

An Analysis of Health benefits of Zinc

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ABSTRACT: Zinc is a nutrient that is required for human health. In attempts to minimize child sickness, improve physical development, and reduce mortality in poor nations, ensuring sufficient zinc intake should be a crucial component. Despite the advantages of sufficient zinc diet, over 2 billion individuals are still at danger of zinc insufficiency. In humans, zinc is present in approximately 200 enzymes and hormones. It's a naturally occurring element that can be found in all plants and animals, and it's readily accessible in over-the-counter vitamin supplements. Zinc is a necessary component of life. It's a naturally occurring element that's present in all plants and animals, and it's important for the health of our skin, teeth, bones, hair, nails, muscles, nerves, and brain function. Zinc is a mineral that is required for growth. It is utilized to regulate the enzymes that function and regenerate our bodies' cells. Without zinc, the creation of DNA, which is the foundation of all life on our planet, would be impossible. Zinc deficiency was shown to be a significant etiological component in the syndrome of teenage nutritional dwarfism in the Middle East. Zinc insufficiency is a serious public health issue, and nutritionists are worried that it affects a significant number of women and children in India and across the globe. Zinc deficiency was identified in the majority of the Indian population in a recent WHO study, and zinc supplements are frequently used to improve wound healing and pneumonia therapy. According to a 1992 research, zinc gluconate lozenges given at the first symptoms of a common cold cut the length and severity of the illness by 42%. Zinc is an essential trace element for human growth and development, particularly in babies and young children.

KEYWORDS: deficiency, health, Protein, symptom, zinc.

1. INTRODUCTION

Zinc is a trace element that is required for all kinds of life. Zinc's importance in human nutrition and public health has only lately been acknowledged. A lack of zinc has been identified by a number of experts as a major public health concern, particularly in poor nations. The incidence and clinical implications of zinc deficiency on growth retardation, diarrhoea, pneumonia, impaired cognitive function, and prenatal development problems. Zinc is such an important nutrient for human health that even a little deficit may be fatal. Zinc supplementation is a potent treatment strategy for a variety of ailments. Zinc is an important trace mineral that is needed for the metabolic function of 300 of the body's enzymes, as well as cell division and DNA and protein synthesis. Protein, carbohydrate, fat, and alcohol metabolism are all aided by these enzymes. Tissue development, wound healing, taste acuity, connective tissue growth and maintenance, immune system function, prostaglandin generation, bone mineralization, correct thyroid function, blood clotting, cognitive functions, prenatal growth, and sperm production are all dependent on zinc[1].

Zinc's physiological function and distribution in the human body are complicated. It can, for example, promote protein synthesis and insulin manufacture; cell and enzyme system maintenance; the composition of a variety of enzymes, and helps to enhance the activity of a variety of enzymes, synthetic DNA; regulating body fluid pH; promote the formation of collagen to make hair, skin, nails, and other healthy growth; and help to improve memory and mental, especially in children. Experiments have shown that zinc testosterone secretion in animals has significant consequences. The absence of zinc in the human body causes anorexia, loss of appetite, loss of smell and taste, and other symptoms; it also causes a weakened immune system, which may lead to arteriosclerosis and anemia. Zinc deficiency in pregnant women may cause fetal brain cell loss, which can impair their mental development. Zinc deficiency in children will impede their normal growth and development, which will be harmful to their intellectual development and reproductive system health. Adult men who are zinc deficient may develop prostatic hyperplasia, which reduces the reproductive function of the system and affects fertility, among other things[2].

1.1 FUNCTIONS OF ZINC:

Zinc's role in the cell may be classified into three categories: catalytic, structural, and regulatory.

- *Catalytical:* Zinc is used by over 100 distinct enzymes to catalyse important chemical processes. Zinc-dependent enzymes may be found in every known enzyme class.

- *Structural:* Zinc is required for the structure of proteins and the cell membrane. Protein structure and cell membrane structure. Zinc has an impact on the form and function of cell membranes. Zinc deficiency in cellular membranes makes them more vulnerable to oxidative damage and affects their activities.
- *Regulatory:* Zinc finger proteins have been discovered to function as transcription factors to control gene expression. Zinc is also involved in cell signalling and has been linked to hormone production and nerve impulse transmission[3].

1.2 Health Benefits Of Zinc:

1.2.1 Zinc, Testosterone and Men's Health:

Zinc is required to maintain appropriate testosterone levels in the blood. Zinc deficiency prevents the pituitary gland from producing luteinizing and follicular stimulating hormones, which boost testosterone synthesis. Zinc also suppresses the enzyme aromatase, which transforms testosterone to estrogen. Men's testosterone-to-estrogen ratio falls with age, from a peak of approximately 50:1 to half of that, or even 10:1. Heart disease, weight gain, and obesity are all linked to increased estrogen activity. The presence of aromatase in fat cells is one cause for increasing weight increase with age. Greater estrogen equals more fat deposition, therefore more fat cells equals more estrogen. Alcohol consumption exacerbates the problem by lowering zinc and increasing estrogen levels, exacerbating the problem. Zinc has been shown to help the body produce healthier sperm by increasing sperm count and motility, in addition to its impact on hormone levels. According to a USDA study, when zinc intake is low, semen volume drops by 30%. Male volunteers who consumed low amounts of zinc had lower semen volumes and serum testosterone concentrations, according to research published in the American Journal of Clinical Nutrition. The male prostate gland has been shown to be severely impacted by zinc deficiency. Zinc deficiency makes the prostate more susceptible to infection (prostatitis), which can lead to prostate gland enlargement (prostatic hypertrophy)[4].

1.2.2 Zinc Boosts the Immune System:

Zinc's importance in the body's reaction to infection is well understood. Zinc is a component of thymic hormone, which regulates and promotes lymphocyte development. Zinc also aids in the development of immune system cells by assisting in cell division and DNA replication.

1.2.3 Zinc Boosts Brain Activity:

Zinc is present in the mossy fiber system of the brain's hippocampus's vesicles. These fibers help to improve memory and cognitive abilities. Women who were zinc deficient performed worse on conventional memory tests, according to University of Texas researchers. Scientists from the USDA discovered that males who were deficient in zinc had worse memory. Accident victims who are given zinc supplements have proven to have better cognitive function in studies. Following an accident or surgery, zinc is redirected to the mending tissues, making it less accessible for other vital activities[5].

1.2.4 Zinc Heals and Protects Skin:

Zinc is necessary for skin health. Diaper rash, itchiness, and chapped lips and skin have all been treated with topical zinc formulations (zinc oxide). Acne, cold sores, and burns have all been treated using zinc sulfate in a water-based solution. Remember that zinc sulfate is a salt that, at high or moderate quantities, may be extremely caustic to raw tissue. Internally, zinc promotes cell division, healing, correct connective tissue development, and boosts Vitamin A transport from the liver to the skin, all of which assist to protect and repair bodily tissue[6].

1.2.5 Zinc and Pre-Menstrual Syndrome:

Premenstrual syndrome may potentially benefit from zinc supplementation (PMS). PMS affects 50% of all women who menstruate. There is mounting evidence that PMS is caused by a progesterone shortage. Many hormones, including progesterone, are regulated by trace quantities of zinc. Women with PMS had substantially decreased zinc levels during the luteal phase of menstruation, the 13 days before menstruation, according to early study from Baylor College of Medicine in Houston. Progesterone and endorphin

productions may be reduced as a result of this decline. Our bodies generate endorphins, which are natural painkillers. While further study is needed, it seems that zinc supplementation may help some women with PMS symptoms[7].

1.2.6 *Zinc in Pregnancy and Lactation:*

It is essential for a pregnant woman to meet her body's zinc requirements. The recommended daily intake (RDI) for pregnant women is 19 milligrams. Low zinc consumption was linked to a two-fold increase in the chance of poor birth weight, and low zinc intake early in pregnancy was linked to more than a trebling of pre-term delivery, according to a study published in the American Journal of Epidemiology in October 1992. Even a well-nourished mother may supply less zinc than her kid by the sixth month of breastfeeding, according to research published in the British medical magazine The Lancet in September 1992. Breastfed infants who were given zinc supplements grew longer and heavier than those who were given a placebo.

1.2.7 *Zinc in Post-Menopausal Health:*

For a variety of causes, a woman's zinc status may deteriorate as she grows older. Excess estrogen may cause zinc levels in the blood to drop. If you're on estrogen replacement treatment, be sure you're getting enough zinc. In elderly women, zinc insufficiency seems to be prevalent. This may be due to the fact that they eat less, as well as the fact that the food they eat is zinc poor. It is widely known that as people become older, their immune systems deteriorate, and zinc deficiency may play a role. Zinc is required for night vision and may possibly help to halt macular degeneration development. Macular Degeneration is a retinal disease that is the primary cause of vision loss in older women[8].

1.2.8 *Zinc Deficiency Linked To Anorexia and Bulimia:*

Zinc is being discovered to be a sustaining component in aberrant eating habit by a range of health researchers, nutritionists, and doctors. Dr. Laurie Humphries of the University of Kentucky discovered that although individuals may acquire eating disorders for psychiatric reasons, the zinc shortage that follows from reduced food intake sustains and complicates them. Zinc deficiency may induce a loss of appetite since zinc is necessary for the sensations of taste and smell. Dr. Alex Schauss states in a 1994 summary article in the Journal for Medical Research that research at Stanford, the University of Kentucky, and the University of California at Davis discovered that most anorexics and many bulimics were zinc deficient. An amazing 85 percent remission rate of anorexia nervosa in individuals given a zinc supplement was found in a five-year research. Zinc supplementation led to weight growth, enhanced physical function, and a more positive mental attitude[9].

1.2.9 *Brain Functions:*

Zinc works with other molecules to deliver signals to the sensory brain center, which improves memory and cognitive abilities. Patients with a head injury had decreased zinc levels in the weeks after the accident, which are believed to enhance cognitive function when supplemented with zinc. Zinc stimulates the brain's taste and smell receptors, allowing them to absorb and process information. Anorexia has been related to a lack of zinc, which responds favorably to zinc replacement therapy. Mood disorder sufferers often have zinc insufficiency. Zinc sulphate seems to be helpful in decreasing tiredness, mood fluctuations, and changes in appetite when taken as a supplement.

1.2.10 *Zinc and Athletic Performance:*

Due to nutritional inadequacies and higher zinc needs and losses, endurance athletes may develop a zinc shortage. Endurance athletes have tried to improve their performance by eating a high-carbohydrate diet. Zinc deficiency is common in high-carbohydrate diets. Low zinc levels are probable if zinc supplements are not used. One symptom of zinc insufficiency is a lack of appetite. Zinc deficiency affects taste and appetite because it is involved in the formation and development of taste buds. Zinc deficiency is exacerbated by the fact that zinc deficient people dislike protein. Zinc deficiency in female athletes may cause irregular menstrual cycles, amenorrhoea, and osteoporosis. Anorexia, weight loss, reduced endurance, tiredness, and an increased risk of osteoporosis are among symptoms of zinc deficiency in athletes. By increasing sweat

loss and zinc redistribution between blood plasma and red blood cells, strenuous exercise may lead to zinc insufficiency[10].

1.3 Recommendations on Zinc Supplements:

Remember that the RDI (Recommended Daily Intake) and RDA (Recommended Daily Allowance) figures are statistical estimates of the levels that prevent people from showing signs and symptoms of deficiency. The ideal nutrition level is usually higher than the RDI values, and in some cases considerably higher. Regrettably, we have no idea what those figures are. Individual requirements can differ depending on age, gender, health condition, and genetic composition. The easiest way to determine optimal zinc intake is to assume it is somewhere between the RDI and the maximum tolerance values in the table above. Zinc supplementation is also recommended since diets are likely to be zinc deficient in general. In general, the total amount of zinc in meals and supplements should not exceed the maximum tolerance levels, at least for a long time. Zinc competes with iron and copper, therefore people who take large amounts of zinc supplements may have shortages in these elements. Taking an excellent wide range multi-mineral supplement is one method to prevent this. To prevent competition over the absorption channels, take them at separate times. Zinc is water soluble and does not keep well in the body.

1.4 Zinc Supplements and Zinc Mono methionine:

Zinc's health advantages include improved immune system function, digestion, diabetes control, stress management, energy metabolism, acne treatment, and wound healing. Pregnancy, hair care, eczema, weight loss, night blindness, cold, eye care, appetite loss, and a variety of additional health advantages of zinc are also mentioned. Zinc, an essential mineral, is required for protein synthesis and aids in the control of cell formation in the human body's immune system. Zinc is mostly present in the body's strong muscles, with particularly large amounts in white and red blood cells, the retina of the eye, the skin, the liver, kidneys, bones, and the pancreas. Men have a lot of zinc in their sperm and prostate gland. Zinc is required for the proper functioning of more than 300 enzymes in the human body. Zinc is thought to be involved in 3000 proteins out of 100,000 in the human body, according to the study. Zinc is found in small amounts in the human body, ranging from two to three grams. Zinc is secreted by many organs in the human body, including the salivary gland, prostate gland, and pancreas. Zinc is secreted by immunological cells as well.

2. DISCUSSION

Zinc (Zn) is an important necessary nutrient with major public health implications. It has a role in a variety of biological processes and is regarded as a versatile trace element because of its ability to bind to over 300 enzymes and over 2000 transcriptional factors. It plays an important role in biochemical processes and physiological activities including oxidative stress response, homeostasis, immunological responses, DNA replication, DNA damage repair, cell cycle progression, apoptosis, and aging. Zn is necessary for the production of protein and collagen, which aids wound healing and skin health. Metallothioneins are metal-binding proteins that are effective heavy metal scavengers, including Zn, and protect the body from stress. Zn insufficiency affects almost 17% of the world's population and affects numerous organ systems, causing both humoral and cell-mediated immunity to malfunction, increasing infection susceptibility. This review delves into the most current data about the link between zinc and human health.

3. CONCLUSION

Zinc is an important micronutrient for children's development, immunological function, and infection resistance. Children in many low-income nations are at an elevated risk of infection and mortality due to zinc deficiency. Although mild to moderate zinc insufficiency is prevalent in poor countries, the public health significance of this level of zinc deficiency is unclear. Zinc deficiency is a serious public health issue, with nutritionists worried that it affects a significant number of women and children across the globe. Zinc has an impact on the immune system in a variety of ways, from skin barriers to gene regulation in lymphocytes. Zinc supplementation has been found to have a substantial effect on the frequency of acute lower respiratory infections in preventative studies. Pneumonia, the common cold, and respiratory infections are all treated with zinc. Zinc supplementation may lower the risk of clinical malaria attacks in children. Sufficient zinc is

necessary for immune system function, and HIV patients are especially vulnerable to zinc deficiencies. In HIV patients, lower serum Zinc levels have been linked to advanced illness and higher death. Zinc supplementation is often used to aid wound healing. Zinc has a number of effects that may help burn victims with debridement and wound healing.

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