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Review Article

Diet, Life Style and Immunity

Ammarah Hasnain[1], Mahvish Kabir[2], Maria Fareed Siddiqui[3], Aroosa Jafferi[4] and Uzma Rafi[5]
[1]Institute of Molecular Biology & Biotechnology, The University of Lahore, Lahore, Pakistan
[2]Department of Biotechnology, University of Management & Technology, Lahore, Pakistan
[3]Department of Pharmacy, The University of Lahore, Lahore, Pakistan
[4]Department of Food & Nutrition, University of Veterinary & Animal Sciences, Lahore, Pakistan
[5]Department of Biology, Lahore Garrison University, Lahore, Pakistan

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Corresponding author:
Ammarah Hasnain
Institute of Molecular Biology & Biotechnology, The University of Lahore, Lahore, Pakistan
ammarahhasnain3@gmail.com

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ABSTRACT

Immunity is a balanced condition in which multicellular organisms have sufficient biological defences to resist infection, illness, or other undesirable biological invasions while also having sufficient tolerance to prevent allergies and autoimmune disorders. Several factors like sleep, diet, stress, hygiene, physical activity and lifestyle can affect the immune system's performance, and any offsets in these behaviours can cause havoc to immune functions. In this review, will discuss the association of Immunity with autoimmune diseases, and impact of diet, physical activity, aging and lifestyle factors on immunity. We discuss that how diet and Physical activity can help in immunity management, also the significant effect of nutrient, i.e., vitamins and minerals in improving and balancing immunity. 8-10hrs sleep and brisk walking for 20-30min at least and eating organic have been considered very effective.

INTRODUCTION

An organism's capacity to fight a specific virus or poison through the use of specialized antibodies or sensitized white blood cells [1]. Immunity is an evolutionary conserved defense strategy, inherent in both plants and animals, for disease tolerance. It confers the host protection against viral, bacterial, protozoan, and fungal infections [2]. During human evolution immune response has been strongly targeted by natural selection [3]. Immune system cells emanate from the bone marrow and subsequently move to the peripheral tissues to defend them. They travel through the bloodstream and the lymphatic system, which is a specialized system of channels. They do so after maturation in the bone marrow [4]. Red blood cells, platelets, and immune system white blood cells are all biological components of blood. which carry oxygen and cause blood clotting in wounded tissues, come from the same source originator or progenitor cells are hematopoietic stem cells found in the bone marrow [5]. These pluripotent hematopoietic stem cells give birth to all types of blood cells, earning them the name pluripotent hematopoietic stem cells [6].

The immune system is made up of a variety of biological components and activities that work together to keep you healthy. Humoral immunity vs. cell-mediated immunity, or the innate immune system vs. the adaptive immune system, are two types of immunity. Mechanical (mucous membranes and skin), chemical (enzymes), and biological (pH, temperature, and oxygen levels) barriers make up the innate immune system, which serves as the first line of defense against external organisms and materials. Antigen-specific leukocytes termed lymphocytes make up the adaptive immune system, which is antigen-specific [7]. Even though modern lifestyles have reduced microorganism contact, pollution, stress, and other factors that contribute to immune dysfunction have increased, and it is clear that the modern diet harms the immune system [8]. Nutrition has a

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significant impact on immunity and overall health. Nutritional deficiencies weaken the immune system, increasing the risk of disease and death. Long-term malnutrition and micronutrient deficiency have an impact on immune cell trading and cytokine response. Chronic illness and starvation wreak havoc on the immune system, causing erroneous immune cell counts, increased inflammatory mediators, decreased leukotrienes, and weakened bacterial ingestion and death. Changes in microbial colonization of mucosal surfaces and a reduced host response to emerging infections might be among the overall impacts [9]. Similarly, undernutrition destroys the immune system by reducing macronutrients and micronutrients. Although protein calorie malnutrition (PCM) has a greater influence on the cellular immune system than the humoral immune system, micronutrient deficiencies will disrupt both the adaptive and innate immune systems [10]. **Calorie and protein;** Inadequate calorie and protein intake is necessary for optimal immune function, and a lack of these severely reduces the immune system's ability to respond, inhibits the development and function of the thymus, and reduces T-cell memorial response to antigens [11]. **Sugars;** In vitro research suggests that simple sugars diminish white blood cell phagocytosis and may boost inflammatory cytokine indicators in the blood; nevertheless, complex carbohydrate fibre (but not starches) lowers inflammation in individuals [11]. **Salt;** High salt intake has been shown in animal studies to increase IL-17-mediated inflammation and exacerbate autoimmune diseases [12]. **Saturated fatty acids;** Saturated fatty acids improve the prostaglandin system, which converts to arachidonic and prostaglandin E2. This has a significant impact on the immune system (PGE2). PGE2 is pro-inflammatory, raises the quantity of IL-17, and activates macrophages through a variety of mechanisms. Dietary fats can also disrupt immune activities by altering the lipids in immune cell membranes [13]. **Omega-3 fatty acid;** Polyunsaturated fats like omega-3 (n-3) have anti-inflammatory properties. Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which are precursors of anti-inflammatory mediators including resolvins and protectins, may be formed from omega-3 fatty acids. These mediators reduce inflammation, promote neutrophil infiltration, enhance macrophage phagocytosis, and improve inflammatory chemokine sifting to eliminate apoptotic cells [14].

Vitamins; Vitamins have been shown in certain studies to have a considerable impact on macrophage phagocytosis and several of its stages. Additionally, it might boost the production of cytokines including tumour necrosis factor (TNF-a), interleukin (IL-1 and -6), inflammatory mediators such prostaglandin E2 (PGE2), and interferon (IFN) (IFN) [15]. *Vitamin A;* Vitamin A has an important function in the growth and development of good immune responses. Vitamin A and its metabolites (especially retinoic acid [RA]) are important regulators of both innate and adaptive immune responses. Vitamin A improves innate immune responses by influencing the integrity of mucosal epithelia, as well as the variety, numbers, and cytokine secretion patterns of macrophages, monocytes, neutrophils, and natural killer cells. Adaptive immune responses are also influenced by the development and maturation of thymocytes, as well as the increase in the number of T-cells, particularly the CD4+ subpopulation [16]. *Vitamins C and E;* Supplementing with vitamins C and E increases neutrophil adherence, natural killer cell activity, phagocytic capacity, lymphocyte proliferation, and chemotaxis while decreasing neutrophil generation of superoxide and oxygen free radicals [17,15]. *1,25-Dihydroxyvitamin D;* By impressing on lymphocytes and adaptive immunity, 1,25-dihydroxyvitamin D (1,25(OH)2D) modulates the function of human immunological responses; nevertheless, research has found that vitamin D also regulates innate immunity [18].

Trace elements; The link between trace elements and macrophage function appears to be as fundamental as the link between vitamins and macrophage activity [19]. *Zinc;* Zinc insufficiency is caused by a variety of disease progressions, and low zinc levels in the blood produce reduced immune function. Zinc supplementation increased the production of cytokines such as IL-1, IL-6, and TNF-a [20]. *Selenium;* Human neutrophils' bactericidal and phagocytic activities are improved in vitro [19]. *Copper;* In humans, a lack of copper in the diet reduces the number of circulating neutrophils and inhibits their function [21]. *Iron;* In iron shortage, neutrophils' capacity to kill germs decreases [22].

The Mucosal Immune System and its Autophagy Regulation

The alimentary canal poses a unique challenge to the membrane system, which must constantly monitor the vast surface for the presence of pathogens while maintaining tolerance to helpful or harmless antigens. Many aspects of membrane immune responses are influenced by the method of autophagy, according to recent research. Initially thought to be a "self-eating" survival system that allows for nutrition use during famine, autophagy has since been linked to a variety of cellular responses, as well as many elements of immunology. The discovery that autophagy will degrade animate creature

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microorganisms led to the first linkages between autophagy and host immunity. Following research revealed that autophagy affects substance processing, thymic choice, leukocyte balance, and the control of immunological serum globulin and protein release, indicating that it plays a much larger role in immune responses. This animation depicts the inflammatory cycle that occurs in the brains of Alzheimer's sufferers [22].

Diagnosis and Treatment

Fever and fatigue are common signs that the immune system isn't working properly, despite the fact that the symptoms of immune diseases vary. Immune deficits are usually detected by blood tests that assess the number of immune components present or their usefulness. Allergic diseases can also be assessed using blood tests or allergic response skin testing to determine which allergens cause symptoms. Medication that reduces the reaction, such as corticosteroids or other immune-suppressive drugs, may be extremely beneficial in active or reactive circumstances [23]. "In some immune deficiency disorders, replacing of missing or deficient components might potentially be a therapeutic," Lau added. "Antibody infusions to combat infections might possibly be involved." Antibodies from the organism may also be used in treatment. A monoclonal antibody is a type of macromolecule generated in a research facility that binds to molecules in the body. They'll be used to modulate the components of the response that cause inflammation. Biological antibodies are being used to treat cancer, according to the National Cancer Institute. They'll deliver drugs, poisons, and heated things to cancer cells [24].

CONCLUSIONS

In conclusion, we concluded that factors such as stress, physical activity, diet, sleep and aging have a significant impact on immunity building. Improper diet or lack of good sleep or physical activity and effect immunity and make a person more vulnerable to diseases and having a healthy lifestyle can help you fight against such conditions. Sleeping for 8-10hr daily and brisk walking for half an hour minimum with some aerobic exercises have shown a positive result. Avoiding junk and fast food and replacing it with organic food helps in positive immune response.

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