Deficiency and Inadequacy of Vitamin E in the Maternal-Infant Group

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Abstract

Preterm newborns are more susceptible to vitamin E deficiency when compared to full-term infants. In adults this deficiency is rare and usually only appears when symptoms are severe. Thus, the preterm is more exposed to erythrocyte hemolysis and other problems due to vitamin E deficiency, such as hemolytic anemia, retinopathy, intracranial hemorrhage, bronchopulmonary dysplasia and increased mortality. Catch up the need for daily consumption of this vitamin is difficult for the maternal infant group, and research on the subject is necessary to implement strategies to combat this deficiency. Therefore, to reduce problems arising from the deficiency of this vitamin it is important to prevent from a proper diet and supplementation.

Keywords: Preterm newborn; Alpha-tocopherol; Maternal nutrition

Introduction

Vitamin E deficiency is rarely found in adults, and its symptoms are more frequent in children due to low body reserves and intense growth and development, which leads to a faster onset of the reflex of the deficiency [1].

Preterm and intrauterine growth restricting newborns may present low levels of alpha-tocopherol [2-4]. During delivery and soon after birth, fetal tissues are subjected to oxidative damage caused by increased free radical formation, as the neonate changes to a hyperoxide environment compared to the uterus [5].

These damages can also occur by the reduction of the antioxidant capacity of the newborn, either by the reduced activity of the antioxidant enzyme complex or by a low concentration of non-enzymatic antioxidants, such as vitamin E [6-7]. This reduction of vitamin E may occur more easily in preterms, as a consequence of the placental transfer occurring more intensely at the end of gestation, besides the immaturity of the lipid metabolism [8-9].

Thus, the preterm neonate may be more exposed to erythrocyte hemolysis and other problems due to vitamin E deficiency (VED), such as hemolytic anemia, retinopathy, intracranial hemorrhage, bronchopulmonary dysplasia, and increased mortality. This VED has also been associated with impairments in the development of the central nervous system in childhood and changes in the pre-pubertal antioxidant defense system, which justifies the importance of knowing the prevalence of VED in this group [10-15].

For this mini review articles were searched in periodicals appended using the key words tocopherol, newborn, maternal infant and the like.

Discussion

The proportion of low levels of alpha-tocopherol in the neonate can reach 80% of cases in preterm, being less frequent in those born after 37 gestational weeks. It should be pointed out that this investigation of VED in the term neonate is still precarious and studies of the influence of gestational age at birth on alpha-tocopherol concentration are controversial. Some authors did not find differences and others observed higher values in the preterm or term [15,16-19].

Another point to be highlighted is the lack of information on the recovery of nutritional status in vitamin E from preterm or term infants during lactation, particularly those on breastfeeding. Research has been conducted with preterm infants from the time of delivery until the hospital discharge period, in situations of other types of diets associated with vitamin E supplementation, without comparing the results with the comparative group term [15,20-24].
Considering this scenario, in view of prematurity being a determinant factor for SVD, the health implications of the neonate and the beneficial effects of an adequate nutritional status of the vitamin in the child’s cognitive development [25], it is necessary to monitor/investigate the alpha-tocopherol levels of the infant during lactation to ensure the nutritional surveillance of this group and to strengthen the fight against VED. In adults, VED is only observed in cases of fat malabsorption, genetic defects in alpha-TTP expression or prolonged insufficient consumption of the vitamin [26-27]. The clinical features are mainly anemia and progressive neurological disorder with spinocerebellar ataxia, due to alterations in sensory and motor nerves caused by lipid peroxidation of membranes [28].

Although deficiency is little found in adults, it is important to consider the assessment of this status in women of reproductive age, since circulating levels of alpha-tocopherol at the end of gestation or postpartum have been positively associated with concentration in the neonate [29-30].

The proportion of VED in adult women in the immediate postpartum ranges from 0% to 16% [31-33], and it was seen that women assisted in public health care for childbirth are more likely to present VED [32].

Maternal serum alpha-tocopherol has been associated with the level of prematurity, newborn weight and maternal age [29,34-36]. It seems that even in situations of low vitamin consumption serum levels remain increased at the end of gestation, protecting the circulating lipids from oxidation [37].

The SVD in women during lactation is also known. Lammi-Keef et al. [38] found a reduction in serum alpha-tocopherol at this stage [38] and the prevalence of VED reached 70% in infants in South Africa [39].

It is a fact that the consumption of the vitamin in this period does not reach the nutritional requirement, being an average food intake of 6-10mg/day by nursing mothers in Spain [40-41]. 6.7mg/day in Iceland [42]. 8-9mg/day in Poland [43] and 9.8mg/day in the United States [44], but the relationship diet and nutritional status in vitamin E in lactation remains indefinite.

There is a discussion on how to combat SVD particularly in critical situations such as premature and low birth weight. Pharmacological doses of vitamin E may be expected to prevent or limit retinopathy of prematurity, haemorrhage, hemolytic anemia among other consequences of the deficiency. However, excessive doses can result in serious side effects [2] and smaller amounts cannot maintain adequate levels of alpha-tocopherol in the neonate [20].

The establishment of exclusive breastfeeding, especially in the first days of life, can be considered as a strategy for the prevention of vitamin E deficiency, since milk secreted up to the 4th day postpartum (colostrum) is particularly rich in alpha-tocopherol, and its intake provides recommended concentrations of the vitamin for the child, being essential for the formation of reserves and prevention of the deficiency [45-48].

References