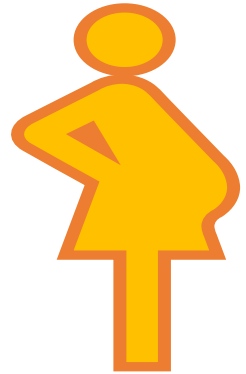
Nutrition during pregnancy & Lactation

Assistant professor Mayasah A. Sadiq
FIBMS-FM



- Good nutrition is an important component of a healthy lifestyle and a healthy baby.

- The best time to review the nutritional status to make appropriate changes is prior to conception.

- A very important time of fetal development is during the first several weeks of pregnancy as all of the major fetal body systems are undergoing formation and rapid development.

- Many women may not even realize they are pregnant at this time.

- Therefore it is prudent to make lifestyle and nutritional changes several months before conception occurs.

Pregnancy is the only time in life of women when weight gain is not only desirable, but also encouraged.

Weight gain should not be confused with being obese.

There are multiple growth spurts of multiple organ systems that contribute to the normal weight gain.

Optimal Weight Gain

- **Personalized approach is best depending on patient's height, pre-pregnancy weight, bone structure, activity level.**
- **Usual 12-17 kg weight gain**
- **Fetus 3.5 kg**
- **Placenta 750 g**
- **Amniotic fluid 4 kg**
- **Uterus 1 kg**
- **Breasts 1 kg**
- **Stored Fat 2kg**
- **Total weight gain 12.5 kg**

Weight Gain

- **1st Trimester** **1-2.5 kg**
  - **may lose weight if N & V**
- **2nd & 3rd trimester** **0.5 kg/week**
- **Dieting is never recommended during pregnancy ; ketoacidosis may result leading to fetal distress.**

TRIMESTER	EXTRA ENERGY NEEDS
1st trimester	100 extra calories each day
2nd and 3rd trimester	300 extra calories each day

WHAT COULD HAPPEN WHEN THERE IS:

NOT ENOUGH WEIGHT GAIN

- Low birth weight baby
- Early birth
- Baby may not develop properly
- Baby may have life-long health problems
- Higher perinatal mortality
- Baby may have mental and behavioural problems

TOO MUCH WEIGHT GAIN

- High birth weight baby
- Difficult birth (Feto pelvic disproportion)
- Higher perinatal mortality
- Mother may develop gestational diabetes
- Baby may develop diabetes & cardiac problems in later life

EXPECTED WEIGHT GAIN

PRE PREGNANCY BMI	WEIGHT FOR HEIGHT CATEGORY	RECOMMENDED GAIN IN BODY WEIGHT (KG)
<18.5	Underweight	12.5 – 18
18.5 – 24.9	Normal Weight	11.5 – 16
25 – 29.9	Overweight	7.0 – 11.5

IMPORTANT NUTRIENTS DURING PREGNANCY

- Folate
- Iron
- Calcium
- Vitamin D
- Vitamin A

- Omega Fatty Acids
- Essential Amino Acids from protein sources
- Calorie providing Food
(Carbohydrate and Fats in proper ratios)

FOLATE

- **Why is it important in pregnancy**
  - Needed to reduce risk of :- Neural tube defects
    Congenital heart defects,
    Cleft lips,
    Limb defects
    Urinary tract anomalies
    Preterm delivery
    Infant low birth weight
    Fetal growth retardation

Neural tube defect

FOLATE(CONT.)

- 400 micrograms of synthetic folic acid daily from fortified foods and/or supplements has been suggested for all non-pregnant women, in order to have adequate folic acid intake even in case of unplanned pregnancies.

- Ideal to start before conception occurs.

RICH SOURCES OF FOLATE

Certain foods are very high in folate:

- ✓ Leafy vegetables - spinach, asparagus, turnip greens, lettuce.
- ✓ Legumes - dried or fresh beans, peas and lentils
- ✓ Egg yolks
- ✓ Baker's yeast
- ✓ Fortified grain products (pasta, cereal, bread)
- ✓ Breakfast cereals (ready-to-eat and others)
- ✓ Sunflower seeds
- ✓ Liver and liver products
- ✓ Kidney

IRON

- **Why is it important in pregnancy**
  - Pregnancy causes a surge in the volume of blood in the body; the expanded volume may go up by 50%.
  - To meet the demands of the increased blood volume, iron requirements go up significantly.
  - Iron is also required for the normal development of the growing baby and the Placenta.

IRON(CONTINUED)

- Iron requirements in pregnancy go up from 18 to 27-30 mg per day.

- Because iron is not easily absorbed from the diet, it is recommended to take an iron supplement

- Risk profile of an anaemic mother includes-

a)Preterm birth.
b)Low birth weight.
c)Increased blood loss during and after labour.
d)Depleted stores.

Anaemia thus remains a major cause of maternal & fetal morbidity, mortality and low birth weight.

Too early, Too close, Too many, Too late conception also adversely affect the health status (nutritional status) of the females.

RICH SOURCES OF IRON

- Cooking In An Iron Skillet
- Red Meat
- Poultry
- Lentils
- Beans
- Leafy Vegetables
- Pistachios
- Fortified Bread & Breakfast Cereals
- Soybean
- Spinach
- Beetroot

CALCIUM

- **Why is it important during pregnancy?**

1. **Total calcium concentration falls because of physiologic hypoalbuminemia**
2. **Free ionized calcium concentration does not change (9-11gm%)**
3. **The placental produces 1,25-dihydroxyvitamin D, which results in increased intestinal absorption of calcium**
4. **Calcium is actively transported across the placenta to the fetus, facilitated by parathyroid hormone-related peptide**

CALCIUM(CONT.)

This increased demand if not met in the diet – Will lead to excessive calcium resorbtion from the maternal bones – Osteoporosis.

- Involved in mineralization of bones and teeth, energy and cell production and electrolyte acid-base buffering.
- Fetal bone and teeth calcification primarily occurs in last 2-3 months. (total fetal requirement=)
- 2 cup full of milk daily or equivalent to supply 1200 mg calcium/1200mg phosphorous daily
- Excess phosphorous can be a problem. Avoid snack foods, processed meats and cola drinks.

- Therapeutic calcium supplementation (1200mg/day) should Be in the form of calcium citrate/ calcium gluconate Supplemented with vit -d

RICH SOURCE OF CALCIUM

- Dairy foods - Milk, yogurt, Cheese,
- Leafy & Green vegetables - Broccoli, Spinach, Okra,
- Fruits - Oranges, Bananas.
- Beans and Peas – Red kidney beans, Soyabean, Cabbage, Celery.
- Tofu, Peanuts, Peas, Black Beans, Baked Beans
- Fish - Salmon, Sardines

VITAMIN D DEFECIENCY AND AUTISM

- A 2020 study published by Frontiers suggests a link between Vitamin D deficiency during pregnancy and an increased risk of autism in children.
- Vitamin D deficiency was higher in autism children compared to healthy children.
- Supplementing infants with Vitamin D might prove to be a safe and effective strategy for reducing the risk of autism.
- High dose vitamin D improves the core symptoms of autism in about 75% of autistic children.

VITAMIN D SOURCE

Age group	RDA	Tolerable Upper Intake
Infants 0–6 months	400 IU*	1000 IU
Infants 7–12 months	400 IU*	1500 IU
Children 1–3 years	600 IU	2500 IU
Children 4–8 years	600 IU	3000 IU
Children and Adults 9–70 years	600 IU	4000 IU
Adults > 70 years	800 IU	4000 IU
Pregnancy & Lactation	600 IU	4000 IU

VITAMIN A

Why is it important in pregnancy?

- Need enough for healthy growth
- Too much can cause birth defects
- Formation of Rhodopsin, essential for normal vision

TOXICITY

One of the rare entities which cause adverse effects if taken in excessive amounts.

Since vitamin A is fat-soluble, disposing of any excesses taken in through diet takes much longer than with water-soluble B vitamins and vitamin C.

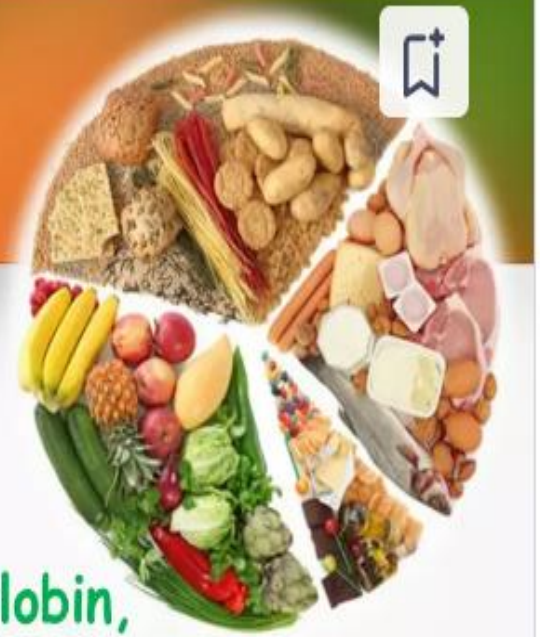
This allows for toxic levels of vitamin A to accumulate.

VITAMIN A TOXICITY

- When the dose of preformed vitamin A is above 10,000 IU per day, there may be a potential risk of teratogenicity.
- There are reports of malformations in children when their mothers consume high doses of preformed vitamin A during pregnancy (>25,000 IU/day)

- ✓ Liver (Beef, Pork, Chicken, Turkey, Fish)
- ✓ Cod Liver Oil
- ✓ Dandelion Greens
- ✓ Carrot
- ✓ Broccoli Leaf
- ✓ Sweet Potato
- ✓ Butter
- ✓ Spinach
- ✓ Cheddar Cheese
- ✓ Melon
- ✓ Egg
- ✓ Apricot
- ✓ Papaya
- ✓ Mango
- ✓ Pea
- ✓ Broccoli

AMINO ACIDS



Why are they important in pregnancy?

- They serve as building blocks of proteins.
- Used in production of DNA, Cell membrane, Haemoglobin, Receptors, Enzymes, Neurotransmitters, Hormones, Antibodies & other Bioactive molecules .
- Serve as body store of energy after fat stored in adipose tissue.

COMPLETE PROTEINS

Proteins from- Meat, Poultry, Fish, Eggs, Milk, Cheese, Yoghurt.

Provide all nine essential amino acids

INCOMPLETE PROTEINS

Proteins from- Legumes, Grains, Nuts, Seeds, Vegetables.

Lack one or more essential amino acids.

OMEGA FATTY ACIDS

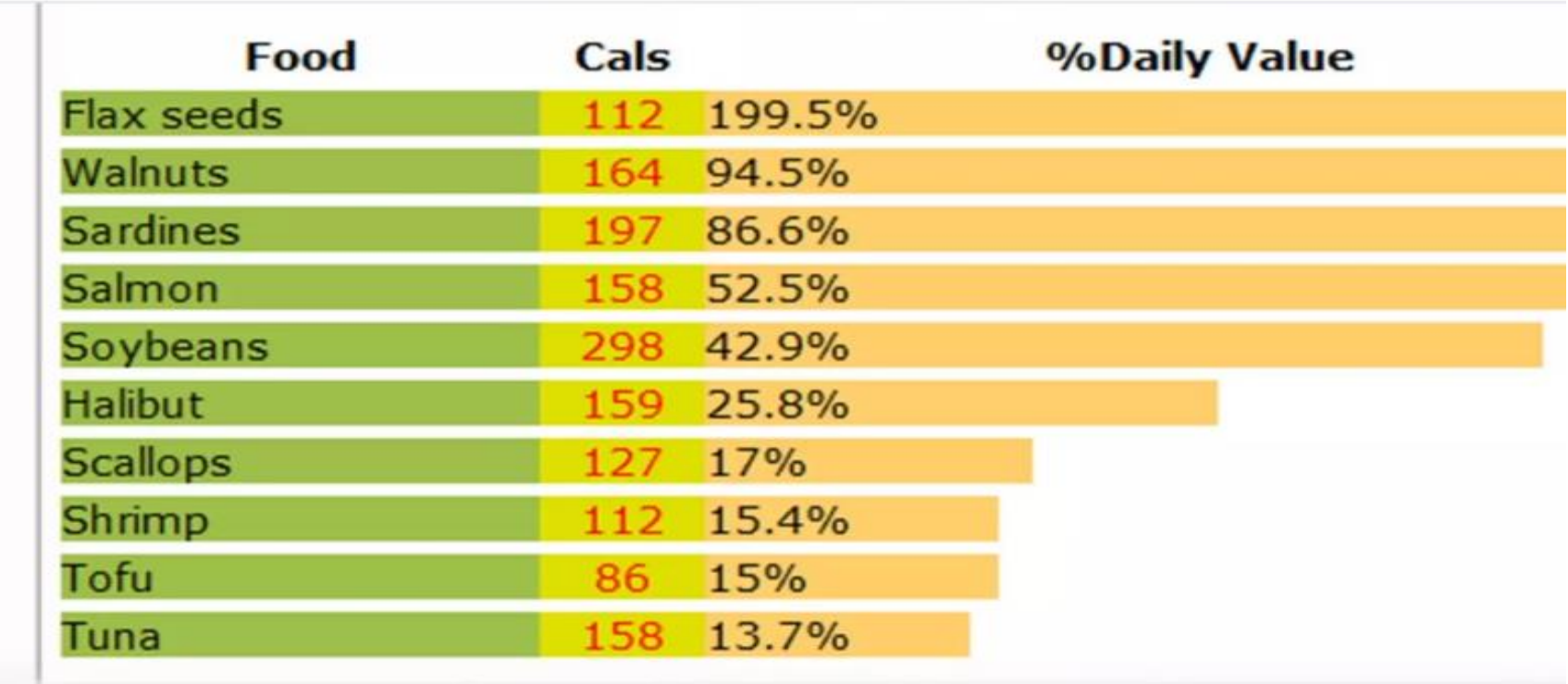
Omega-3 fatty acids are fats commonly found in marine and plant oils.

They are considered essential fatty acids, meaning that they cannot be synthesized by the human body but are vital for normal metabolism.

Though mammals cannot synthesize omega-3 fatty acids, they have a limited ability to form the long-chain omega-3 fatty acids including

- Eicosapentaenoic Acid
- Docosahexaenoic Acid
- α-Linolenic Acid

OMEGA 3 RICH SOURCE FOOD



Food	Cals	%Daily Value
Flax seeds	112	199.5%
Walnuts	164	94.5%
Sardines	197	86.6%
Salmon	158	52.5%
Soybeans	298	42.9%
Halibut	159	25.8%
Scallops	127	17%
Shrimp	112	15.4%
Tofu	86	15%
Tuna	158	13.7%

There is an enormous growth spurt in the human brain during the last trimester of pregnancy and the first postnatal months, with a large increase in the cerebral content of Arachidonic Acid (AA) and DHA.

The fetus and the newborn infant depend on a continual maternal supply of DHA and AA.

CARBOHYDRATES

Pregnant women should not go on low-carb diets, let alone carb-free diets.

In fact, it is recommended that at least half of the calories that pregnant women consume should be carbohydrates.

The main reason is because carbs are known to turn to glucose, which is necessary for the unborn baby.

Carbs are known to provide the baby with nutrients, protein and healthy fats. All of these are quite essential to the proper development of the baby.

LOW CARB DIET

What many people do not realize is that a carb-free diet can actually harm an unborn baby.
It is highly likely that the baby will not get the nutrients that he or she needs for healthy development when one puts oneself on a carb-free, high-protein diet.

When women choose to go on a diet that is high in protein when they are pregnant, their cortisol levels are known to increase.

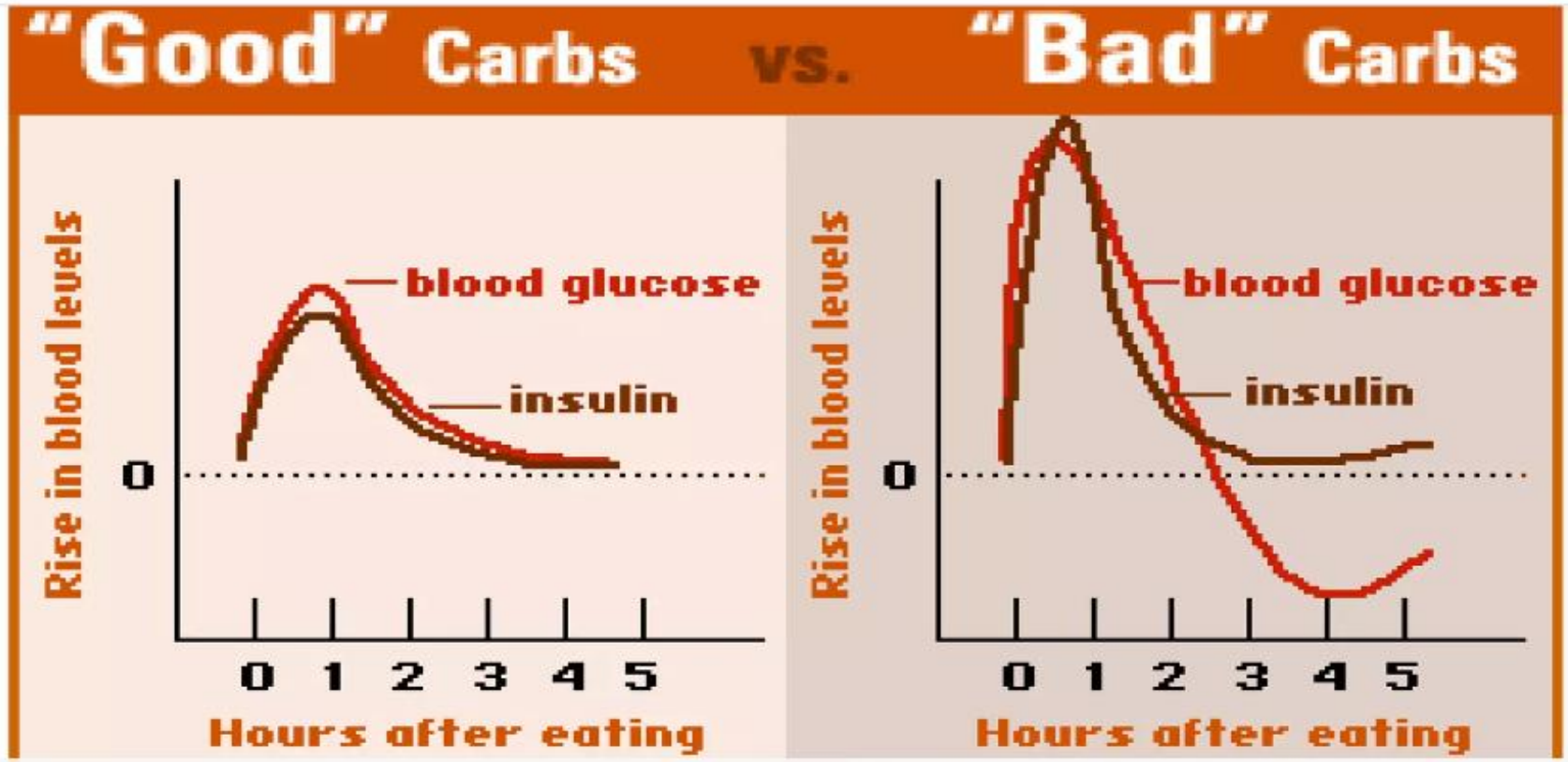
When an unborn baby is exposed to higher cortisol levels, the chances that he or she will have high blood pressure later on in childhood or adulthood increases.

CARBOHYDRATES

There are various types of carbs that pregnant women should eat while they are pregnant in order to ensure the ultimate health and development of their baby.

Some of these carbs include fruits, vegetables and whole grains.

These are what most people refer to as "**GOOD CARBS**" and ultimately, are what will provide the baby with the nutrients needed for healthy development.


"Good" Carbs
vs.
"Bad" Carbs
Rise in blood levels
blood glucose
insulin
0
0 1 2 3 4 5
Hours after eating
Rise in blood levels
blood glucose
insulin
0
0 1 2 3 4 5
Hours after eating

BAD CARBS

There are many carbs that pregnant women should avoid, or only eat in moderation.

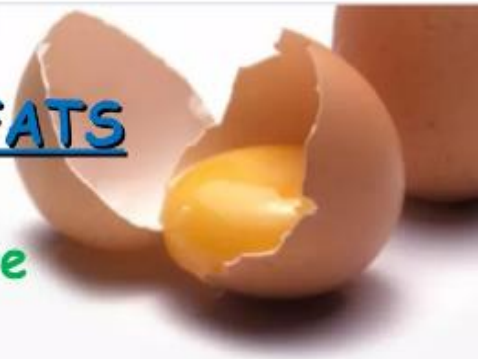
These are what most people call "**BAD CARBS**." Some of these types of carbs include donuts, candy, fast food etc.

These carbs and known to cause weight gain and gestational diabetes among pregnant women.

Although eating bad carbs will not necessarily cause any harm to the baby, they will not provide any health benefits.

FATS

WHY THE DEVELOPING BABY NEEDS FATS



- Babies need a diet high in beneficial fats, as these are their main source of energy.

- A baby's brain, which is around 60% fat, uses nearly three quarters of total dietary energy for growth, whereas an adult's uses only a fifth.

- Once born, they'll get a lot of essential fats from breastmilk, which contains over 50% of its calories as fat

FAT IS ESSENTIAL FOR VITAMIN ABSORPTION

Fats act as carriers for fat-soluble Vitamins such as A, D, E and K.

Vitamin D Helps Keep Bones And Teeth Healthy.

Vitamin E Protects Cell Membranes By Acting As An Antioxidant

Vitamin K Helps Wounds Heal Properly As It Helps With Blood Clotting And Also Helps Build Strong Bones

Caffeine

- caffeine is believed to cause blood vessels in the uterus and placenta to constrict, which could reduce the blood supply to the fetus and inhibit growth.
- Cause pregnancy loss, low birth weight, and impaired brain development in offspring
- Similarly, researchers believe caffeine could potentially disrupt fetal stress hormones, putting infants at risk for rapid weight gain after birth and for later life obesity, heart disease and diabetes

- The American College of Obstetricians and Gynecologists (ACOG) recommends that pregnant women limit their caffeine consumption to less than 200 mg (about two, six-ounce cups) per day.

SMOKING

- Smoking is harmful to the baby
- Passive smoking is dangerous
- Nicotine causes vasospasm leading to Placental insufficiency.
- IUGR
- Preterm Birth.

Lactation

- Is the production and secretion of breast milk for the purpose of nourishing an infant
- Human milk is formulated to meet the nutrient needs of infants for the first 6 months of life.

Benefits of Breastfeeding

1- For the Infant

- Breast milk has the perfect composition for a baby's needs.

- No babies are allergic to their mother's milk.

- Human milk contains at least 100 ingredients not found in formula.
- Lower incidence of ear infections, diarrhea, allergies, and hospital admissions
- Breastfed babies receive antibodies from breast milk.

- Promotes good jaw development
- Decreases risk of obesity later in life
- Facilitates bonding.

2- For the Mother

- Helps lose the weight gained during pregnancy
- Stimulates uterus to contract back to its original size

- Breastfeeding is economical.
- Provides opportunity for resting
- Milk is always at the right temperature and is readily available.

1. During lactation adequate nutrition is required as infant derives all its nutrition from the mother's milk.
2. Mother needs extra nutrition as she has to nourish a fully developed & rapidly growing infant. She needs extra nutrients to meet baby's needs in addition to her own requirements.
3. Any inadequacy in mothers diet influence both the quality & quantity of mother's milk secreted.
4. If mother's diet is inadequate then she will draw her own body reserves to meet the needs of lactation at the cost of her own health.
5. Nutrient deficiency can lead to lower levels of nutrients in the mother's milk.

ENERGY REQUIREMENTS

- During 1^{st} 6months of lactation-additional 550 kcal/day is required.
- During 6-12 months of lactation-additional 400kcallday is required.

Protein requirement:

During lactation protein needs also increases as mothers milk contains 1.15g of protein/100ml.

For proper milk production, adequate amounts of good quality protein or good quality protein should be included in the mother's diet.

During first 6 months of lactation- 75g of protein is required everyday

During 6-12 months of lactation – 68g of protein is required everyday

Calcium: 1g/d

Additional calcium is required for breast milk secretion. 30-40mg of calcium is secreted per 100ml or 300mg of calcium per 850 ml of milk.

Additional intake of calcium is essential to enable the retention of calcium in breast milk.

Adequate dietary calcium intake during lactation meets the mother's calcium needs and extra calcium requirement for breast milk production.

Iron: 30mg/d

Iron requirement during lactation is the addition of the requirement of the mother & required to make up the iron secreted in breast milk.

Most of the lactating woman have lactation amenorrhea, resulting in saving of 1mg of iron per day which would otherwise lost in the menstrual blood.

The requirement of iron is same as the non pregnant woman

Vitamin A (950µg/d):

- Breast milk is rich in vit A so lactating mother needs adequate amount of vitamin A in their diet.
- Average amount of vitamin A secreted in mother's milk is 350µg/d retinol.

Vitamin B6 (2.5mg/d): It's requirement increases during lactation.

Vitamin B12 (1.5mg/d): Additional Vitamin B12 is required to meet the needs of the lactation.

Folic acid (150µg/d): Additional folic acid intake will meet the needs of the lactation.

Vitamin C (25mg/d): Appreciable amount of vitamin C is secreted in breast milk. Additional intake will meet the need of the lactation.

Diet and feeding patterns:

2. Lactating mother requires larger quantities of body building and protective foods & additional energy yielding foods to facilitate the formation & secretion of breast milk.
3. Fluid intake should be increased as fluids are essential for adequate quantity of milk production.
4. No food should be restricted except highly spiced & strongly flavored food, as they impart flavor to milk which may be repulsive to the baby.
5. Nutrient needs of lactating mother are greatly enhanced during lactation hence she should have snacks in between the meals. Lactating mother should have 5-6 meals in a day.

Nutrient Requirements during Lactation

- Protein: 71 g/day
- Minerals: Calcium 1000 mg/day
- Vitamins: Vit C - 120 mg./day; also increased Vit A and B-complex
- Increase fluids

- Most chemicals can pass into the mother’s milk.

- Caffeine may make an infant irritable.

CONCLUSION

- A pregnant woman is most likely to remain healthy and bear a healthy infant if she follows a well-balanced diet.
- Anemia and PIH are two conditions that can be caused by inadequate nutrition.
- Caloric and most nutrient requirements increase for pregnant and lactating women.