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ROLE OF ZINC IN LOW BIRTH WEIGHT

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Abstract: *Zinc a potent antioxidant a needed for cellular metabolism particularly to need the need of low birth weight children. More than 80% do have Zn deficiency in the last trimester of pregnancy. Studies of the effects of zinc supplementation during pregnancy have shown inconsistent results, possibly in part because of the challenges in establishing baseline zinc status in populations. However, zinc supplementation had no apparent effect on other infant outcomes including neonatal mortality, mean gestational age or any parameter of fetal growth such as risk of low birth weight or mean weight, length or head circumference at birth, or on primary maternal outcomes such as pre-eclampsia.*

Keywords: *Low birth weight, Weight at Different Periods,Weight Gain*

Introduction

Zinc is an essential trace element for humans, animals and plants. It is vital for many biological functions and plays a crucial role in more than 300 enzymes in the human body. The adult body contains about 2-3 grams of zinc. Zinc is found in all parts of the body: it is in organs, tissues, bones, fluids and cells. Muscles and bones contain most of the body's zinc (90%). Particularly high concentrations of zinc are in the prostate gland and semen. Everyone needs zinc. Children need zinc to grow, adults need zinc for health. Growing infants, children and adolescents, pregnant women and lactating mothers, athletes, vegetarians and the elderly often require more zinc [1].

Pathophysiology : Zinc is vital for growth and cell division especially important during pregnancy, for the growing fetus whose cells are rapidly dividing. It also helps to avoid congenital abnormalities and pre-term delivery. It is vital in activating growth - height, weight and bone development - in infants, children and teenagers. It plays a vital role in fertility. In males, zinc protects the prostate gland from infection and ultimately from enlargement. In females, zinc can help treat menstrual problems and alleviate symptoms associated with premenstrual syndrome (PMS). Among all the vitamins and minerals, zinc shows the strongest effect on our all-important immune system. It plays a unique role in the T-cells. Low zinc levels lead to reduced and weakened T-cells which are not able to recognize and fight against certain infections. It activates areas of the brain that receive and process the information from taste and smell sensors. Levels of zinc in

plasma and zinc's effect on other nutrients, like copper and manganese, influence appetite and taste preference. Zinc accelerates the renewal of the skin cells. Zinc creams are used for babies to soothe diaper rash and to heal cuts and wounds. High concentrations of zinc are found in the retina. With age the retinal zinc declines which seem to play a role in the development of age-related macular degeneration, which leads to partial or complete loss of vision [2].

Dietary Sources of Zinc & their Average Zinc Content (mg/100g)

Dietary Sources of Zinc	Average Zinc Content (mg/100g)
Meat (especially red meat)	5.2
Nuts	3.0
Poultry	1.5
Eggs	1.3
Milk products	1.2
Bread	1.0
Fish	0.8
Sugars & preserves	0.6
Green vegetables	0.4
Potatoes	0.3
Fresh fruits	0.09

Our body regularly needs zinc. Recommended daily intakes are:

Infants	5 mg
Children	10 mg
Women	12 mg
Pregnant Women	15 mg
Lactating Women	16 mg
Men	15 mg

Pregnant women and lactating mothers require more zinc to ensure optimal development of the fetus and newborn baby [2].

Zinc deficiency : Zinc deficiency is a serious problem in many developing countries. zinc deficiency is ranked as the 5th leading risk factor in causing disease, especially diarrhea and pneumonia in children, which can lead to high mortality rates in these underdeveloped regions. Other severe deficiency symptoms include stunted growth and impaired development of infants, children and adolescents. Early zinc deficiency also leads to impaired cognitive function, behavioral problems, memory impairment and problems with spatial learning and neuronal atrophy. Public health programs involving zinc supplementation and food fortification could help overcome these problems. In

industrialized countries cases of mild zinc deficiency can be observed. The most common symptoms include dry and rough skin, dull looking hair, brittle finger nails, white spots on nails, reduced taste and smell, loss of appetite, mood swings, reduced adaptation to darkness, frequent infections, delayed wound healing, dermatitis and acne. Mild zinc deficiency symptoms can usually be corrected by supplying the body with the right amount of zinc each day. Supplemental zinc not exceeding the recommended daily allowance might be taken. Therapies involving larger doses of zinc should always be discussed with your physician. Therapeutically doses typically range from 20 mg – 30 mg, in some rare cases doses might be higher[3].

Causes of deficiency : Phytates that can be found in wholegrain, rice, corn and legumes can reduce absorption. Zinc absorption is impaired by iron, copper and calcium. The causes of zinc deficiency are mentioned below:

- Oral contraceptive
- High perspiration – so athletes can lose a lot in sweat
- Diarrhea
- Diabetes, liver or kidney disease
- Caffeine and high alcohol intake
- Antacids and antibiotics
- Stress – zinc decreases and copper increases in stress [4].

Low birth weight in newborns : Babies are weighed within the first few hours after birth. The weight is compared with the baby's gestational age and recorded in the medical record. A birth weight less than 5 pounds, 8 ounces is diagnosed as low birth weight. Babies weighing less than 3 pounds, 5 ounces at birth are considered very low birth weight.

- The average newborn weighs about 7.6 pounds
- About 7.6 percent of all newborns in the United States have low birth weight.
- The overall rate of these very small babies is increasing, primarily because of the increase in multiple birth babies, who tend to be born earlier and weigh less. More than half of multiple birth babies have low birth weight [5].

Materials & Methods

Lacunae on knowledge of Zn supplementation was determined by records of authors of the field and national data was collected by Islam, A (2009). The results are presented and explained for drawing conclusion.

Discussion

While there is no specific treatment, it is very important to maintain adequate nutrition during pregnancy for you and the fetus and for your infant once he is born. In some cases, risk factors that may lead to low birth weight can be identified early on in the pregnancy and be reduced or eliminated through behavioral changes and treatment of chronic conditions. Most low birth-weight infants eventually catch up with the growth of other

babies their age somewhere between the 18th and 24th month. A number of complications may occur if your infant has experienced intrauterine growth restriction. You should also call if your infant or child does not seem to be growing or developing at a standard rate[6].

Low Birth Weight Neonate and Maternal Serum Zinc Concentration: Zinc deficiency can lead to clinically relevant disturbances in tissue functions and particularly important for birth weight of neonates. The aim of this study was to determine the relationship between serum zinc in pregnant women and the incidence of low birth weight (<2500 g) in their newborns. Low birth weight (LBW) is a crucial and a substantial factor contributing to infant mortality. Infants with LBW are at increased risks for long term disability and various physical morbidities. Poor nutrition during pregnancy is recognized as an important cause for LBW particularly in developing countries. Deficiencies in micronutrients such as zinc, iron, folic acid and iodine during pregnancy can cause LBW. Pregnant women in developing countries were shown to consume diets with a lower density of minerals and vitamins. Suboptimal zinc intake may be relatively common throughout the world. Low zinc intake may be especially detrimental during pregnancy due to the role that zinc plays in growth and development. Potential adverse consequences of zinc deficiency during pregnancy include increased maternal mortality, LBW, prolonged labor, spontaneous abortion and premature delivery. Impaired zinc status during pregnancy was recently found to adversely influence late fetal development. Zinc deficiency is one of the important problems within the developed and developing countries. Pregnant women are facing zinc deficiency more than the other groups, due to having fetus which need zinc for its poor growth. A separate study in 2001[6-9] indicated that using zinc supplements by pregnant mother, increased newborn birth weight, and decreased the mortality rate. The aim of this prospective case-controlled study was to determine the relationship between maternal zinc concentrations and neonatal birth weight in a group of mothers having LBW deliveries as compared to a group who delivered normal birth weight infants. If zinc was found to be involved in the pathogenesis of LBW, then supplementation of zinc during pregnancy could possibly be considered to ameliorate this serious morbidity[6-9].

Management of Low Birth Weight: An extremely low birth weight (ELBW) infant is defined as one with a birth weight of less than 1000g (2lb, 3oz). Most extremely low birth weight infants are also the youngest of premature newborns, usually born at 27 weeks' gestational age or younger. Infants born at less than 1500g are defined as having very low birth weight (VLBW).Low birth weight (< 2500g) was noted in 8.3% of all births in the United States in 2006, and very low birth weight was noted in 1.48% of all births; approximately 63,137 US births were reported in 2006. Infants whose weight is appropriate for their gestational ages are termed appropriate for gestational age (AGA). Infants who are heavier than expected are large for gestational age (LGA); conversely, those smaller than expected are considered small for gestational age (SGA) and are also usually found to be intrauterine growth restricted (IUGR) prior to birth. Extremely low birth weight survival has improved with the widespread use of surfactant agents, maternal steroids, and advancements in neonatal technologies. The minimum age of viability is

now as young as 23 weeks' gestation, with scattered reports of survivors born at 21-22 weeks' estimated gestation [10].

Nutritional Management of the Very-Low-Birth weight Infant: "Early aggressive nutrition" of the very-low-birth weight infant is no longer just a buzzword; it is becoming an imperative. Aggressive nutrition of the very-low-birth weight infant has been defined as practice that "ranks toward the upper end of the range of established practice" or "goes beyond the established into untested territory. Currently, postnatal, or extra uterine, growth failure is a problem in the majority of very-low-birth weight infants. It is believed that there is a critical window of opportunity, between birth and when birth weight is regained, when optimal nutrition has its greatest benefit. In the transition to extra uterine life, there should be minimal interruption in growth and development of the fetus/newborn. The way to achieve this is to also minimize or eliminate the interruption in the transfer of nutrients to the infant at the time of birth, via immediate, aggressive nutrition [10].

Outcomes of Very Low Birth Weight : Approximately 85% of infants with a very low birth weight survive to be discharged from the hospitals. Within 2 years after discharge, 2 to 5% die from medical complications related to their preterm birth. The incidence of most short-term major medical complications associated with prematurity has remained relatively stable. The EPI Cure study reported outcomes for all infants born at a gestational age of 20 to 25 weeks over a 10-month period in 1995 in the United Kingdom and Ireland. Only 811 of the 4004 infants (20%) received intensive care, and 39% of those survived to discharge. Of the survivors, 16.5% had ultrasonography evidence of severe brain injury, and 74% needed supplemental oxygen at 36 weeks' postmenstrual age. Decisions about which infants will be considered candidates for resuscitation and intensive care are generally based on the anticipated gestational age at birth. However, the likelihood of survival without serious squeal may be influenced by factors in addition to gestational age. The reduced risk was similar to the risk for infants with an additional week of gestational age [10-14]. Although there are no proven prevention strategies, there are a few things you can do to increase your chances of giving birth to a baby with healthy weight. Proper nutrition, adequate rest, and avoidance of cigarettes, drugs, and alcohol will contribute to the development of a healthier child [15].

Results

The primary data of Islam A. was further analyze and presented as follows in table & graph.

Table 1: Descriptive Measurements for Weight at Different Periods, Weight Gain, and Gestational Period (For Case and Control)

Birth weight			Difference	P value
Weight after 72 hours	Control 1614.00	Case 1610.50	3.5	P= 0.05
Weight after 7 days	Control 1802.00	Case 1810.00	8	P= 0.05
Weight after 14 days	Control 1975.00	Case 1966.00	9	P= 0.07
Weight after 21 days	Control 2168.50	Case 2273.00	104.5	P= 0.05
Weight after 28 days	Control 2407.00	Case 2665.50	258.5	P=0.001

Figure 1: Comparison between initial weight and final weight

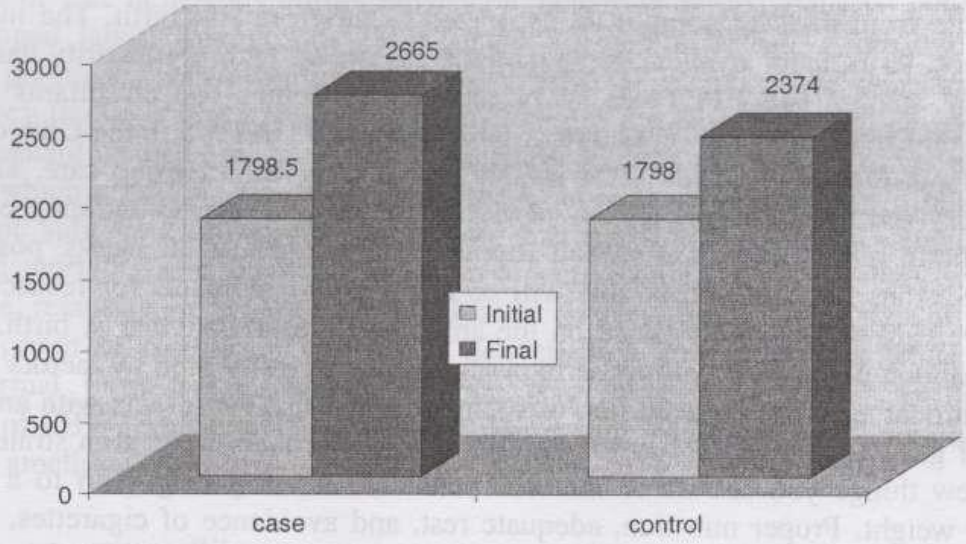

Figure 1 showed that mean weight of final follow up of cases and control group were significantly higher (P<0.000) when compared with mean birth weight. Improvement of weight in cases and control were 48.92 percent and 32.66 percent respectively.

Conclusion

Zinc is an essential mineral that is naturally present in some foods, added to others, and available as a dietary supplement. Zinc is involved in numerous aspects of cellular metabolism. A daily intake of zinc is required to maintain a steady state because the body has no specialized zinc storage system. Severe zinc deficiency is rare in humans, but mild

to moderate deficiency may be common, especially in populations with low consumption of zinc-rich animal-source foods and high intakes of foods rich in phytates, which inhibit zinc absorption. It is estimated that over 80% of pregnant women worldwide have inadequate zinc intake, consuming on an average at 9.6 mg zinc per day, well below the recommended minimum daily levels for the last two trimesters of pregnancy in settings of low zinc bioavailability. Maternal zinc deficiency may compromise with infant development and lead to poor birth outcomes. Low plasma zinc concentrations reduce placental zinc transport and may affect the supply of zinc to the fetus. Low birth weight and prematurity are significant risk factors for neonatal and infant morbidity and mortality. It has been hypothesized that zinc supplementation may improve pregnancy outcomes for mothers and infants. Studies of the effects of zinc supplementation during pregnancy have shown inconsistent results, possibly in part because of the challenges in establishing baseline zinc status in populations. However, zinc supplementation had no apparent effect on other infant outcomes including neonatal mortality, mean gestational age or any parameter of fetal growth such as risk of low birth weight or mean weight, length or head circumference at birth, or on primary maternal outcomes such as pre-eclampsia[16-18].

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