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Review Article

Child Delivery and Antioxidants

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Abstract

Child delivery is a process that culminates from conception. Child delivery possesses stress that increases levels of free radicals both in the mother and the child. The increased levels of free radicals can affect the fetal heart rate and affect the outcome of child delivery if not handled promptly and accurately. Antioxidants are usually present in low levels in the body. Mothers are advised to eat foods rich in antioxidants to avert some dangers for the mother and the child.

Antioxidants

Antioxidants are shown to be substances that, when present in minute concentrations, compared to that of an oxidizable substrate, significantly delay or prevent oxidation of that substance (Halliwell and Gutteridge, 1998). It is reported that two classes of antioxidants are known: the low molecular weight compounds such as vitamins C and E, beta-carotene, glutathione, uric acid, bilirubin, among others and the proteins: albumin, transferrin, cerulosplasmin, ferritin, superoxide dismutase, glutathione peroxidase, catalase, among others. Similarly as stated, antioxidants in biological system can be either enzymatic or non-enzymatic. The enzymatic antioxidants include catalase, superoxide dismutase, and glutathione which catalyse neutralization

of many types of free radicals, while the non-enzymatic enzymatic antioxidants include Vitamin C, selenium, vitamin E, carotenoids, and polyphenols. There is increasing proof that antioxidants has a major role in the prevention of heart disease, cancer, DNA degeneration, pulmonary disease, and neurological disorder [1,2]. Recently, there has been an upsurge of interest in the therapeutic potential of plants as antioxidants in reducing oxidative tissue injuries. Typical phenolics that possess antioxidant activity have been characterized as phenolic acid and flavonoids. The increasing awareness of consumers to issues regarding food additive safety, results in an enhanced effort in finding alternative additives and preservatives from natural and probably safer sources. The main disadvantage with the synthetic antioxidants is their side effects when taken *in vivo*. It is necessary for food manufacturers have been encouraged to use natural antioxidants instead of synthetic compounds to maintain the nutritional values of their products. For example, commercial antioxidants such as butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA) can be replaced by plants extracts, particularly polyphenols (Balasundram *et al.,* 2006). Antioxidants are given to prevent or delay its (food) oxidation, normally initiated by free radicals produced during the food's exposure to environmental factors such as air, light and temperature. Generation of free radicals or reactive oxygen species (ROS) during metabolism and other activities beyond the antioxidant capacity of a biological system gives rise to oxidative stress. Oxidative stress (OS) has a role in heart diseases, neurodegenerative diseases, cancer and in aging process. Antioxidants oppose these effects thus lowering the risk of diseases.

Antioxidant and Child Delivery

Labour is shown as a stressful process for mother and the newborn. The increased synthesis of free radicals during labour and their removal by the existing antioxidants imposes a challenge to the mother. Oxidative stress occurs during pregnancy due to lipid peroxidation that is caused in the placenta [3]. Oxidative stress increases during pregnancy because of the elevated oxygen requirements of the fetus and the placenta is well equipped with a large number of mitochondria to meet this demand [4]. And also, the antioxidant system was shown to be stronger than peroxidation during pregnancy [5]. In normal pregnancy, placental lipid synthesis is regulated by placental antioxidant systems [6]. An imbalance develops in peroxidative and antioxidative status during delivery which may affect the fetus [7]. Oxidative stress is caused by neural and hormonal factors during labour and this may induce the synthesis of high MDA in the newborn if it is not counteracted by maternal antioxidant defense system [8]. Monitoring of lipid peroxidation level is necessary as it helps in understanding the relationship between oxidative stress and pregnancy outcome. Hence, the antioxidant system of the mother has a major function in combating the stress caused during labour.

In dairy cows also it was found that the LPO (Lipid Peroxides) function was higher after delivery when compared to late pregnancy and elevated metabolic demands associated with parturition and initiation of lactation were speculated as the reason for it [9,10]. Raised synthesis of pro-inflammatory mediators such as prostaglandins and thrombaxanes at the onset of labour also was suggested for the raised synthesis of free radicals [11]. The oscillation of oxygen levels during labour contractions followed by tissue reoxygenation was another reason speculated for the increased production of free radicals [5]. Labour pain with physical and psychological stress of the mother was yet another probability for the increased production of MDA [12]. Nakai *et al.* (2000) [13] showed that oxidative stress continues to be present even at post-partum [14]. These biochemical modifications may affect the long term cardiovascular health of the mother with high

parity [15]. Glutathione is shown as another potent non-enzymatic antioxidant. It is present in abundance intracellularly and it protects the cells from free radical injury. It also helps to regenerate the stores of other antioxidants like Vitamin C and E. In the blood 99.5% of glutathione is in the RBC to maintain the hemoglobin in reduced form. It plays an important role in maintenance of pregnancy and prevents the oxidative stress that occurs during labour and birth process [16]. The process of labour at term induces up regulation of glutathione in both the maternal and fetal compartment which is highly beneficial [17].

Elevation in oxidative stress causes antioxidant enzyme function as SOD in red blood cell which plays an important role in protecting the growing embryo from the danger of free radical destructions [18]. However, GPx activity during labour was significantly depressed in B and A in our study when compared to control which is in accordance with the earlier observations [19]. Previous studies have suggested that high MDA levels possibly inhibit the activity of GPx with advancement of pregnancy with a significant decrease of Se and SeGSH-Px activities in both blood and plasma with a drop in total antioxidant status [20]. The process of labour also shows wide variation as it is influenced by maternal as well as fetal factors. The maternal factors are age, parity, gravidity and nutritional status, which can modify the process of labour. When correlated with maternal age it was positively correlated with GPX levels (r= 0.016). This implies that maternal age is an important determinant of oxidative stress. Elderly primigravida experienced greater degree of oxidative stress evidenced by lesser GPX activity in the postpartum period [19]. However, our results did not show any correlation between duration of labour and oxidative stress markers in maternal bloodwhich coincides with the report of Simko *et al.* (2002) [21]. According to Gurupras & Rao (2003) [22] a positive correlation exists between MDA level and duration of labour [22]. This could be due to the inclusion of only uncomplicated deliveries as study group and further study is needed to confirm this fact. The nutritional status of the mother is yet another important factor to be considered with respect to oxidative stress. The non-enzymatic antioxidants such as Vitamin C, Vitamin E and micronutrients such as copper, zinc, manganese and selenium which are co-factors for enzymatic antioxidants can also modulate the oxidative stress. The importance of antioxidant micronutrient supplementations of antenatal mothers have well been explored [23]. The stress during labour and the efficiency of maternal antioxidant system should not be overlooked as various other factors may induce oxidative stress through external sources like chemicals in drinking water and diet, tobacco usage, air pollution, deficit of antioxidants etc. The level of antioxidants may also be modulated by genetic polymorphism of metabolizing and oxidative stress related enzymes.

Conclusion

Labour is a process that herald child delivery which is usually very stressful both to the mother and the child and increase the levels of free radical through increased lipid peroxidation. The levels of antioxidants are usually low in the body. The increased level of free radicals will deplete the antioxidants more and then the mothers need to eat foods rich in antioxidants to prevent apoptosis of their cells and their children cells also.

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