

# Effect of Maternal Nutritional Status on the Quality and Quantity of Breast Milk: Implications of Maternal Malnutrition

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Maternal nutrition plays a crucial role in determining lactation performance and infant health outcomes. Breast milk is the optimal source of nutrition for infants, providing essential nutrients and immunological protection. However, maternal malnutrition remains a major public health concern, particularly in developing countries, affecting both the quantity and quality of breast milk. This paper reviews the physiological mechanisms of lactation, the composition of

breast milk, and the influence of maternal nutritional status on milk production. Special emphasis is placed on maternal malnutrition and its consequences for infant growth and development. The paper also discusses nutritional requirements during lactation and strategies to improve maternal nutrition. The findings

highlight the importance of targeted interventions to enhance maternal health and breastfeeding outcomes.

## 1. Introduction

Lactation is a complex physiological process involving the synthesis and secretion of milk from the mammary glands following childbirth. It is regulated primarily by the hormones prolactin and oxytocin. Breast milk provides complete nutrition and immunological protection to infants during the first six months of life.



Maternal nutritional status plays a critical role in determining the success of lactation. In developing countries, maternal malnutrition—characterized by deficiencies in energy, protein, and micronutrients—remains a significant challenge. Although physiological mechanisms prioritize milk production,

prolonged nutritional deficiencies can affect both milk quantity and micronutrient composition.

According to UNICEF (2019), the prevalence of maternal malnutrition is approximately 17.3%, ranging between 16–18.2%. Data from the National Family Health Survey (NFHS-5, 2020–21) indicate that 45.9% of pregnant women (15–49 years) and 50.6% of non-pregnant women are anaemic. The Comprehensive National Nutrition Survey (2016–18) reported that 24% of adolescents (10–19 years) have vitamin D deficiency. Additionally, vitamin B12 deficiency among pregnant Indian women ranges from 40–70%.

## 2. Physiology of Lactation and Infant Growth

Milk production begins shortly after delivery, with an initial yield of approximately 500 mL/day, increasing to about 1 L/day by the fifth month. The average milk production is around 650 mL/day.

Infant growth serves as an indicator of adequate milk intake. Typically, infants double their birth weight within the first six months. Growth charts are used to monitor development. Maternal factors such as age, health status, parity, and nutritional status significantly influence lactation.

## 3. Types and Composition of Breast Milk

### 3.1 Types of Breast Milk

Breast milk is classified into three stages:

- **Colostrum:** Produced during late pregnancy and early postpartum period; rich in antibodies.
- **Transitional Milk:** Produced from day 4 to 10; contains increased fat and lactose.
- **Mature Milk:** Produced after 10 days; provides balanced nutrition.

### 3.2 Composition of Breast Milk

Breast milk contains:

- **Macronutrients:** Lactose, proteins, and fats
- **Micronutrients:** Vitamins (A, B, C, D) and minerals (calcium, iron, iodine)
- **Bioactive Components:** Enzymes, hormones, and antibodies

Certain nutrients, especially water-soluble vitamins, depend significantly on maternal dietary intake.

## 4. Factors Affecting Breast Milk Quantity and Quality

### 4.1 Maternal Nutritional Status

Maternal nutrition influences:

- Milk volume (energy intake)
- Protein synthesis (protein intake)
- Micronutrient composition

Undernourished mothers may produce less milk, although macronutrient composition remains relatively stable.

### 4.2 Infant Demand

Frequent breastfeeding stimulates milk production through hormonal pathways, while reduced feeding frequency decreases milk output.

### 4.3 Parity and Physiological Factors

Milk from primiparous mothers may contain higher fat content. Maternal health, hydration, and hormonal balance also influence lactation.

### 4.4 Dietary Influence

Fatty acid composition reflects maternal diet, and water-soluble vitamins are strongly influenced by maternal intake.

## 5. Maternal Malnutrition

### 5.1 Types of Malnutrition

- Undernutrition (energy and protein deficiency)

- Micronutrient deficiencies
- Overnutrition (obesity)

## 5.2 Effect on Milk Quantity

Maternal undernutrition may lead to:

- Reduced milk production
- Delayed onset of lactation
- Increased maternal fatigue

## 5.3 Effect on Milk Quality

- **Relatively Stable:** Lactose, protein, calcium
- **Reduced:** Vitamin A, iodine, and B-vitamins

## 5.4 Impact on Infant Health

- Growth retardation
- Increased susceptibility to infections
- Cognitive impairment
- Higher mortality risk

## 5.5 Intergenerational Impact

Maternal malnutrition contributes to low birth weight and perpetuates the cycle of malnutrition across generations.

## 6. Nutritional Requirements During Lactation

### Energy Requirements

- +600 kcal/day (first 6 months)
- +520 kcal/day (next 6 months)

### Protein

Increased intake is required for milk synthesis; 2–3 servings per day are recommended.

### Fat

Minimum of 30 g/day is required to supply essential fatty acids and fat-soluble vitamins.

### Minerals

- **Calcium:** 1200 mg/day
- **Iron:** 25 mg/day

### Vitamins

- Increased requirements for vitamins A, B-complex, and C
- Supplementation may be necessary

## 7. Benefits of Breastfeeding to Mothers

- Promotes maternal-infant bonding
- Aids uterine involution
- Supports postpartum weight loss
- Delays ovulation
- Reduces risk of certain cancers

## 8. Strategies to Combat Maternal Malnutrition

### 8.1 Dietary Diversification

Consumption of a balanced diet including fruits, vegetables, dairy, and protein-rich foods.

### 8.2 Supplementation

Iron, folic acid, vitamin A, and iodine supplementation.

### 8.3 Public Health Measures

- Nutrition education
- Maternal healthcare programs
- Food fortification

### 8.4 Socioeconomic Interventions

- Women empowerment
- Improved healthcare access
- Poverty reduction

## 9. Discussion

Maternal nutritional status significantly affects lactation outcomes. While physiological adaptations help preserve milk quality, chronic malnutrition reduces milk quantity and micronutrient content. This has serious implications for infant health, particularly in resource-limited settings. A multi-sectoral approach is essential to address maternal malnutrition effectively.

## 10. Conclusion

Maternal nutrition is fundamental to successful lactation and infant health. Although breast milk composition is relatively resilient, severe malnutrition compromises both milk quantity and micronutrient

levels. Improving maternal nutrition through targeted interventions is essential to ensure optimal breastfeeding outcomes and to break the intergenerational cycle of malnutrition.

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