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"Micronutrient Deficiencies and Health Challenges in Lactating Women: A Review"

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Abstract: The postpartum period places significant nutritional demands on mothers, particularly during lactation. Iron and vitamin D are two essential micronutrients whose deficiencies are commonly observed in breastfeeding women, often with serious health implications. This review examines the dual challenge of iron and vitamin D deficiencies among lactating mothers, focusing on their prevalence, underlying causes, health impacts, and current management practices. Iron deficiency, frequently stemming from childbirth-related blood loss and inadequate dietary intake, can result in anemia, fatigue, reduced cognitive performance, and weakened immunity. At the same time, vitamin D deficiency, often due to low sun exposure and insufficient intake, affects calcium metabolism, bone health, and immune function. The simultaneous occurrence of both deficiencies may amplify negative health effects, especially in low-resource settings where access to proper nutrition and medical care is limited. Addressing these deficiencies is crucial for safeguarding maternal health and supporting infant growth and development. The paper concludes by emphasizing the need for continued research and stronger health during lactation and micronutrient deficiency.

Keywords*:* iron, vitamin D, maternal behavior.

I. INTRODUCTION

Lactation is a differential trait of mammals and milk formation and secretion are intricate biochemical and neuroendocrine phenomena which involve the sensitive nipple and areola terminals and are regulated hormonally. Therefore, lactation is an instantaneous and spontaneous consequence of pregnancy and childbirth, similar to an integral component of the act of reproduction, advantageous for the mother and the baby at the same time **Kent et al. (2006)**.

The inter-relationship between all these elements will be the cause of milk production and will certainly induce changes in the mother organism by also establishing good physical and emotional health states in the lactating woman, which will translate to her life in the future (**Mezzacappa,2002; Bosch,2011**).

In addition, socio-cultural inequality in society adds to variation in work culture and the probability of undernourishment among women. Poverty conditions result in poor micronutrient consumption among lactating mothers due to scarce resources. Social status reduces even further access to animal-source food like fruits and vegetables. Lower micronutrient consumption than the required levels leads to numerous deficiencies **Haileslassie et al.(2013**).

Breastfeeding (BF) appears to be associated with good physical and mental status of the mother in puerperium, lactating phase and during all her later life. Epidemiological studies have concluded that compared to non-breastfed women, lactating women revealed less number of visits to physicians, lower rates of frequency of respiratory, cardiocirculatory, and gastrointestinal illness, and lower rates of symptoms attributed to emotional disorders (**Gertosio,2016; Truck,2013**).

A. Maternal Health During Lactating

Breast-feeding children and mothers are most susceptible to malnutrition because of low family income & low intakes, uneven distribution of food within the family, low occupational status & educational attainment, round delivery frequency & household work overload, low family encouragement & irregular meal delivery, poor access to nutritional knowledge and nutrition information, infectious diseases, and health care. If the underweight lactating mother, the quality and quantity of nutrients passed to the baby will be low. When the mother is overweight, it will impede blood flow to the uterus and limit the amount of nutrients passed to mammary glands of mothers for milk production and to the baby. Lactating mothers' malnutrition lead to premature metabolic derangement in infancy life, especially those nutritional cause irreversible physiologic changes in the infant. Therefore, milk composition and quantity as well as maternal health, infancy and adulthood of human life are affected by lactating mothers' nutritional deficiency research conducted by **Sansui et al. (2009)**.

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A study by **(Marwaha,2008; Goswami,2008)** says that vitamin D deficiency has been noted in countries that are both 'sunshine deficient' and 'sunshine sufficient'. It is also considered a public health issue in India. Despite receiving plenty of sunshine year-round, hypovitaminosis D is still regarded as an emerging issue**.** An elevated prevalence (50-90%) of deficiency of vitamin D, as well as low dietary calcium intake has been reported in Indian by Harinarayan **et al. (2009)**.

B. Postpartum Depression and Anxiety

According to a study by **Skrundz et al. (2011)**, the process of childbirth is usually one of joy and pleasure for the family. Nevertheless, it is reported that 13% of all puerperae can develop signs and symptoms of depression in a span of 12 weeks after delivery. Oxytocin levels have been found to be low in these women compared to the other new mothers. It was shown in recent research that oxytocin is a key factor to the stimulation of the mother-child relationship, provoking positive reactions like vocalization with the child, eye gazing into its eyes, stimulating contact and caresses. Mothers also admitted that they were calmer, less aggressive and tense, had improved mood, and were more friendly since the beginning of postpartum reported by **Jonas et al. (2016)**.

Some of the factors may be categorized as stressors to the puerpera. The physical work of baby care and other domestic work, the limited amount of sleep, body change, loss of sexual relationship and the emotional stress of being a good mother and to meet all expectations constitute a burden which is normally not compatible with the woman's personality and capacity to perform her function as a mother. On this point, BF can achieve this through stress reduction levels by virtue of its action on the reduction of cortisol and ACTH levels hence anxiety levels reduction by **Benjamin et al.(2015)**. Second, the fortification of mother-child bonding is a strong stimulus towards BF continuation for as long as possible, closing a virtuous circle likely to advantage both mother and child.

Consistent with previous studies, we found that the proportion of women with depressive symptoms in the postpartum period (34/184, 18.5%) was similar to that in the third trimester (33/180, 18.3%). The increasing number of women who show depressive symptoms in the third trimester of pregnancy might be explained by greater physical discomfort, increased anxiety about the upcoming childbirth, and transition into a new role as a mother by **Rallis et al. (2014**). After delivery, the high prevalence of depressive symptoms can be explained by the onset of baby blues shortly after childbirth by **Reck et al. (2009)**.

Another study by **Shorey et al. (2018**) baby blues, being a transient condition, the prevalence of depressive symptoms in our sample decreased 3 months postpartum to 9.8% and increased slightly once again 6 months postpartum to 13.2%.

These findings are in line with the results of a review published in 2018, in which an increase in depressive symptoms 6 months postpartum was reported and may reflect the added stress due to caring for a newborn and the constant demands of the infant. A similar prevalence of PPD measured by the EPDS (cut-off > 10) was found in another German sample: 20.4% at 2 weeks postpartum, 15.8% at 6 weeks postpartum, and 15.4% 3-5 months postpartum by **(Reck,2008; Weidner,2013)**.

Childbirth is normally a reason for happiness and delight in the family.However, it has been discovered that ~ 13% of all puerperae are susceptible to developing signs and symptoms of depression within 12 weeks postpartum **Skrundz et al. (2011).** In such women, oxytocin levels have been reported to be lower than in the other new mothers. Recent studies have presented evidence that oxytocin is a key component in initiating mother-child bonding, precipitating positive behaviors such as vocalization with the baby, gazing into its eyes, and engaging in gentle touch and caresses. Mothers have responded that they are more relaxed, less aggressive and tense, in a good mood, and more outgoing since the earliest days after childbirth by **Jonas et al. (2016)**.

II. MATERIALS AND METHODS

This review collates current evidence on iron and vitamin D deficiency in lactating women. Systematic searching was conducted through databases such as PubMed, Scopus, Web of Science, and Google Scholar, shodganga, with keywords like "maternal nutrition," "iron deficiency," and "vitamin D deficiency." The review considered peer-reviewed articles published between 2010 and 2024, in English, on human subjects. Studies included were randomized controlled trials and observational studies up to systematic reviews. Descriptive data were collected on contributing factors, health outcomes, prevalence rates.

III. RESULT AND DISCUSSION

Developing country lactating women are nutritionally vulnerable groups since during this time, a substantial nutritional burden is put on the mother. Improper diet of the mother during this time will result in poor secretion of nutrients into breast milk and this will have long term effects on the child's health by **(Marcos,2024; Jones,2010)**

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A study by **Zhang et al. (2016)** examined the prevalence of anemia (hemoglobin 81-120 g/l) was 73.8% among the study participants, and 10.8% severe anemia (hemoglobin ≤ 80 g/l). Risk factors for malnutrition (mid-upper arm circumference < 23.5 cm, p = 0.013), iron deficiency (serum iron concentration < 6.6 mmol/l, p = 0.008), and source of drinking water (p = 0.031) were identified as predictors for anemia. Fifty-six-point three percent of women with anemia had a low serum iron level. Anemia was prevalent among study subjects in Kokang.

Since a high percentage of anemic women in our study had a low serum level of iron, we conclude that the main cause of anemia in our study was iron deficiency. Hemoglobin and anthropometric measures were assessed for 733 lactating women. Logistic regression tests had been used to determine factors related to anemia. The rate of anemia prevalence was 60.3% in lactating women and 20.3% lactating women had severe anemia. Malnutrition determinants (P = 0.026), self-reported night blindness or difficulty adapting to dark (P < 0.001), lack of primary education experience (P < 0.001), low family yearly capita income (< 800 MMK; P < 0.001), drinking spring or river water(P < 0.001), and drinking unboiled water (P = 0.016) were predictors for anemia.The health promotion among lactating women should be given by an integrated intervention an study by **Zhao et al. (2014).**

In the current study, lactating mother of urban and rural regions with under-nutrition (MUAC< 23 cm) was 15.3%. Under-nutrition was also found to be twice as high among rural women compared to their counterparts living in urban (i.e. 9.5% vs. 21.1% in urban and rural areas, respectively). This was higher than that of the study finding of the South Eastern Zone of Tigre, Ethiopia **Haileslassie et al.(2013)**.

Findings of this study validated that anemia had a very high prevalence rate in low-income countries as well as low-income families. The UNICEF Humanitarian Action Plan for Myanmar states that 60% of pregnant and lactating women were targeted to take the micronutrients in the hard-to-reach areas in the year 2011, and 4,600 pregnant and lactating women were targeted to take micronutrient supplementation in 2013 **(United Nations Children's Fund, 2011; United Nations Children's Fund ,2013**).

Rural lactating women in Myanmar had a high rate of anemia. Based on this study's outcome, several determinants may exist at the same time in a person or a population. The most effective determinants are low family income, no experience of primary education, malnutrition, consumption of river or spring water, or consumption of non-boiled water. Anemia is typically preventable at low cost, and the benefit/cost ratio for the application of prevention programs has been known to be one of the highest in public health. An intervention blend combining infectious disease control, nutrition promotion, and health education may constitute the optimal approach to achieve anemia control comprehensively in this region by **Kotecha et al. (2011)**.

The algorithm for postpartum risk of anemia currently endorsed by the CDC includes third-trimester anemia, excessive labor blood loss, and multiple gestation as factors **Gibson et al. (2020),** whereas previously in other studies factors like multiparity, pre-pregnancy obesity, and not breastfeeding are proposed to be included by **Franca et al. (2013**).

The study of **Dean et al. (2020)** declares that factors were related with increased risks for postpartum anemia in earlier studies. Multiparous women may be at increased risk from the poor iron status recovery during pregnancies. Obesity can cause anemia through such channels as increased blood loss and lower quality diets. Exclusive breastfeeding can have protection against anemia by minimizing iron loss or as an indicator of a higher socioeconomic status and dietary intake **Hannan et al. (2009**). Two Indonesian studies investigated the association of anemia in lactating mothers with anemia in infants and concluded that newborn iron stores are not related to breast milk. The anemic lactating women were also more often found with stunted infants. The association of anemia with infant stunting at ages 0–6 months was not statistically significant **Malik et al. (2020**).

Agarwal et al. (2006) analyzed that maternal stature, age at marriage, parity and foetal loss also contributed their role in haemoglobin status. There were interstate variations, reduced fertility, increased female literacy and better diet in Himachal Pradesh than Haryana. Female literacy and nutrition status were lower among women of Tamil Nadu than Kerala. These 3 other states had also poor fertility, lower social living index and nutrition status with >90 per cent of pregnant and lactating women anaemic. The lower percentage of severe anaemia in Orissa compared to Assam was due to the availability and consumption of iron-folate tablets. The first-trimester antenatal care and physician checkup, and availability and consumption of iron folate tablets for over 3 months in all the States influenced the haemoglobin level. Among these, 84 per cent pregnant and 92.2 per cent lactating women were anaemic with 9.2 and 7.3 per cent being suffering from severe anaemia respectively; 39.2 and 27.3 per cent in Madhya Pradesh, 14.4 and 8.6 per cent in Assam, and 8.5 and 13.4 per cent in Haryana were suffering from severe anaemia during pregnancy and lactation, respectively

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CONCLUSION

Lactating women in low- and middle-income countries, particularly in rural and hard-to-reach areas, have alarmingly high levels of undernutrition, anemia, and micronutrient deficiencies. Close to one quarter are underweight, with factors including adolescent pregnancy, multiple births, inadequate dietary intake, low income, low education, unclean water, and poor access to health care.". Anemia, usually due to iron deficiency, is also affected by vitamin D deficiency, increased BMI, postpartum depression, and early weaning, and exclusive breastfeeding might have protective effects. Prevalence is between 60% and more than 90% in countries like Myanmar and certain parts of India. In spite of the gravity, such problems are mostly avoidable with low-cost interventions such as micronutrient supplementation, nutrition education, clean water, early antenatal care, and health education outreach. A broad, locally adapted, and long-term strategy is required to enhance maternal health and healthy infant development.

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CONFLICT OF INTEREST

All authors have no conflict of interest or any affiliation or involvement in any organization, academic, commercial, financial, personal or professionally relevant to the work.

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