

Impact of Yoga on Improving Immunity

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Abstract

The immune system is essential for survival. The immune system is made up of lymphatic system, special organs (i.e. spleen, thymus & bone marrow), white blood cells and antibodies that fight against infection (microbes). A weak immune system makes us more susceptible to infection and disease caused by microbes (bacteria, viruses, parasites, fungi etc.). Immune system plays a key role in defending the body against infection and maintaining its health. Stress is our body's response to pressure. Many different situations can induce stress. Chronic stress can suppress immunity by decreasing immune cell numbers and function and/or increasing active immunosuppressive mechanisms. Regular practice of Yoga helps to balance the nervous system, reinforce the respiratory system, reduce stress hormones and activate the lymphatic system, which plays a major role in immune function.

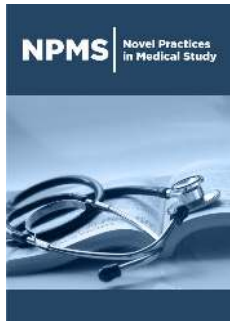
Keywords: Immunity; Yoga; Stress; Yoga therapy; Meditation

Introduction

The immune system is essential for survival. The immune system is made up of lymphatic system, special immune organs (i.e. spleen, thymus & bone marrow), white blood cells and antibodies that fight against infection (microbes). Without a strong immune system, our bodies get prone to infections /diseases caused by attack from microbes / pathogens (bacteria, viruses, parasites or fungi etc.). Immune system plays an important role to defend the body against infection and maintain healthy state [1]. White blood cells (leukocytes) patrol the blood and tissues throughout the body in search of intruders / pathogens. When they find a foreign substance, they begin to multiply and send signals out to other cell types to do the same and launch an immune attack. These disease-fighting cells are made in the bone marrow and are stored at different places in the body, called as lymphoid organs such as Thymus, Spleen, Bone marrow, Lymph nodes [2]. The immune system requires a constant supply of nutrients and energy to maintain optimal function. Toxins in the environment, poor diet, lack of physical activity, anxiety, depression and stress can all adversely affect the function of the immune system and the body becomes subject to health problems [3].

Stress and Immunity

Stress is our body's response to pressure. Many different situations can induce stress. Stress is often triggered while we experience something new, unexpected threats. Everyone deal with stress differently and it can depend on our genetics, early life events/incidents, personality and social & economic circumstances [4]. During stress, the hypothalamic-pituitary-adrenal (HPA) axis is activated. The hypothalamic-pituitary-adrenal axis (HPA axis) is a complex set of direct influences and feedback interactions among three components which are hypothalamus, pituitary gland and the adrenal ("suprarenal") glands. These organs and their interactions constitute the HPA axis, a major neuroendocrine system [5,6] that controls reactions to stress and regulates many body processes, including digestion, the immune system, mood and emotions, sexuality, and energy storage and expenditure [7]. Hypothalamic neurons within the HPA axis secrete Corticotropin-Releasing Hormone (CRH) that causes the release of Adrenocorticotropic hormone (ACTH) from the pituitary. The ACTH causes the adrenal gland to secrete cortisol (a stress hormone) [8]. While we encounter stress, our body produces stress hormones (cortisol) that trigger a fight or flight response (also known as the acute stress response) which prepare our body to either stay and deal with a threat or to run away to safety [9].



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Submission: 📅 December 07, 2021

Published: 📅 January 26, 2022

Volume 1 - Issue 1

How to cite this article: Lakshmi Kandhan S*, Guru Deo, Elanchezhiyan Devarajan. Impact of Yoga on Improving Immunity. *Novel Practices in Med Study*. 1(1). NPMS.000502.2022.

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During acute stress, the rapid and transient movement of immune cells (cytotoxic cells) into the peripheral blood which may increase the number of immune cells in the blood, and it also changes the composition of the blood. As a result, the number of circulating immune system 'soldiers' will likely increase, which, at least historically, boosts immunity during times of stress when injury and infection are more likely [10]. However, chronic stress can induce negative effects on the body. It can leave us in a permanent state of fight or flight, and this long term, can affect our physical and mental health [11]. There are several physiological mechanisms associated with stress, including the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system. When these two pathways are activated, certain hormones are released into the bloodstream, such as cortisol and catecholamines (epinephrine and norepinephrine), which are directly linked to immune function. Increases in cortisol and epinephrine lead to a weakened immune system by decreases in the number of white blood cells in blood circulation. Lymphocyte proliferation and natural killer cell activity are also decreased while acute increases in cortisol and epinephrine. Consequently, stress plays an important role in suppressing immune function and increasing susceptibility to infections. Chronic stress can reduce immune cell counts and function, and increase immunosuppressive mechanisms (e.g. regulatory T cells) to suppress immunity [12].

Yoga and Stress Management

A lot of scientific research studies have mentioned that Yoga is one of the most effective natural immunity boosters that can lead to a healthy body. Regular practicing Yoga can enhance muscular strength and body flexibility, improve respiratory and cardiovascular function, reduce stress, anxiety, depression, and chronic pain, improve sleep patterns, and enhance overall well-being and quality of life [13]. Yoga is a physical and spiritual practice, originating about 5000 years BC in ancient India. The word 'Yoga' is derived from Sanskrit and may be translated as 'union' or 'conjunction' [14], entailing the idea of uniting body, mind, and spirit [14]. Since, it has been employed to promote health and well-being across various health issues. Yogic practices inhibit the activity of the paraventricular nuclei of the hypothalamus, which in turn affects the anterior pituitary gland to produce less AdrenoCortico Tropic hormone (ACTH). The decrease in ACTH decreases the synthesis of cortisol from the adrenal glands. The decrease in cortisol levels with Yoga has been observed in various studies [15].

Deep relaxation and calming of the mind through Yoga result in effective reduction in blood pressure, pulse rate, respiratory rate, stress, depression and anxiety by enhancing levels of melatonin, GABA, serotonin, and dopamine, while decreasing levels of cortisol and acetylcholine [16]. As a result, Yoga decreases psychological conflicts, suppressions, and hypersensitivities, which are recognized as triggers for psychosomatic problems [17].

Yoga and Immunity

Practicing Yoga helps boosting resistance to infection by stimulating the lymphatic system to oust toxins from the body,

and bringing oxygenated blood to the various organs to ensure their optimal function. Yogic relaxation techniques help to regulate sleep, which is crucial for wellness; sleep is one of the most important factors in healing and maintaining a healthy immune system. Yoga increases natural killer cells and rejuvenates immune organs and channels [18].

Kriya practices like Neti (nasal wash) and Kapalabhati helps to cleanse the upper respiratory tract and increase the resistance of respiratory tract from infections like nasal allergies, sinusitis [19,20].

Asanas (Yoga poses) that twist and compress organs, help in massaging and rejuvenating immune organs and channels. And also, Yoga practices generate balanced energy-vital energy required by the immune system. Asana practices stimulate endocrine glands, especially thymus gland and to enhancing the immunity [3].

The thymus is located in the upper anterior (front) part of chest directly behind **sternum bone** and between the lungs. It secretes Thymosin, which stimulates the development of T cells and it is responsible for immunity [21].

- I. *Marjariasana, Matsyasana, Dhanurasana, Sethubandasana, Kurmasana* (Tortoise pose) stimulates the thymus gland [22].
- II. Inversions and forward bends, e.g., *Adho Mukha Svanasana* (Downward Facing Dog pose) improve the flow of the sinuses and help flushing mucus from the lungs [3,21-23].
- III. Chest and lung openers, e.g., *Ustrasana* (Camel pose), *Yoga Mudra*, and *Bhujangasana* (Camel pose) also increase lung mobility and flush out the lungs [3].
- IV. Restorative Yoga poses (supported and gravity-based) can provide healing benefits during low periods of energy [24].

Pranayama improves the relationship between hypothalamus –pituitary (master gland) thereby enhancing the functions of immune system. Pranayama practices like Nadishodhana, Ujjayi, Bhramari and Sitkari plays major role in enhance the lungs' efficiency and boost immune system [25].

- I. Monroe, R. D et.al (1991), emphasized on effect of breathing exercises. Sectional breathing and rapid abdominal breathing "increase the resistance of respiratory tract". They recommend that nasal wash (Jal Neti) and alternate-nostril breathing "increase the resistance of sinuses" [26].
- II. While practicing Pranayama, the movement of diaphragm massage the internal organs and glands, which in turn helps moving lymph (fluid containing the immune system's white blood cells) throughout the body to their targeted locations [27].
- III. A Yogic breathwork-based study published in the Public Library of Science found that controlled deep belly breathing may also strengthen the body's defences by changing the gene expression of certain immune cells [28].

- IV. Study by the Norwegian University of Science & Technology (NTNU) holding your breath can not only change the genetic activity of white blood cells (immune cells), but it also appears to significantly increase white blood cells to help fight illness [29].
- V. Research studies shows that yogic breathing helps to improve immune response and enhances stress-response [30].

Yoga nidra (Yogic sleep) helps stimulate the pineal gland, which is located directly behind the third eye in the centre of the forehead. The pineal gland release of melatonin for enhancing relaxation and sleep. Circadian synthesis research demonstrates that the release of melatonin modulates the antibody response and antagonizes the immuno-suppressive effect of corticosterone, thereby strengthening the immune system even when you are exposed to continual stress [15].

Meditation increases the level of endorphins and decreases the level of cortisol hormone and leads to a state of homeostasis. This also helps to boost your immunity [31]. Regular meditation practice having positive effects on individuals' NK cell activity, B-lymphocyte numbers, and telomerase activity, also helps in keeping CD8+ T-cell numbers stable during times of high stress. In addition, meditation has also been shown to increase antibody response in individuals. Practicing meditation is having several benefits, like reducing the severity of psychological disorders and stress-related ailments, increasing immune function, and delaying the progression of various stress related lifestyle disorders.

Conclusion

Thus, regular practice of Yoga helps to balance the nervous system, reinforce the respiratory system, reduces stress hormones and activates the lymphatic system. In this way Yoga practices are tend to induce deep relaxation which plays vital role to strengthens immune system. The mechanism of regular yoga practice works through the psychoneuroendocrinology of stress which results in prevention of disease and enhancing the functioning of entire neuro-immune system.

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