foetus takes the nutrients it needs from the mother's blood. A malnourished mother cannot meet the needs for foetal growth and development. The result would be a baby weighing less than normal at birth. Such infants are called low birth weight infants. The lower the birth weight, the higher would be the chances that the infant would die. In addition to this high risk of death, low birth weight babies also tend to:

- suffer from more frequent infections and recover with greater difficulty
- have fewer brain cells
- have a slower rate of growth and
- be mentally retarded

Several studies have shown that low birth weight infants are too weak to respond adequately to stimulation. Hence the learning process is affected and mental development slows down. This effect is in addition to the fact that such infants may be born with less brain cells and therefore less capacity to learn.

In addition to low birth weight, infants whose mothers suffer from malnutrition develop specific deficiency disorders as well. If the mother's diet is very deficient in iodine, she develops iodine deficiency disorders. In such a case her infant would be born a cretin. An infant who is a cretin suffers from mental retardation, growth failure, speech and hearing defects and paralysis in some cases.

Similarly an infant born to a mother with iron deficiency would also suffer from anaemia. You would learn about nutrition related disorders such as anaemia and iodine deficiency disorders in Block 5 of this Course.

Let us now talk about the consequences of maternal malnutrition during lactation. As you learnt in Section 9.5, lactating women need even more energy and protein than pregnant women. Hence the chances of becoming malnourished during lactation is even higher.

How does maternal malnutrition during lactation affect the infant? Studies have shown that the composition of breast milk does not change much unless the mother is severely malnourished. However there may be a reduction in the quantity of breast milk secreted. This means that the quantity and/or quality of breast milk would definitely be affected in severe malnutrition. This can become life threatening for the infant who is solely dependent on her mother's milk for nourishment. However, usually the mother loses a lot of calcium, energy and protein reserves from her own body in order to maintain the levels in breast milk. This would make her extremely weak.

In this context, can you imagine the effect on the mother of repeated pregnancies? An average woman in our country (particularly in rural areas) goes through cycles of pregnancy and lactation a number of times. Further, many women also have the next child when the older child is just about one year of age. The spacing or the gap between the two children, therefore, is very small. Such close spacing of births is harmful not only for the health of the mother but also for the child. In the case of the mother, closely spaced deliveries do not provide enough time for the woman to recover from the physiological stress caused by the previous pregnancy. In the case of the child, the mother's malnourished status results in less nutrients being supplied. The child born later usually has a low birth weight and is at greater risk of developing severe forms of malnutrition like kwashiorkor or marasmus.

Repeated infections and a heavy work load in addition to a poor diet, greatly increase the chances of the woman being severely malnourished. This can harm the child. Also, infections can slow down foetal growth and may lead to still birth or low birth weight. Smoking, alcohol consumption and inappropriate use of drugs are other factors which create problems for the infant. When women who were regular smokers were compared with non-smokers, the infants born to regular smokers were twice as likely to be low birth weight. In India, smoking and alcohol abuse is increasing in the case of women. This would have serious consequences for the health of the infant. Use of certain medicines without a doctor's, prescription is also dangerous. Some drugs are known to cause birth defects.

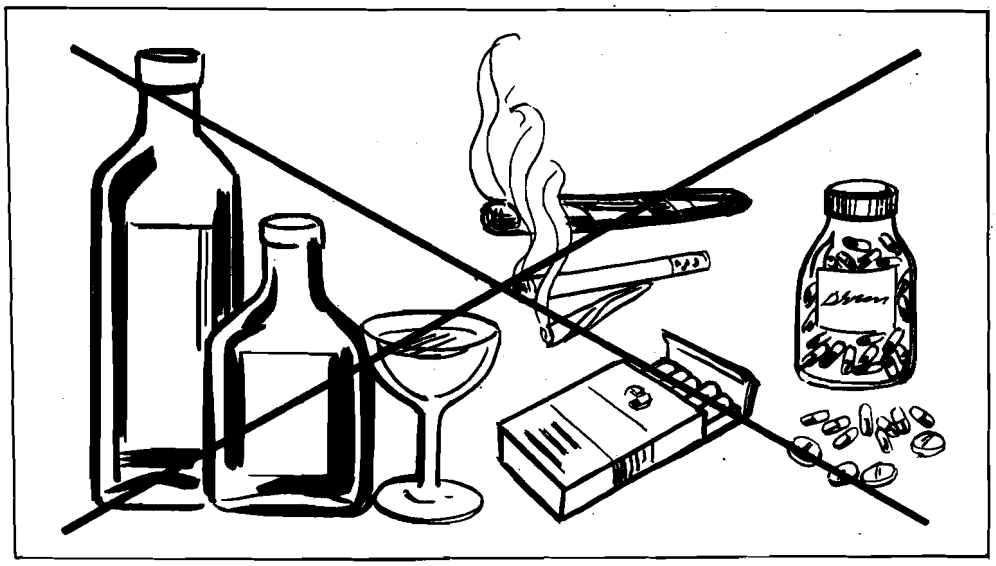

Fig. 9.5: Substances to avoid in pregnancy

Some of the factors we have discussed such as repeated pregnancies, closely spaced births, smoking and alcohol consumption can be identified as major "risk factors". What are risk factors? A risk factor is a condition which can cause problems for both mother and infant. Let us now list the risk factors. These are:

i) Age below 18 years or above 35 years

ii) Height less than 145 cm

iii) Weight less than 42 kg

iv) Woman with previous child weighing less than 2 kg at birth

v) History of twin births

vi) Woman having severe anaemia (haemoglobin below 8 g %)

vii) Closely spaced pregnancy

viii) Repeated pregnancies (four or more)

ix) Woman who had lost her previous child

x) Woman belonging to a very poor family

xi) Woman who had difficult labour during the earlier pregnancy

xii) Woman suffering from diseases such as diabetes, heart disease or high blood pressure

xiii) Woman who is a heavy smoker or drinker or is addicted to drugs.

Can you identify the risk factors in this list which are related to nutrition? Let us take the example of (ii) and (iii). A short stature and low body weight is very much related to malnutrition — it is also related to heredity. However, we can assume that women who have short stature and low body weight have been subjected to long periods of poor dietary intake in their childhood and adolescence.

Many of the other factors we have listed either lead to or are caused by poor food intake/dietary pattern and poor nutritional status. However the age of the mother and a poor gynaecological history (e.g. history of difficult births, miscarriages, complications in pregnancy) are not related to nutrition. You will read more about these risk factors in the next two Units.

Check Your Progress Exercise 5

1) a) What are "risk factors" in pregnancy?

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b) List any three risk factors which contribute to malnutrition of the mother and foetus.

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2) You want to plan a diet for Sushma who is in the second trimester of pregnancy and belongs to the middle income group. List the steps you would follow while planning the diet and any two major considerations you would keep in mind.

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9.10 SUMMING UP

The major points that emerge from this Unit are as follows:

- In both pregnancy and lactation, the nutrient needs go up. The increase is greater in lactation than in pregnancy.
- The needs for energy, protein, B Complex vitamins, iron and calcium go up in pregnancy in order to support the growth of the foetus.
- The needs for energy, protein, B Complex vitamins, calcium, vitamin C and vitamin A go up in lactation for production of milk.
- Particular care has to be taken to include rich sources of these nutrients in the diets of pregnant and lactating women.
- Proper selection of foods from the three food groups for every meal is essential. Nutritious snacks included midmorning should provide one fourth to one fifth of RDIs for energy and protein. The snacks/meals should also be rich in iron and calcium in the case of pregnancy and calcium/vitamin C/vitamin A in the case of lactation. Plenty of fluid should be included.
- Iodized salt should be used.

- Local beliefs and customs may play an important role in including certain types of foods and omitting others. If these are likely to result in deficiency of nutrients or otherwise harm the mother and baby, they must be discouraged.
- It is very important for the mother to be well nourished from conception right through pregnancy and lactation. Otherwise she may not be able to cope with the increased physiological stress. A malnourished mother cannot meet the nutrient needs of her infant in pregnancy and lactation. This could result in low birth weight of the infant and perhaps even the death of the infant.
- Repeated pregnancies, closely spaced births, heavy smoking and alcohol consumption or misuse of drugs, poor gynaecological history and diseases in the mother such as diabetes and high blood pressure are some of the risk factors in pregnancy.

9.11 GLOSSARY

Gynaecological history : Previous experience of the mother during pregnancy and delivery.

Heartburn : Burning sensation experienced just above abdomen (stomach)

Kwashiorkor : A form of malnutrition where child shows patches and swelling on legs and is not responsive to the environment; growth is retarded.

Marasmus : A form of malnutrition where child is extremely underweight, skin is wrinkled and growth is retarded.

Physiological stress : Stress on body caused by normal changes in the body e.g. in pregnancy.

Reserves : Stored nutrients in the body

Stature : Height

9.12 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

1) a) BMR goes up. Growth of both foetus and maternal tissues requires energy. Energy is also stored in the body in the form of fat.

   b) Protein is required to support growth of foetus and maternal tissues such as placenta, uterus, breasts.

   c) Blood volume increases in pregnancy. This means more haemoglobin must be made and haemoglobin is made of iron.

   d) Calcium is deposited in the growing skeleton of the infant.

2) Second and Third. By the beginning of the second trimester the foetus is bigger in size and the maternal tissues also grow more. This means that the nutrient needs for supporting growth become significant and therefore the diet needs to be supplemented by this stage.

3) a) An adolescent girl who becomes pregnant carries a double burden. She has to support her own growth needs, and the needs of the growing foetus. Her nutrient needs are therefore very high and it would be difficult to meet them.

   b) One would emphasize that they are growing so fast, they require a good diet. This would help to give them the capacity to be more productive and to realize their full potential. Adolescence is also the time when they would prepare for motherhood — pregnancy and lactation. A good diet would help them to be healthy and also have healthy babies.

Check Your Progress Exercise 2

1)

NUTRIENT	RDI FOR MODERATE WORKING NON-PREGNANT WOMAN	RDI FOR MODERATE WORKING PREGNANT WOMAN
Energy (Kcal.)	2225	2225 + 300 = 2525
Protein (g)	50	50 + 15 = 65

Check Your Progress Exercise 3

1) a) Yes. Wheat flour, sugar and ghee are rich in energy. Khoa is rich in protein and calcium. Nuts provide both protein and energy. Raisins are rich in iron.

   b) Yes. It is a convenient snack which can be stored and consumed whenever needed — e.g. midmorning or midafternoon. It also supplies nutrients in concentrated form — eating one or two pieces or laddoos would provide enough nutrients.

2) Any six of the following:

   Nutritional adequacy, tolerance for specific foods, period of pregnancy (first/second/third trimester), income group, meal frequency, occupation of the woman, regional factors, local beliefs determining selection of foods and their acceptability, restrictions on use of alcoholic beverages.

Check Your Progress Exercise 4

1) Adequate nutrition, frequent sucking by the infant, mother keeping relaxed.

2) Sprouted foods are rich in vitamin C and vitamin B complex. Sprouting improves the digestibility of proteins. It also improves absorption of iron. Fermented foods are rich in B complex vitamins.

3) i) Balanced, nutritious snacks offered twice a day per day perhaps midmorning and midafternoon would make sure that the requirements for nutrients are met.

   ii) The additional meals at which snacks are offered help to take the load off the main meals. Smaller meals make it easier for the lactating woman to consume adequate food.

Check Your Progress Exercise 5

1) a) A risk factor in pregnancy is a condition which could harm the health of both mother and infant.

   b) Mother with age below 18 years, repeated pregnancies, or closely spaced pregnancy.

2) *Steps in planning diet*: Deciding on total quantities of foods to be offered in the day; distributing these foods over the day's meals; deciding on the menu.

   Major considerations (any two): Inclusion of nutritious snacks, offering foods rich in iron/calcium as well as energy and protein, increasing meal frequency, offering fluids, avoiding foods poorly tolerated.