Effects of Malnourishment on the immune system: a short review

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ABSTRACT

Malnutrition is the sweeping condition effecting the health of a children. The connection between immunity and dietary intake is very significant. Malnutrition effects the child's growth and development. Now research study has shown that malnutrition has a higher impact on infants and preschool children due to their greater susceptibility. Malnutrition can cause by lack of food intake during the childhood period. Research have shown 45 percent children died before the age of 5 years. Malnutrition makes the child more susceptible to infection, disease. Undernourished children are potential risk for physical growth and mental abilities. PEM (Protein Energy Malnutrition) is found out as a crucial health problem in all over India. Nutritionally Acquired Immune Deficiency Syndromes are the name given to immunological disorders linked to malnutrition (NAIDS). Children and infants are especially vulnerable because of undernutrition, which stunts the development of their immune systems. The supplementation of good quality diet enrich with high calorie and protein, can help recovery Protein Energy Malnutrition or PEM. The effects of malnutrition on the immune system are outlined in this review article.

Keywords: B lymphocyte, Immunity, Malnourishment, Protein Energy Malnutrition, Vitamin – C, Zinc.

INTRODUCTION

Malnutrition, which encompasses both under- and overeating, is a leading contributor to disease and mortality in many parts of the world (Pattanayak *et al*., 2022). Child malnutrition is a crucial public health issue on a global scale (Black *et al.*,2013). Malnutrition is caused by lack of nutrition, transportation or consumption, and it has a higher impact on infants and preschoolers due to their greater vulnerability (Muradas and Carvalho, 2008). The risk of malnourished children has increased dying of contagious diseases, and it is expected as malnutrition is the primary factor in 45% of all pediatric fatalities worldwide (Black *et al.,* 2013); (Nandy *et al*., 2016). It is now generally approved that nutrition is a crucial determinant of immune response (Chandra, 1996). The two primary types of energy deficiency that rise the gamble of disease in adults are excess and absence of food consumption, according to estimates of health and developmental sources of the disease (Campisanon *et al.,* 2019). The immune system needs adequate intake of vitamins and trace ingredients to work efficiently (Wintergerst *et al*., 2007) Micronutrient insufficiency impairs immune responses by inhibiting innate T-cell-mediated immunity, adaptive antibody responses, and balanced host responses. Children who are malnourished may also be affected by non-immunological variables in their growth. Loss of muscle mass impairs breathing when there is lung infection (Soler-catalun *et al*., 2005). According to recent investigations, adult life is dominated by peripheral perivascular space thymic components that are functionally active, and those regulatory changes in neuro endocrine thymus interactions rather than easy losses Thymic tissue mediation decreases T cell function (Haynes *et al.,* 2000); (Mocchegiani *et al.,* 2006). Reduced zinc intake can be key to loss of thymic function (Mocchegiani *et al*., 2003). and supplementation of zinc may be effective in improving immune response (Saha *et al.,* 1995); (Haase *et al*., 2006).

This short analysis, Different kinds of malnutrition and their paradoxical immunological effects will be discussed. Below is a description of them:

(a)The massive universal status of childhood malnutrition is in terms of its closely related immune system dysfunction, that is, the acquired immune dysfunction syndrome (AIDS) .

(b The cumulative compassion of children with an immune to malnutrition, immunologically decreased, leads to one distressing risky infection after another that ultimately leads to death.

(c) Interrelationship between nutritionally persuaded immune system dysfunction and those bring on by an HIV infection in a child.

Deficiency in the immune system and generalized malnutrition

Erosion of lymphoid tissues is generally caused by protein-energy malnutrition (PEM), particularly in youngsters. Affected organs include the tonsils, spleen, thymus, and lymph nodes (Keusch, 1993), these tissues have histological evidence of the maximum amount of erosion in the T-lymphocyte region. Blood levels for eosinophils and lymphocytes are decreased. Natural killer cell activity is declining. (Salimonu, 1993). Lymphoid deterioration is a dramatic feature of protein-energy malnutrition (PEM) (Chandra, 1983). PPEM significantly reduced T-

lymphocyte activity and cell-mediated immunity. Children who are underweight exhibit dermal anergy, DDH (delayed dermal hypersensitivity) responses were absent, a change in the ratio of T-helper to suppressor cells, and a reduction in the ability of killer lymphocytes to recognise and attack foreign tissues (Chandra, 1991); (Salimonu,1993). In opposition, B-lymphocyte numbers and its action commonly come out to be maintained. Although the production of existing antibodies is stored or even increased during generalized malnutrition, New primary antibody reactions of T-cell-based antibody and antigens affinity are damaged (Chandra, 1991); (Ross 1995). Primary malnutrition is linked to lymphoid organ wasting and severe immunological deficiencies that make a person more susceptible to emergence of opportunistic illnesses, pathogens, and reactivation of viral infections (Madhok *et al.,* 2005*).* Leptin loss, thymic atrophy from PCM, and elevated blood glucocorticoid levels are all related to hormonal imbalance. Infections and inflammation typically cause rapid increases in leptin levels (Faggion *et al.,* 2001*).*

Immunity is affected by malnutrition

Primary immunodeficiency is a disorder that results from an immune system genetic or developmental flaw (Geraix *et al.,* 2008). The resulting abnormalities in the immune system affect both adaptive and innate immunity (Sakamoto *et al.,* 1998*).* When food and calorie intake are sufficient, selective micronutrient shortages can happen. The most frequent shortages are those in iron, copper, and zinc. A significant double-blind trial of fortified milk in preschoolers revealed positive effects on growth and iron status as well as decreased morbidity from illnesses including diarrhoea and respiratory infections (Juyal *et al.,* 2004). Additionally, the phagocyte's capacity to take in and eradicate infections was also diminished (Chandra, 2002). Important regulators of mucosal immune activity include vitamins A and D. In rats, experimental vitamin A deprivation effectively disrupts the enzymes of the intestinal epithelium and results in bacterial translocation and diarrhoea (Kozakova *et al.,* 2003*).* Supplements for measles patients deficient in vitamin A reduce the risk of measles-related pneumonia (Rosales, 2002) Recent research using the lactulose/mannitol test on mildly malnourished, uninfected children revealed that the inhibitory function of the gut was inversely connected with serum retinol content (Quadro *et al.,* 2000). When it comes to the production, control and upkeep of innate immunological responses and acquired immunity, antigen-representation cells (APCs) are crucial (Mellman and Steinman, 2001). Malnutrition undoubtedly affects hematopoiesis, determines anemia, determines leukopenia, and Animals that are impoverished by IL-6 and TNF-producing bone marrow cells produce much less IL-6 and TNFM(Fock *et al.,* 2007). The ability to support the growth of hematopoietic stem cells (CD34+) in vitro malnourished hematopoietic stroma in vitro has also been reduced (Xavier *et al.,* 2007). Given that CD34+ cells can differentiate into a variety of distinct hematopoietic lineages, including myeloids, erythroids, and lymphoids, this finding is extremely important (B and T) (Giassi *et al.,* 2008) Poor activation of T cells has been clearly linked to a

deficiency in cytokine production that is the main molecular mediator of immunity. This was seen in malnourished children who had lower levels of type 1 cytokines (IL-2 and IFN-) production (Man *et al.,* 1998).

Malnutrition and chronic infection

A child's metabolism and growth may be correlated with changing cytokine patterns that influence both local and systemic immune responses. Chronic infections are commonly associated with altered cytokine patterns that involve malabsorption and malnutrition, both regional and systemic immune responses affecting changes in metabolism and growth. Chronic diseases like HIV and tuberculosis are serious issues even if they are less common in affluent nations and where host defenses are influenced by dietary condition. When included in the recent migratory population, other than extremely rare parasitic diseases, children in wealthy nations must be considered to have serious chronic infections (Schwarzwald, 2005; Salas *et al.,* 1990). In these infections, nutritional deficiencies are associated with a decrease in host defenses. As opposed to studies in mice where short-term fasting increased the replication of the hepatitis B virus (Shlomai *et al.,* 2006). In adults who have chronic hepatitis C virus infection, dietary limitation of total calories, fat, iron, and protein lowers serum alanine amino transferase levels without having any negative consequences. Pediatric HIV infection continues to be plagued by a serious malnutrition issue (van Lettow *et al.,* 2005). International adopters are at high gamble for the progression of TB and active TB infections (Miller, 2005). Parasitic infection causes malnutrition and reduces the host immune response and is affected by host nutrients and immunity. Anemia from intestinal hookworm is severe (Stoltzfus, 2004). Malnutrition can cause an imbalance in the T cell subpopulation that can reduce defective T cell maturation and a certain anti-ascariasis IgE response and worsen infection with lumbricoids. (Hagel *et al.,* 2003).

CONCLUSION

From this review article it was concluded that the development and malnutrition or a diet lacking in one or more nutrients might interfere with immune cells' and antibodies' ability to function. And it was also found that malnutrition makes the child more susceptible to infection, disease. Undernourished children are potential risk for physical growth and mental abilities

Acknowledgment

We humbly thank the Vice Chancellor, Chief Operating Officer, Registrar, and Deputy Registrar Sir of Swami Vivekananda University in Barrackpore, West Bengal for their outstanding assistance in carrying out this study.

Conflict of Interest. None

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