

# A COMPREHENSIVE REVIEW ON NUTRITION DURING PREGNANCY : NUTRIENT REQUIREMENT AND GUIDELINES

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**Abstract** - This paper emphasizes the significance of providing adequate nutrition to both the mother and foetus during pregnancy to promote healthy development. It presents a detailed review of the current knowledge on nutrient requirements and guidelines for pregnant women, focusing on optimizing maternal and foetal health outcomes during this critical period of development. Expectant and breastfeeding women require a complete and nutritious diet that includes essential nutrients like protein, vitamins (A, C, B1, B2, and folate), iron, and fibre. The recommended nutrient intake during pregnancy varies based on the individual's nutritional status and eating habits. Eating healthy meals and exercising regularly can help control unnecessary weight gain during pregnancy. Inadequate nutrition during pregnancy has been linked to suboptimal foetal development, premature birth, and an increased risk of long-term illnesses. Therefore, it is crucial to ensure that pregnant women consume a balanced and wholesome diet to maintain adequate nourishment and minimize the possibility of adverse health effects for both the mother and newborn. The paper concluded by emphasizing the importance of proper nutrition during pregnancy and provides guidelines on nutrient requirements and best practices for achieving adequate nutrition. However, there is a need for further research on the potential risks associated with excessive nutrient supplementation during pregnancy.

**Index Terms** - Diet Quality, Expectant Mothers, Health Status, Nutritional Status, Pregnancy

## INTRODUCTION

Humans in general require a range of meals to fulfil nutritional requirements, and the importance of a various diet has been widely acknowledged. In order to grow and develop both physically and mentally, babies and young kids require diets that is nutrients dense and should be able to meet the daily requirement to live a healthy active lifestyle [1]. Similarly pregnant women also require good nutrition. Pregnancy become healthier, happier, and more comfortable with good diet, as it will boost the energy level and reduces the chances of experiencing the pregnancy related side effects such as morning sickness, nausea, anaemia, diarrhoea, constipation and generally improves mood. For developing infant, proper nourishment is also very beneficial. As it fulfils all the nutritional requirement the maturing infant requires. It increases the probability that baby will be born with an appropriate birth weight and lowers the risk of congenital defects. In human when counting from the last menstrual cycle to delivery, a pregnancy typically lasts for about 266 days or 38 weeks or over 9 months [2]. Pregnancy is divided into three trimesters, first trimester, second trimester, and third trimester last for 12, 12 to 24, and 24 to 40 weeks respectively. First trimester lasts for week 1 to week 12 during this duration foetus develop brain, and spinal cord from neural tube, other organs, including the heart, also begins to develop [3]. Second trimester of pregnancy last from Week 13 – 27 during this time period foetus limbs and legs are formed, and the head is upright and infant's eyes starts to progressively turn towards the front, and the ears are almost in their ultimate position [3]. After 27-week mother enters in last trimester i.e., third trimester ends at week 40 when baby is born [4]. Getting enough macro- and micronutrients throughout pregnancy is essential for an infant's optimal development [5]. According to age nutritional needs vary and have wide range of effects on maternal health status and milk composition particularly in adolescent or malnourished mothers [6]. According to (NIN, ICMR 2011) energy and protein needs of pregnant women rise by 330 Kcal and 15 g, respectively, per day. Pregnant women need to eat healthily to fulfil their personal requirements, those of their unborn children, and to get themselves ready for breastfeeding [7]. Fe, Ca, omega-3 fatty acids, choline, folic acid, vitamin B, C and D are essential during pregnancy and inadequate consumption of these nutrients can cause nutrient deficiencies. The government of India has launched several initiatives aimed at enhancing the health and nutrition of mothers who are pregnant or breastfeeding, including the CSSM (Child Survival and Safe Motherhood Programme), NNAPP (National Nutritional Anaemia Prophylaxis Programme), RCH (Reproductive Child Health), and ICDS (Integrated Child Development Scheme) [8].

## NUTRITION DURING PREGNANCY

According to "Eat well Plate" model pregnant and lactating women are encouraged to eat a balanced and nutritious diet. Several vital nutrients, including protein, vitamins A, C, B1, B2, folate, are needed in greater quantities during pregnancy. Iron and folate levels in diet are frequently low, thus pregnant women are advised to eat food rich in these nutrients [7]. Depending on the population's nutritional state and dietary habits, several guidelines regarding certain nutrition for pregnant women were established. In order to avoid unnaturally high gestational weight gain (GWG), proper food and physical activity are encouraged [9].

Calorie intake increases during pregnancy due to the increased basal metabolic rate and the need to support the growth of the foetus, placenta, and other tissues. Calorie intake during first trimester is same as that of non-pregnant women, while in second and trimester calorie intake is additional 340Kcal/day, and 452Kcal/day is required in trimester2, trimester3 respectively. Consuming more calories while pregnancy has a positive impact on weight of newborns. Whereas consuming calorie less than 1500Kcal lead to low birth weight (LBW) baby [10]. An appropriate supply of energy and raw material is necessary to support growth and development of foetus throughout pregnancy. Protein is necessary as it provides the structural framework to all newly formed cells and tissues in the mother and foetus. Protein requirement during whole pregnancy is 0.88 and 1.1g/kg/day according to estimated Average Requirement and RDA recommendations respectively [11]. In order to maintain good health, a diet must include carbohydrates. Carbohydrate intake during pregnancy is 45-65% of energy i.e. 175g/day. Fat plays an important role in diet of pregnant women. For the development of brain and good functioning of retina consumption of omega -3 fatty acid is necessary. Fat is consumed in 20-30% of energy during trimester [12], additional 8-4g/day and 11-18g/day in trimester 2 and 3 [13]. Consumption of fibre-rich meals during pregnancy and breastfeeding promote heart health, lowers the risk of diabetes, avoids constipation, as well as reduce hypertension risks (Anderson et al., 2009). During pregnancy women should consume 28 g fibre per day [12]. Iron is an important micronutrient that is essential for the development of red blood cells, haemoglobin, and appropriate energy metabolism. Iron also aids in immunological function, cell division, and help in delivery of oxygen to body tissue. According to RDA pregnant women should consume 40mg iron per day. Calcium is required for the development of teeth and bones of the foetus. 1000mg /day calcium should be consumed by pregnant women according to RDA. Every woman needs calcium, iron, and folate, these are three key nutrients, in order to carry out her tasks normally. Additionally, this study found that one in four women's diets does not include enough iron and that three out of every four women have inadequate calcium consumption [14].

## NUTRITION STATUS

Healthy food consumption and adequate nutritional status have been identified as key factors in healthy pregnancy and delivery outcomes. Contrarily, inadequate nutrition and poor diets during pregnancy have been linked to poor foetal growth, pre-mature delivery, and a higher chance of developing chronic illnesses in later life [15]. Infants, pregnant women, nursing women, and women at reproductive age are most prone to developing dietary issues such as micronutrient deficiencies, iron deficiency anaemia, obesity, underweight, overweight, gestational diabetes mellitus [16].

### *Micronutrient deficiencies*

Due to a persistently inadequate diet, pregnant women in nations with low income frequently struggle to fulfil the nutritional requirements of the growing foetus [17]. In addition, there aren't enough estimates of the population for micronutrient deficits throughout pregnancy since it is expensive to evaluate biochemical markers of specific micronutrients. The phrase "hidden hunger" was coined in response to micronutrient deficiencies and describes its absence of understanding the scope and effects of dietary expense [18]. Due consumption of diets that are rich in fat and sugar and lower in nutritional quality, dietary micronutrient deficient is identified [19].

### *Obesity*

Women's obesity is regarded as an emerging problem linked to wealth. There is a significant incidence of overweight and obesity among women in the GCC nations, with estimates that range from 54% to 70%, according to recent studies. According to epidemiological investigations obesity is a risk factor for a number of chronic illnesses, including high blood pressure, diabetes, heart disease, and several kinds of illnesses such as cancer. There are higher chances that obese mother give birth to new born with high birth weight. Increased blood glucose from maternal obesity and overeating triggers increased foetal insulin, which in turn causes abnormally enhanced lipid production and an excessive accumulation of fat tissue [16]. Risk of getting gestational diabetes, high level of blood pressure, and high lipid level are seen pregnant women who are 150% obese.

### *Underweight*

Just like overweight, maternal underweight is also very common. According to the World Health Organization (WHO), a body mass index (BMI) of less than 18.5 kg/m is considered underweight. 4.3% of pregnant women in the UK and 9.0% of women in China were found underweight at the first prenatal appointment [20]. Low birth weight (LBW) is the second most significant factor, while PTB (preterm birth) is the primary cause of newborn morbidity and death. Women who were underweight have a higher chance of having LBW babies. Not eating enough nutritious food, over exercising, such as an overactive thyroid, are few of the reason for mother being underweight.

### *Gestational Diabetes Mellitus*

Hormone produced by the placenta interferes with the body's ability to use insulin, resulting in gestational diabetes mellitus (GDM). Diabetes is a major public health problem in India with prevalence rates reported between 4.6% and 14% in urban areas, and 1.7% and 13.2% in rural areas [21]. With increase in prevalence of diabetes there seems to be increasing chances of gestational diabetes mellitus (GDM), i.e., diabetes diagnosed during pregnancy. GDM not influences immediate maternal preeclampsia, stillbirths, macrosomia, and needs for caesarean section) and neonatal outcomes (hypoglycaemia, respiratory distress), and can increase the chances of diabetes in child in their late thirties) [22].

### **FACTORS AFFECTING NUTRITIONAL STATUS OF PREGNANT WOMEN**

Pregnant women's dietary status affects both the mother and the developing baby. Challenges that mother faces includes anaemia, bleeding, the mother's weight is not increasing regularly, and she may also get infections. Poor nutritional health status of pregnant women can result in LBW, early delivery, development issues, foetal abortion, and death of infant. Numerous factors, such as social and economic circumstances, birth spacing that is too close, age during first pregnancy, knowledge, financial status, parity and level of exercise, lead to dietary intake issues in pregnant women.

#### *Age*

The optimum age for women to have a child is between 20 and 35 years old as this age is considered to be healthy and safe. Under 20 years of age is considered too young as girl at this age is psychologically and physiologically immature. There is additional nutrition requirement for young pregnant women as they share nutrition with developing foetus [23]. Over 30 years of age women seem to be at high risk because their own immune systems have been weakened and many illnesses start to manifest at this point in their lives [24]. According to the study conducted in Ethiopia the women who conceive in late 40 they may face trouble while delivering babies and are subjected to anaemia [25].

#### *Knowledge*

The degree of knowledge is essential for moms to properly understand and take up the guidance given by medical professionals since it alters their point of view towards eating healthy foods. Pregnant women who have been malnourished do not have awareness about dietary behaviours and experience malnutrition status [26]. Nutrition awareness program are conducted for pregnant women to make them aware of the importance of nutrition so that they will make sure of their nutrition and to for their baby. Women with no formal education are more likely to develop anaemia in comparison to women who are educated [25].

#### *Parity*

Pregnant women have a risk parity of greater than three. Chronic energy deficiency is seen in women who has faced more than three parities [23]. Due to increased parity, mothers must concentrate on raising kids rather than maintaining their own health and nutrition throughout pregnancy [27]. After several pregnancy mother is more prone to develop iron deficiency, they are by increasing the risk to developing anaemia [28].

#### *Socio economic status*

Low-income group pregnant women frequently do not get enough nutrition [29]. Women having less income consume greater amounts of saturated fat, crabs, sugary beverages, and nutrient-deficient food in their diets [30]. According to a study, eating a lot of fatty foods increases the risk of developing overweight or obesity, pregnancy-related diabetes, prenatal pregnancy, and abortion, particularly in women who are overweight. In future there is a good chance that the infant will grow up with type 2 diabetes [31]. Access to food is based on household income and food prices, households with higher incomes and resources typically have more balanced and nutritious diets and therefore mother will give birth to healthy child.

### **COMPLICATION DURING PREGNANCY**

During and after pregnancy women face various complication include both physical and mental disorder which further effect the health of the foetus. To reduce the risk of difficulties during pregnancy, it is crucial for women who are getting pregnant to receive medical attention before, throughout, and after pregnancy. Common complication that arise before, during and after pregnancy are anxiety, anaemia, diabetes, depression, heart problem, hypertension, hyperemesis gravid arum, miscarriage.

#### *Anemia*

Due to decreased production of red blood cells and iron during pregnancy results in anemia. Mild anemia is common during pregnancy but due to insufficient iron or vitamin levels during pregnancy leads to more severe anemia. Not having nutritious food and genetics can be the reason for women to become anemic. Iron deficiency and folate deficiency anemia are the type of anemia seen in pregnant women. Iron deficiency anemia is seen when body lacks sufficient amount of iron and it fails to produce adequate hemoglobin (protein found in the red blood cells which carry oxygen to the lungs and to the body tissue). Not having iron rich food is one of the reasons to develop iron deficiency anemia. Risk factor associated with low hemoglobin level are preterm delivery,

LBW, and in the worst circumstances, premature death occurs [32]. Therefore, in order to prevent iron deficiency doctor, recommend supplement and food rich in iron such as nuts, seeds, leafy greens, eggs, leafy greens etc. Folate deficiency anemia, folate is water soluble vitamin, it occurs during pregnancy when women is not consuming required amount of folate and body is unable to produce red blood cell to transport oxygen to all of the body tissue. Risk factors associated with folic acid deficiencies are neural discords such as spin bifida, LBW, unexpected abortion, fetal mortality, embryonic growth restriction, and preterm births [33]. In order to overcome folic acid deficiency doctors, recommend folic acid supplement and advice to consume broccoli, chickpeas, green leafy vegetable, kale, peas, kidney beans, folic acid fortified breakfast cereals.

### *Anxiety*

About 10-15% [34] to 33% pregnant women frequently experience anxiety throughout their significant life shift. Pregnant women get concerned about the health of the unborn child, the bodily changes they go through in addition to the impending labor and expected discomfort [35]. Childbirth specialists are concerned if a woman exhibits symptoms including difficulty in concentrating, difficulty in functioning at work or home, frequent sensations of panic, nervousness, or anxiousness, thoughts that are obsessive, or a lack of joy for activities that used to make her happy [36]. Lack of a spouse support, a history of domestic violence, a personal history of psychological disorders, an undesired pregnancy, stressful life events, current or previous pregnancy problems, and premature delivery are few of the criteria women develop anxiety. Increased anxiety has an adverse effect on the health of fetus is still not clear. To overcome severe anxiety proper medication prescribed by the doctors are to be taken, several other activities such as meditation, yoga, having nutritious food, building a family support system, good sleep, keeping good knowledge about the pregnancy [36].

### *Hypertension*

One of the primary root causes of premature birth and mortality particularly in underdeveloped countries is hypertension during pregnancy that account for 10-15% of maternal fatalities [37]. Different categories of hypertension in pregnancy include chronic hypertension, gestational hypertension, preeclampsia, preeclampsia superimposed on chronic hypertension [38].

- **Chronic hypertension**

Chronic hypertension is high blood pressure that exists before becoming pregnant or before 20 weeks of gestation [38].

- **Gestational hypertension**

This disorder develops when a woman only has high blood pressure during pregnancy and do not have any other disorder, and is diagnosed after 20 weeks of pregnancy and it usually gets after pregnancy [39].

- **Preeclampsia**

Preeclampsia develops after 20 weeks of gestation period with several other issues like cardiac or renal issues, protein in urine, or any other abnormalities [38].

- **Preeclampsia superimposed on chronic hypertension**

Condition in which preeclampsia develop after the pre-existing hypertension [38].

To overcome hypertension women should consult doctors and should take medication as per the prescription, diet consulting plays a major role, beta-blockers, hydralazine, calcium channel blockers,  $\alpha$ -adrenergic agonists, diuretics, renin-angiotensin-aldosterone system blockade can be used [40].

### *Hyperemesis gravidarum*

Extreme nausea and vomiting that occur during pregnancy is known as hyperemesis gravidarum (HG) [41]. About 70% to 91% of pregnant women experience nausea and vomiting in the first trimester of their pregnancy. Pregnancy-related hyperemesis gravidarum (HG) is an uncontrollable vomiting illness that cause dehydration, electrolyte imbalance, nutrient deficiencies, and weight loss is frequently severe enough to call for hospitalization. HG usually occur during fourth and tenth week of pregnancy. About 10% HG patients experience symptoms in entire pregnancy [42]. Exact cause of HG has not been identified yet, but more than one factor has been found to cause HG such as numerous pregnancies, young maternal age, pregnant women is either underweight or overweight, assisted reproductive technology (ART) are at the higher risk [43]. In order to prevent HG lifestyle modifications, help (proper sleep, stress free environment, family support), multivitamin supplementation according to the prescription, diet modification (consuming small meals and fluid in frequent intervals, blend diet, light snacks like beans, dry fruits, nuts, and meals should be less in fat and rich in protein and carbohydrate, it is advised to avoid food which provoke nausea and vomiting).

## **CONCLUSION**

To guarantee a safe pregnancy and delivery as well as to prevent chronic illnesses in later life, pregnant and breastfeeding women need to eat a balanced and nutritious diet. Guidelines have been devised to promote optimal diet since certain essential nutrients, such as protein, vitamins A, C, B1, B2, folate, iron, and calcium, are required in larger amounts during pregnancy. However, due to micronutrient deficits and meals that are high in fat and sugar but low in nutritional quality, it is still difficult to achieve an acceptable nutritional status, especially in low-income countries. Another growing issue that raises the risk of chronic illnesses and unfavourable pregnancy outcomes is maternal obesity and underweight. Pregnant women should have a balanced and nutritious diet to promote a

healthy pregnancy. According to the "Eat well Plate" approach, pregnant and nursing women should eat enough of the basic nutrients they need, as well as foods high in iron and fibre. For pregnant women, healthy eating and exercise are suggested to prevent excessive weight gain. Inadequate nutrition and poor diets during pregnancy have been associated to poor foetal growth, preterm birth, and chronic illnesses in later life. Adequate nutrition and appropriate food consumption are crucial for healthy pregnancy and delivery outcomes. Infants, pregnant women, nursing mothers, and women of reproductive age are more likely to experience vitamin deficiencies, obesity, underweight, and gestational diabetes mellitus. Pregnancy obesity is a serious new issue that is associated with affluence and is a risk factor for many chronic diseases, whereas maternal underweight can result in low birth weight and premature birth. To safeguard the health of both themselves and their unborn child, pregnant women must understand their nutritional needs and eat a balanced, nutrient-rich diet.

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