# SOLUTIONS MICRONUTRIENT-VITAMINS DEFICIENCY IN LOW BIRTH WEIGHT INFANTS

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***Abstract. Insufficient supply of pregnant women with micronutrients leads to the development of a number of congenital malformations of the fetus. In order to study the multivitamin-mineral complexes application's effect on pregnant women during pregnancy, and on intrauterine fetal growth and development. Was revealed that a deficiency of bioelements and vitamins in mothers is a common cause of intrauterine growth retardation, serious violations of organs and systems functioning. So, it is indicates integrated approach significance in the treatment of microelementosis in pregnant.***

***Keywords: microelements, vitamins, newborns, intrauterine growth, pregnancy.***

## Introduction

The rational nutrition of a woman during pregnancy and during lactation determines both her own health and the full development and health of the child. A special role in this belongs to vitamins and minerals. The mother's body during pregnancy is the only source of vitamins and other nutrients for the fetus, and mother's milk during breastfeeding is the only source of these micronutrients for the baby [4]. Infant mortality, especially among children of the first 5 years of life, depends not only on the level of development of medicine and the quality of medical care [1]. A significant role in this is also played by non-medical factors such as environmental factors, adequate and rational nutrition, providing the child's body with necessary vitamins and calories, as well as the ecological environment of the children. The human need for vitamins and minerals (physiological need) is an objective value that has developed during evolution and does not depend on our knowledge. Based on scientific data on the study of physiological needs, the recommended rate of intake (RRI) of vitamins and minerals is established [12]. They take into account the real micronutrient supply of our country's population, but they are also fully consistent with global trends (Table 1)

**Table 1. : Recommended norms of consumption of vitamins and minerals for pregnant and lactating women**

| Vitamins | Women of childbearing age and pregnant (first half of pregnancy) | pregnant (second half pregnancy) | | nursing (1-12 months) | |
|---|---|---|---|---|---|
| C mg | 90 | 100 | (+11%) | 120 | (+33%) |
| B1 mg | 1,5 | 1,7 | (+13%) | 1,8 | (+20%) |
| B2 mg | 1,8 | 2,0 | (+11%) | 2,1 | (+17%) |
| B12, mcg | 3,0 | 3,5 | (+17%) | 3,5 | (+17%) |
| Folate, mcg | 400 | 600 | (+50%) | 500 | (+25%) |
| Pantothenic acid, | 5,0 | 6,0 | (+20%) | 7,0 | (+40%) |

| | | | | | |
|---|---|---|---|---|---|
| mg | | | | | |
| A, mcg | 900 | 1000 | (+11%) | 1300 | (+44%) |
| Beta-carotene, mg | 5,0 | 5,0 | (+0%) | 5,0 | (+0%) |
| E mg | 15 | 17 | (+13%) | 19 | (+27%) |
| D, mcg | 10 | 12,5 | (+25%) | 12,5 | (+25%) |
| Minerals | | | | | |
| Calcium mg | 1000 | 1300 | (+30%) | 1400 | (+40%) |
| Phosphorus mg | 800 | 1000 | (+25%) | 1000 | (+25%) |
| Magnesium mg | 400 | 450 | (+12,5%) | 450 | (+12%) |
| Potassium mg | 2500 | 2500 | (+0%) | 2500 | (+0%) |
| Sodium, mg | 1300 | 1300 | (+0%) | 1300 | (+0%) |
| Iron mg | 18 | 33 | (+83%) | 18 | (+0%) |
| Zinc mg | 12 | 15 | (+25%) | 15 | (+25%) |
| Iodine, mcg | 150 | 220 | (+47%) | 290 | (+93%) |
| Copper mg | 1,0 | 1,1 | (+10%) | 1,4 | (+40%) |
| Manganese, mg | 2,0 | 2,2 | (+10%) | 2,8 | (+40%) |
| Selenium, mcg | 55 | 65 | (+18%) | 65 | (+18%) |

**Note.** In parentheses is the percentage increase in consumption relative to norms for women of childbearing age.

The needs of a woman's body during pregnancy in nutrients naturally increase from I to III trimester and during lactation. Accordingly, RRI for pregnant women in the second half of pregnancy and lactating women for different vitamins is 10–50% higher than for women of childbearing age, since a woman must provide vitamins not only to her body, but also to the baby's body.

One of the priority directions in the implementation of the goal "A healthy mother is a healthy child", raised to the state level, is to improve the nutrition of the country's population. The Laws of the Republic of Uzbekistan "On the prevention of iodine deficiency diseases" and "On the prevention of micronutrient deficiency among the population", "On additional measures to strengthen the reproductive health of mothers and children in rural areas of the republic" were adopted [2, 9]. One of the leading areas of healthcare is the prevention of micronutrient deficiency in women of childbearing age, and measures are being taken to provide pregnant women with free multivitamin-mineral complexes (MMC) [9].

During pregnancy and lactation, the need for minerals and vitamins significantly increases; therefore, a woman's nutrition during pregnancy determines both her own health and the full health and development of the unborn child [7]. Deficiency of micronutrients and vitamins in pregnant women causes chronic fetal hypoxia, impaired fetal development, a decrease in growth rates, as well as protective immune functions [1]. A small group of newborns is occupied by small children, characterized by a decrease in all indicators of physical development. Analysis of the actual nutrition of lactating women showed [5] that the intake of vitamins A, C, B1 and B2 does not reach the recommended norms. Especially noticeable is the lack of vitamin B1 and calcium. It is known that in a decrease in bone mineral density and the development of caries in children, one of the leading places is a deficiency of calcium and fluoride in the body. The low level of health of infants and young children is accompanied by an increase in the frequency of decrease in bone mineral density [7, 22]. Their consumption barely reaches half of the recommended. Even the most diverse diet can not cover the body's need for vitamins and minerals. The reason for the inadequate supply of vitamins and minerals is both unbalanced diets and the quality of the products themselves, the nutritional value of which is significantly reduced when using modern production technologies. In

accordance with the recommendations of optimal nutrition per day, it is recommended to consume 3–6 servings of vegetables, from 2 to 4 servings of milk and dairy products, 2-3 times a day meat and / or fish, but an insufficient proportion of adults consume these products [8 ]. Surveys of recent years show that a deficiency of vitamins and micronutrients among pregnant and lactating women continues to persist in a significant part of the examined regardless of the season [2]. The vast majority of the examined (70-80%) have a combined deficiency of three or more vitamins, i.e. polyhypovitaminous conditions, regardless of age.
A shortage of essential nutrients, including vitamins and minerals, during pregnancy negatively affects the health of not only the woman herself, but also the unborn baby. Deficiency of different micronutrients leads to unequal consequences [6]. Vitamin deficiency during the preconceptual period and, especially, during pregnancy, when the female body's demand for these essential nutrients is especially high, damages the health of the mother and child, increases the risk of perinatal pathology, increases child mortality, is one of the causes of prematurity, congenital deformities, impaired physical and mental development of children [15, 23] (Table 2).

**Table 2. : Some possible effects of nutritional micronutrient deficiencies in pregnant women**

| Deficit | Effects |
|---|---|
| ФК, B1, B6, E, A, I, Zn | Congenital malformations of the fetus (neural tube developmental defect), the likelihood of stillbirth, the birth of deaf and dumb children |
| ФК, I, Zn | Low fetal weight |
| ФК, B1, D | Prematurity, premature birth |
| B6, B12, фолат, I | Risk of miscarriage |
| B2, B6, B12, фолат, Fe, Co | Anemia, impaired synthesis of nucleic acids and protein, inhibition of growth and division of cells and tissues |
| D | Violation of the formation of the skeleton in a child, fetal growth restriction, immune disorders of the newborn and in children during the first year of life. |
| B2 и PP | The risk of heart disease in a newborn |
| B2, B6 | Limb defect risk |
| D, Ca | Rickets in a child |
| A, D | Increased susceptibility to infections |
| B1 | Acute heart failure in newborns |
| B12 | Weight gain |

Mother’s milk remains an indispensable food product for children of the first months of life [4, 5]. Insufficient or improper nutrition of the mother during pregnancy and lactation, i.e. deficiency of essential nutrients, including vitamins, and, as a result, the release of milk with a low content of vitamins, may be one of the reasons for the development of nutritional-dependent conditions in young children, such as malnutrition, hypovitaminosis, anemia.

Numerous studies have shown that insufficient or borderline provision of vitamins for lactating women adversely affects the growth rates, as well as the psychological development of the child [5]. Women who have not additionally taken vitamins during pregnancy and lactation are not able to provide their child with the necessary amount of vitamins. The amount of milk and the content of vitamins in it covers the child's need for vitamins by no more than half [5]. The content of vitamins in breast milk is considered as a non-invasive method for the diagnosis of hypovitaminous states of lactating women [4].

The importance of polyunsaturated fatty acids (PUFAs) for the normal course of pregnancy and the development of the newborn is also sometimes underestimated. Enrichment of the diet during pregnancy contributes to the preservation of pregnancy and reduces the risk of complications during pregnancy [19, 24]. Epidemiological studies have established a direct relationship between insufficient fatty acid supply and an increased risk of premature birth and the development of postpartum depression, as well as behavioral disorders in children (attention deficit hyperactivity disorder) [20]. During a survey of mothers and children participating in the Viva project (USA), it was found that a better PUFA status of mother and fetus is associated with a lower risk of child obesity [23].

One way to eliminate polyhypovitaminosis and a lack of PUFA is an additional regular regular intake of multivitamin-mineral complexes by pregnant and lactating women. Among women who constantly took multivitamins, a deficiency of vitamins A, C, E was not detected, and deficiency of vitamins B2 and B6 was 2-4 times less common [6]. The revealed reliable positive correlation between the content of vitamins in the diet and breast milk substantiates the advisability of continuous use of PVMK in the diet of lactating women [17].

**The purpose of the study** is to study the role of trace elements and vitamins in providing the physiological needs of newborns and children to strengthen their health.

**Materials and research methods**. Studies have been conducted to study the effect of the use of multivitamin-mineral complexes in pregnant women during pregnancy, as well as on intrauterine growth and development of the fetus, on the further development of the child. A statistical analysis of the clinical and anamnestic data of newborns was carried out according to 155 questionnaires in the Tashkent region, where mothers took the full course of MMC (group 1). Comparative indicators are given from scientific studies on the birth of children with low weight and the effect of anemia in mothers on the microelement balance [1], and a group of children was selected from mothers who took only iron-containing drugs (ICD) during pregnancy to treat anemia (2 -Group).

Results and its discussion. As a result of the studies, it was found that newborns of the 1st group in all physical indicators are superior to children of the 2nd group. Of the newborns from mothers who took MMC, only 5 children were born with low weight (LW), which is 3.7% of the total number, a larger number of children were born with normal weight (NW) - 96.3%, and among children whose mothers did not take MMC; children with CF accounted for 63.2%. The average indicators of the weight of children in the 1st group are 3553.0 ± 50.1, more (by 609.8 grams) than in the 2nd group (Table 3).

**Table 3.: Comparative data of physical indicators of newborns**

| **Indicators** | **Newborns from mothers who took MMC** | **Newborns from mothers who did not take MMC** | |
|---|---|---|---|
| | | Total newborns | Of which: from mothers with anemia who took only ICD |
| **amount** | **155** | **95** | **28** |
| Of which: with HB | 130 | 35 | 8 |
| with MV | 25 | 60 | 20 |
| Weight average (g) | 3553,0 ± 50,1 | 2943,2 ± 47,2 | 2952,9 ± 35,4 |
| children with HB (%) | 96,3 | 36,8 | 28,6 |
| children with CF (%) | 3,7 | 63,2 | 71,4 |
| Body length (cm) | 50,9 ± 0,18 | 49,7 ± 0,21 | 49,5 ± 0,22 |
| BMI | 13,7 ± 0,13 | 11,8 ± 0,17 | 11,8 ± 0,16 |
| Sur. head (cm) | 35,0 ± 0,16 | 34,6 ± 0,15 | 34,8 ± 014 |
| Sur. breast (cm) | 34,2 ± 0,14 | 33,5 ± 0,13 | 33,7 ± 0,15 |

Note: * - reliability between indicators of compared groups (p<0,001).

The body length of newborns in the 1st group was reliably 50.9 ± 0.18 cm and 1.2 cm more than in the 2nd group. The body mass index (BMI), which is calculated from the weight and body length of the child, is naturally higher in the 1st group (13.7 ± 0.13 and 11.8 ± 0.17, respectively). The head circumference and chest circumference are also higher in the 1st group than in the 2nd group. The decrease in physical indicators in children from mothers with anemia who took only ICD, is a manifestation of a deficiency not only of the iron element, but also of a number of vitamins and microelements - manganese, zinc, chromium, copper, selenium, iodine, which are directly involved in blood formation and tissue construction in the body [11]. Their insufficiency contributes to the development of anemia in the body, leading to a decrease in fetal development.

Comparative data on the clinical indicators of the condition of newborns made it possible to note that according to all data, children of the 2nd group are inferior to newborns of the 1st group. In all cases, the newborns in the 1st group screamed immediately (100%), the cry in children was loud (95.4%), the skin was pink (100%), the reflexes were preserved (100%). These babies were attached to the breast immediately after birth in the delivery room, actively sucked, the duration of physiological jaundice was 3.9 ± 0.11 and 4.6 ± 0.17 days respectively, according to the Cramer scale, jaundice was of I and II severity. The adaptation period in children proceeded without complications. Children were discharged home on days 4-5.

The rates of children born to mothers who did not take MMC are relatively low, the skin is pink in 83.4% of children, the cry at birth is loud in 69.2%, average in 22.5% and weak strength in 8.3%, preservation of unconditioned reflexes - Moro (74.2%) and sucking (86.6%) in a relatively smaller percentage of children. At the first application, the children took their breasts well. Physiological jaundice was observed for 4.8 ± 0.39 days, which is 0.9 days more than in the previous group; according to the Kramer scale, jaundice of the skin was also observed mainly in the I and II degrees, in isolated cases (2 children) III degrees. Children were discharged home on days 5-6, which is 1-2 days more than in the previous group (Table 4).

Table 4.: **Comparative data on the condition of newborns**

| **Indicators** | **Newborns from mothers who took MMC** | **Newborns from mothers who did not take MMC** | |
|---|---|---|---|
| | | Total newborns | Of which: from mothers with anemia + ICD |
| amount | **155** | **95** | **28** |
| Apgar score: 1 min | 6,9 ± 0,05 | 6,8 ± 0,04 | 6,9 ± 0,05 |
| for 5 min | 7,9 ± 0,06 | 7,8 ± 0,05 | 7,8 ± 0,06 |
| Scream: loud (%) | 95,4 | 69,2 | 57,5 |
| middle (%) | 4,6 | 22,5 | 37,5 |
| weak (%) | 0 | 8,3 | 5,0 |
| Skin: of which: pink (%) | 100 | 83,4 | 85,0 |
| cyan pink (%) | 0 | 15,8 | 15,0 |
| cyanotic (%) | 0 | 0,8 | 0 |
| Fiz. jaundice (days) | 3,9 ± 0,11 | 4,8 ± 0,39 | 5,4 ± 0,41 |
| Reflexes: Moro - saved (%) | 100 | 74,2 | 77,5 |

| | | | |
|---|---|---|---|
| sucking - save | 100 | 86,6 | 90,0 |
| hospital discharge | 4,9 ± 0,14 | 5,6 ± 0,42 | 6,0 ± 0,44 |

Note: * - reliability between indicators of compared groups (p<0,005).

When comparing the parameters of a blood test, studies showed that the hemoglobin content in the blood in practically healthy newborns of the 1st group did not generally decrease. The hemoglobin level in 1 groups on average reliably amounted to 191.5 ± 5.8 g / l, erythrocytes - 5.9 ± 0.2 million, white blood cells - 14.4 ± 0.6 thousand, only in 2 newborns (1.5%) experienced anemia. In newborns from mothers who did not take MMC, the hemoglobin content in the blood is almost within the normal range, but relatively reduced (by 9.2 g / l) than in the 1st group - 182.3 ± 4.7 g / l (table. 5).

Table 5.: **Comparative blood counts**

| Indicators | **Newborns from mothers who took MMC** | **Newborns from mothers who did not take MMC** | |
|---|---|---|---|
| | | Total newborns | Of which: from mothers with anemia + ICD |
| amount | **155** | **95** | **28** |
| Hemoglobin (g / l) | 191,5 ± 5,8 | 182,3 ± 4,7 | 171,7 ± 4,6 |
| Red blood cells (million) | 5,9 ± 0,2 | 5,7 ± 0,1 | 5,8 ± 0,2 |
| White blood cells (thousand) | 14,4 ± 0,6 | 14,3 ± 0,4 | 14,0 ± 0,4 |

Note: * - reliability between indicators of compared groups (p<0,001).

Thus, the data presented once again indicate the importance of the role of vitamins and trace elements in the etiopathogenesis of anemia. The role of ME in the etiopathogenesis of anemia is not always adequately evaluated, and, unfortunately, only the gland often plays the main role. The main signs of anemia are a decrease in hemoglobin in the blood and a decrease in the number of red blood cells, as well as a change in vitamin balance, a decrease in the amount of ME and enzymes in the body [10]. Information continues to accumulate on the clinically proven benefits of eliminating the deficiency of certain vitamins and minerals [13] in pregnant women. Comparing the effectiveness of the use of MMC during pregnancy, convincing evidence was obtained of the benefits of the combined inclusion of vitamins and minerals compared with the individual use of folic acid and iron preparations. The relative decrease in hemoglobin in children from mothers with anemia who took only ICD, also proves the advisability of prescribing a complex of minerals and vitamins to women during pregnancy.

Comparative data on the history of mothers in terms of blood indicators shows that in the first group, where mothers who during pregnancy were combined with a parent-child health insurance were combined, the pregnancy was uneventful. The hemoglobin index in this group of mothers during pregnancy averaged 106.3 ± 1.4 g / l, during childbirth - 112.4 ± 0.8 g / l, which indicates a good rise in hemoglobin during pregnancy before childbirth these mothers. Anemia in this group was diagnosed in 41.5% of pregnant women. In the 2 group of women where mothers did not receive MMC, it was found that the hemoglobin in these women during pregnancy was significantly 100.3 ± 5.2 g / l; during childbirth, this indicator rose to only 106.2 ± 5 , 1 g / l, which is significantly less (by 6.2 g / l) than in the 1-group. The hemoglobin index in women with anemia who took ICD during pregnancy, on average, reliably is 95.6 ± 4.7 g / l, during childbirth this indicator is 106.4 ± 4.9 g / l, approximately the same indicators as in the 2 group of

women, but again less (by 5.8 g / l) than in the 1 group. The revealed data indicate a satisfactory increase in hemoglobin in women who took MMC than taking only ICD, which once again indicates the importance of the need for an integrated approach in the treatment of anemia.

In recent years, when comparing the effectiveness of the use of MMC during pregnancy, evidence has been obtained of the benefits of the combined inclusion of vitamins and minerals. The intake of MMC by pregnant women over a period of 20 weeks led to a significantly greater increase in the serum levels of mothers and newborns in the levels of calcium, magnesium and glutathione compared with women and their children who did not take multivitamins [16]. The body mass and head circumference at birth were greater in children whose mothers received calcium, iron, and zinc containing MMC for 5 months during pregnancy compared with infants whose mothers did not receive multivitamin supplements [14]. The advantages of using MMC are proved on the basis of the analysis of data from 17 studies, including 137791 women, in 15 of which the comparison group consisted of women taking only iron and folic acid [18]. MMC intake resulted in a significant reduction in the number of low birth weight infants, a decrease in stillbirth, or in the birth of children with low gestational age.

Thus, the undoubted benefit of the additional intake of vitamins in physiological doses is completely obvious. Replenishment of micronutrient deficiencies in pregnant women does not increase fetal body weight, but reduces the risk of giving birth to premature and small babies.

**Conclusion**. Thus, the huge role of trace elements and vitamins lies in affecting many key stages of metabolic processes, has a great impact on the growth and development of a growing child's body. The degree of provision of the child's body with the whole complex of microelements and vitamins at the prenatal stage is reflected in the entire subsequent development of the child. Deficiency of bioelements and vitamins in mothers is a common cause of intrauterine growth retardation of the fetus, serious impaired functioning of organs and systems, anemia, which leads to the birth of low birth weight children and an increase in the incidence in the neonatal period.

Prevention of vitamin deficiency in pregnant and lactating women is aimed at ensuring full compliance between the needs for vitamins and their dietary intake. Most likely, it is necessary to agree with the opinion of a number of authors [21] that there is a need to develop certain educational measures that increase women's awareness of the choice of taking MMC.

The revealed results in scientific research are a prerequisite for recommending the treatment of anemia during pregnancy and microelements not only with iron preparations, but also taking into account other trace elements, preparations containing trace elements and vitamins, as well as balance their nutrition with the consumption of foods rich in vitamins and micronutrients.

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