



## Postnatal Supplement for Women using Natofer Kit Package

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**Abstract:** A mother requires rich source of vitamins and minerals in an extraordinary journey of giving birth to a new offspring. A perfect post-partum plan can support replenishing the nutrient stores in the body that a mother needs to thrive. The postnatal vitamin and mineral supplements provide adequate nutrition and ensure good health of mother and baby. The two incredibly demanding physiological processes such as recovery from the pregnancy and delivery and the lactation process for the newborn demands a good supply of vitamins and minerals. The fluctuating hormone levels make them feel more emotional and stressed during this time. However, full recovery from childbirth may take 6-8 weeks or even a few months. Breast milk composed of proteins, carbohydrates, lipids and all essential vitamins and minerals provides a complete nutrition for the newborn. Hence breastfeeding mothers should consume a balanced nutritious diet to meet these daily requirements. However, mothers benefit by the use of appropriate supplement that supply various required components to the mother as well as to the baby. This review aims at explaining the significance of the combination of minerals and vitamins that are prescribed as a nutritional supplement especially as a postnatal care. The role of each mineral and vitamins and their daily recommended intake are discussed. The Unique formulation named Natofer Kit meets the demand of the postnatal care. This cost effective unique packaging technique also overcomes the inadequate medication adherence with improved patient compliance. This review is an attempt to explain the significance of the vitamins and minerals being prescribed as a nutritional supplement named “Natofer Kit” for women during their postnatal care.

**Key Words:** Postnatal care, Multivitamins, Nutritional supplement, novel packing, hematinic

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## I. INTRODUCTION

Postnatal care is essential in maintaining and promoting the health of mother and new born baby. As per the World Health Organization's (WHO) recommendation, the postnatal period is referred to as the time immediately after the birth of the baby and upto six weeks after birth. Appropriate postnatal care helps in educating the mother on various aspects such as breast feeding practices, personal hygiene and family planning counselling services. Postnatal care also includes recommending calcium and iron supplementation along with immunization chart to the newborns. Despite of various government programmes, postnatal care was unacceptably low<sup>1</sup>. In 2015, approximately 99% of global maternal deaths took place in developing countries, with India being reported as 15%. Lack of knowledge about its importance, inadequate counselling on postnatal care in institutional deliveries, lower level of education, insufficient access to health services and women's inclination towards child care rather caring themselves are the most common causes for the dearth in postnatal care. The socio cultural beliefs that prevail among the community also contribute to the poor postnatal care<sup>2</sup>. In 2005, India launched a new conditional cash transfer (CCT) programme called Janani Suraksha Yojana (JSY). This largest CCT program in the world was introduced to reduce the maternal mortality rate and to promote the institutional access for delivery and maternal care<sup>3</sup>. This scheme has shown improvement in antenatal care and delivery services but the survey studies conducted in rural India, urban slums and in urban area have shown poor coverage of postnatal care. Earlier study revealed that majority of mothers have adequate knowledge on breast feeding and immunization coverage but poor and inadequate postnatal care was observed despite their education and socioeconomic status<sup>2</sup>. An attempt has been made to understand whether the adherence to medication therapy can improve the postnatal care of mothers and infants. Adherence with medication therapy during pregnancy and breastfeeding plays a vital role in managing the fetal well being and maternal health. Unfortunately, non adherence to given medication therapy is a common problem among women during pregnancy. A Pregnant woman requires additional nutritional supplements like iron and folic acid for the maternal and fetal well being<sup>2</sup>. The WHO recommended standard dose of 60 mg of iron and 400 mg of folic acid everyday throughout the pregnancy period. Non adherence to these supplements may have a negative impact on the health of the infant and mother. Recent research focuses on identifying the methods of intervention for improving medication adherence and reported that novel packaging techniques could bring a simple solution for the problem of non adherence<sup>3</sup>. Stimulated to the reported non adherence to medication, an unique packaging technique was adopted to meet the different practical requirements such as easy storage, better way of dispensing and reinforcement, easy to educate and offers a much easier way of cueing and monitoring of doses. This article aims at bringing out awareness on the availability of unique novel pack of vitamins and minerals that could support postnatal care of women. This approach brings in all mothers as an integral part of the postnatal care rather than being side-lined.

### I.1 What should Lactating Mothers Eat?

A new mother experiences a mixed feeling during the period of lactation. She experiences fear and anxieties as a first timer. The mother should discard the myths, simplify her own routine in order to maintain her health. The composition of human milk depends on three factors such as endogenous biosynthesis in the mammary glands, release of fatty acids from the tissue deposits laid down during pregnancy and the diet of the breastfeeding mother. It is important to emphasize the mother and her care giver to prioritize her health for the health of the baby. Mother should choose a variety of foods to build up immunity of the child. Food should include vegetables, fruits, whole grains and dairy products to provide sufficient nutrition to mother and newborn baby. The secretory IgA antibodies commonly found in human milk provides protection against enteric pathogens like *Clostridium difficile*, *E.coli*, *Klebsiella pneumoniae*, *Salmonella* species, *Shigella* species, *Vibrio cholerae*, Parasites, *Giardia lamblia*, Polio virus and Rota virus. It also provides protection against respiratory pathogens such as *H.Influenza*, *Streptococcus pneumoniae*, influenza virus and respiratory syncytial virus<sup>4</sup>.

### I.2 Major Constituents of Milk<sup>5-8</sup>

- Lactose and human milk oligosaccharides (HMO) are the constituents belonging to the class of carbohydrates acts as a major source of energy for the baby. This major constituent modulates the immune system and upregulates the inflammatory cytokine system IL-0 and IL-1.
- Proteins provide all essential aminoacids necessary for baby's growth. It also provides protection from microbes and helps in the development of gastro intestinal tract (GIT). Lactoferrin is an iron binding glycoprotein that contributes to better growth, health and development of baby.
- Lipids comprising of cholesterol, Decosahexanoic acid (DHA) and triglycerides provides a major source of energy for baby. It also supports the cognitive, visual, motor and immune developments.
- Phospholipids comprising of sphingomyelin provides anti-infective and antitumour activity.
- Maternal leukocytes containing immunoglobulins that acts against infections.
- Vitamins A, B1, B2 and B5 are required to maintain vision, vitamin D protects the cell membrane in eye and lungs and vitamin K supports production of clotting factors. Vitamin C supports the immune system and promotes the absorption of iron. Vitamins B1, B5, B6 and B12 help in healthy brain development.

The lactating mothers passes on all the ingredients benefiting the baby, that are obtained from her body stores which she has built up during her pregnancy or from her diet. Hence it is important for the mother to give importance

## 2. Novel Kit in Postnatal care

Natofer kit contains the perfect blend of Multivitamins, Minerals, Calcium and vitamin D3 with Iron as a unique novel pack to fulfill the need of postnatal care of women as shown in Figure 1. Natofer kit is a pioneer in supportive care and

offers general wellness to postnatal care in terms of good patient compliance, higher relative bioavailability and minimal

gastric disturbances.

<b>Natofer KIT</b>	
<b>Yellow Tablets : Morning Dose</b>	
<b>Adenosylcobalamin</b>	<b>500 mcg</b>
Niacinamide	50 mg
Vitamin B6	3 mg
Vitamin B2	5 mg
Vitamin B1	4.5 mg
Alpha Tocopheryl Acetate	24 mg
Vitamin A	5000 I.U.
Copper Sulphate	2.5 mcg
Zinc Sulphate	63 mg
<b>White Tablets : Afternoon Dose</b>	
<b>Calcium Carbonate</b>	<b>500 mg</b>
Vitamin D3	200 I.U.
Ammonium Molybdate	180 mcg
Magnesium Hydroxide	25 mg
Magnesium Sulphate	1.25 mcg
Selenium Dioxide	70 mcg
<b>Red Tablets : Night Dose</b>	
<b>Sodium Ferredetate</b>	<b>231 mg</b>
Folic Acid	5 mg
Vitamin C	150 mg

Fig 1: Composition of Natofer Kit

Natofer kit is prepared by adopting the novel packaging technique to meet the requirement of postnatal mothers. The Natofer kit contains complete supplement of Iron, Multivitamin, Micro nutrient, Calcium and Vit D3 in three divided doses which must be administered in the Morning, Afternoon and Night. The morning dose of Vitamin and mineral is exhibited as a yellow color tablet, the afternoon dose of calcium and vitamin D3 in white color, the night dose of Iron in red color.

## 2.1 Importance of Iron, Multivitamins and mineral supplements in Postnatal Mothers

### 2.1.1 Zinc Sulphate Monohydrate

The prevalence of postpartum anxiety is more than 30% in the first month after delivery and the prolonged anxiety may lead to postpartum depression. Mother's anxiety may in turn affect the care of the newborn. Zinc is considered to exert its antidepressant and anxiolytic effect through neurotransmitters. Zinc is also important in regulating the functioning of many enzymes, DNA and RNA synthesis, carbohydrate metabolism, folate absorption, acid base homeostasis, inactivation of vit A and D and to maintain stability of the cell membrane. Zinc also plays a vital role in the foetal development and milk secretion during pregnancy and lactation<sup>3</sup>. One of the research reports reveals that worldwide over 80% of pregnant women were found to be with inadequate zinc intake<sup>9</sup>. The recommended daily intake of zinc in lactating women includes 12 mg/day<sup>10</sup>. Hence WHO recommends the use of zinc in the form of water soluble compounds such as zinc sulfate, zinc acetate and zinc gluconate as they can substitute 23%, 30% and 14% of zinc. Few researchers have made an attempt to understand the absorption of zinc in humans and the amount of zinc absorbed from these water soluble compounds was similar to that of zinc oxide<sup>11</sup>.

### 2.1.2 Vitamin A concentrate as acetate

Vitamin A is one of the essential micronutrients for pregnant women and their fetuses. The requirement of this vitamin

during pregnancy is essential for the morphological and functional development of the fetus. It also supports the ocular integrity and exerts other systemic effects on the fetal organs as well as on the fetal skeleton. Vitamin A deficiency in pregnant women is one of the major public health issues recorded in most of the developing countries. Many researches have revealed that infants were generally born with low stores of vitamin A, even if the mother has adequate amounts of vitamin A. Vitamin A stores in liver of the infants could be improved by the supply of vitamin A through the breastmilk, a rich source of vitamin A. About 9.8 million pregnant women were found to be deficient of vitamin A and have developed xerophthalmia across the world as per the report given by WHO. The deficiency of Vitamin A also causes other effects like increased risk of anemia and in turn results in slower growth and development of infants. It may also result in maternal and infant morbidity and mortality. Vitamin A, when supplied as retinyl ester is well absorbed by the intestinal mucosal cells and is first converted to retinol and then oxidized to retinal and then to retinoic acid. Vitamin A deficiency in the population is characterized by plasma retinol concentration of less than 20 mcg/dl. The recommended dietary intake of vitamin A during pregnancy is 770 mcg per day and 1300 mcg per day during lactation period. The recommended daily intake as per NIH is only 400 mcg per day for infants aged 6 months or less<sup>12</sup>. Lactating mothers are advised for an additional supplement along with their regular diet in order to meet the additional daily requirement. Vitamin A supplementation during pregnancy and lactation provides many undiscovered benefits such as improved antioxidant capacity and immune function though the role of vitamin A in reducing mortality and the risk of anemia remain unproven<sup>12</sup>.

### 2.1.3 Alpha Tocopheryl acetate

Alpha tocopherol, the isoform of vitamin E, is present in human diet and breast milk. The daily recommended intake of vitamin E is 19 mg for lactating mothers. The alpha tocopherol in milk provides the antioxidant capacity. It is known as a lipid soluble antioxidant which, damages free radicals and protects cells of the body.

#### 2.1.4 **Thiamine Monohydrate**

Thiamine commonly known as vitamin B1, is essential for neuronal functioning, energy metabolism and for cognitive development. The deficiency of thiamine can result in the development of infantile beriberi. Recent studies have suggested that milder forms of infantile thiamine deficiency may be the root cause for long term cognitive impairments<sup>13,14</sup>. Thiamine deficiency is still reported throughout South Asia and in some parts of Southeast Asia, which is mainly attributed to the higher intake of highly polished white rice<sup>15</sup>. When this diet is consumed by lactating mothers, thiamine poor milk is produced and hence their breast fed infants are put at a risk of cognitive impairment or infantile beriberi. Nutritional deficiency can be avoided if the diet contains more whole grains. Excessive vomiting during pregnancy may also lead to thiamine deficiency. Hence the antenatal vitamin supplement containing vitamin B1 may be beneficial. A recent study conducted among Cambodian women for 22 week has revealed that a high dose of vitamin B1 about 10 mg per day among the breast feeding mothers has shown to aid language development in infants<sup>16</sup>. The maternal thiamine supplementation has resulted in the development of cognitive motor skills in infants<sup>17</sup>.

#### 2.1.5 **Riboflavin**

Riboflavin is one of the cofactors for enzymes that are involved in generating energy, biosynthesis of molecules, detoxification and electron scavenging pathways. Riboflavin also plays an important role in the metabolism of other B vitamins. Deficiency of Riboflavin was encountered in combination with other B vitamins due to consumption of poor nutrition. The regions, where people consume rice and wheat as their major food along with less or no consumption of meat or dairy products are prone to Riboflavin deficiency. Riboflavin deficient mothers produce riboflavin deficient infants and remain deficient during breastfeeding and weaning. Hence, to ensure adequate riboflavin supply in both mother and infant, an ideal supplementation is highly recommended along with an increased intake of dairy products and meat consumption<sup>17</sup>.

#### 2.1.6 **Pyridoxine Hydrochloride**

Vitamin B6 popularly known as pyridoxine, helps in regular cell metabolism and in the synthesis of neurotransmitters such as dopamine, adrenaline and serotonin. It is also essential for normal brain development and functioning helps in relieving nipple vasospasm in breast feeding mothers. This also helps to combat the symptoms of premenstrual tension or postnatal depression. The Recommended Dietary Allowance (RDA) of vit B6 for a woman is 1.3 to 1.9 mg/day during pregnancy and up to 2 mg/day during lactation as recommended by National Institutes of Health<sup>18</sup>.

#### 2.1.7 **Adenosylcobalamin**

The daily recommended intake of vitamin B12 in lactating women is 2.8 mcg. Lactating mothers may be advised to supplement their diet with vit B12. Deficient mothers should be encouraged to supplement during lactation, if they miss the opportunity to supplement during pregnancy. It is widely used as a nutritional supplement to treat pernicious anemia,

stomatitis, depression, anxiety and panic attacks. Adenosylcobalamin, an active form of vitamin B12 is also known as cobamide or dibenxoxide<sup>19</sup>.

#### 2.1.8 **Niacinamide**

This is a common water soluble vitamin which is required for tissue respiration, glycogenolysis and for lipid metabolism. Niacin is a precursor of Niacinamide and is excreted into the breast milk. It is also transported to the fetus and hence the newborn is found to have high concentration of this vitamin. The RDA recommended by the National Academy of Science is 20 mg for lactating mother<sup>20</sup>. The supplementation with niacinamide is not recommended with an adequate supply of the vitamin in the diet among pregnant and lactating women.

#### 2.1.9 **Calcium carbonate**

Insufficient calcium in diet results in maternal bone loss, bone mineralization, reduced fetal growth and impaired breast milk calcium secretion. Pregnancy and lactation are the important stages for every woman demanding high calcium in diet. Calcium carbonate is a dietary supplement used to increase calcium levels in the body. Calcium is important as it helps in maintaining the bones, nerves, muscles, brain and heart to stay healthy. During pregnancy stage, the fetus receives its total nourishment from the maternal source. The maternal calcium equilibrium may get affected because of the dynamic balance between the maternal calcium storage and fetal nutritional needs. The highest maternal calcium fetal transfer occurs at the third trimester. A required amount of calcium is also transferred to the neonate during nursing. Calcium may be extracted from the maternal bone mass to meet the fetal calcium needs and hence may result in increased skeletal stress. Hence the recommended daily allowance (RDA) of calcium for pregnant and breastfeeding women is 1000 - 1300 mg<sup>21</sup>.

#### 2.1.10 **Cholecalciferol**

Vitamin D is a common component of human milk and is required for calcium and bone metabolism. This vitamin can be synthesized in the skin followed by an exposure to UV-B radiation, but this cannot be achieved in high latitude countries. A high dose supplementation of vitamin D to pregnant and lactating women is essentially an important alternative strategy to improve the vitamin D status of breast fed infants. A daily vitamin supplementation of 400 to 2000 IU can meet the daily requirement of an infant. This maternal supplementation showed elevated serum concentrations of 25-hydroxy vitamin D among mothers and infants<sup>16</sup>. Depending on the mother's vitamin D underlying status and the daily infant milk intake, the daily vitamin D dose can vary from 400 to 4000 IU<sup>22,23</sup>.

#### 2.1.11 **Ammonium molybdate**

Molybdenum is one of the constituents of the enzymes such as xanthine oxidase, sulfite oxidase and aldehyde oxidase. The function of these enzymes include the conversion of Xanthine to hypoxanthine, sulfite to sulfate and hence supports the detoxification process. The intake levels in the diet along with other substances such as copper and sulphate decides the storage level of molybdenum in the tissue. Molybdenum deficiency includes tachycardia, tachypnea, night blindness, nausea, vomiting etc.

### 2.1.12 Sodium feredetate

The daily intake of iron by Indian women was found to be twice as that of western women. Despite that the incidence of iron deficiency anemia is more and is attributed to the large consumption of cereal based diet that inhibits the iron absorption. Iron deficiency can be prevented by consumption of iron preparations such as ferrous sulphate, fumarate or gluconate. But these salts when given orally tend to cause poor compliance and less absorption. Iron in the form of sodium iron edetate (sodium feredetate) is more water soluble and results in good bioavailability. This preparation also reduces the GI side effects and provides more patient compliance. A study was performed by the researchers to compare the efficacy of sodium feredetate and ferrous sulphate in women with iron deficiency anemia. The serum ferritin and Hb concentration were found to improve significantly with the intake of sodium feredetate than that of ferrous sulphate. The side effects were minimal and patients were well tolerated. The study identifies that the preparation is not cost effective as that of other preparations. The randomized double blind study concluded sodium feredetate effectively improves haemoglobin profile and also the study states low doses of sodium feredetate produce comparable results as higher dose of ferrous fumarate as 100mg elemental iron given twice daily<sup>24</sup>.

### 3. CONCLUSION

Vitamins and micronutrient supplements play a vital role in the maternal well being during pregnancy and breastfeeding stages of women. Due to lack of knowledge and ignorance, medical non adherence is common among women during pregnancy as well as after delivery. This unique pack named as Natofer Kit meets the pre-requisite demands of the postnatal mothers. This also provides a triple benefit of maintaining the iron, calcium and multivitamin levels. This distinctive packing helps to maintain patient compliance and also economic. This formulation also meets the various component functions such as easy storage, easy to educate, proper queuing and monitoring benefits, simple dispensing and reinforcing options. This technique may overcome the medication non adherence and improve the post natal care in near future.

### 4. AUTHOR CONTRIBUTION STATEMENT

Dr.Balaji and Dr.Ramamoorthy conceptualized and designed the manuscript. Mrs.Devi and Dr.Lakshmi collected the data and prepared the original manuscript, Dr.Vijayalakshmi provided necessary inputs for designing the manuscript. All authors contributed to the preparation and submission of manuscript.

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### 6. CONFLICT OF INTEREST

Conflict of interest declared by none.

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