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Mini Review

Impact of Yoga on Improving Immunity

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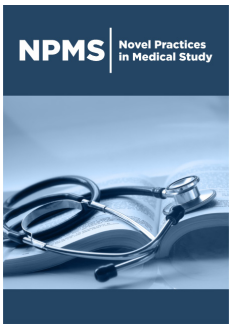
Abstract

The immune system is essential for survival.The immune system is made up of lymphatic system, special organs (i.espleen, thymus&bone marrow), white blood cellsand 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



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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 defends 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 sameand launch an immune attack. These disease-fighting cells are made in the bone marrow and are storedat 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 threatens. 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 AdrenoCortico Trophic 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].

During acute stress, the rapid and transient movement of immune cells (cytotoxic cells) into the peripheral blood which may increases 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 body. It can leave us in a permanent stage 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 Trophic 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 bystimulating 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 Kapalbhati helps to cleanse the upper respiratory tract and increase the resistance of respiratory tract from infections likenasal 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 stimulates 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. Monro, 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 hormoneand 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 reults in prevetion of disease and enhancing the functioning of entire neuor-immnue sytem.

References

1. Abbas AK, Lichtman AH, Pillai S (2019) Basic immunology e-book: functions and disorders of the immune system. Elsevier Health Sciences.
2. Ruddle NH, Akirav EM (2009) Secondary Lymphoid Organs: Responding to Genetic and Environmental Cues in Ontogeny and the Immune Response. J Immunol 183(4): 2205-2212.
3. Arora S, Bhattacharjee J (2008) Modulation of immune responses in stress by Yoga. Int J Yoga 1(2): 45-55.
4. Bae YS, Shin EC, Bae YS, Van EW (2019) Stress and immunity. Front Immunol 10: 245.
5. Tsigos C, Chrousos GP (2002) Hypothalamic–pituitary–adrenal axis, neuroendocrine factors and stress. J Psychosom Res 53(4): 865-871.
6. Malenka RC, Nestler EJ, Hyman SE (2009) Chapter 10: Neural and Neuroendocrine Control of the Internal Milieu. In: Sydor A, Brown RY (Edts.), Molecular Neuropharmacology: A Foundation for Clinical Neuroscience (2nd edn), McGraw-Hill Medical, New York, USA, pp. 246, 248-259.
7. Spenrath MA, Clarke ME, Kutcher S (2011) The science of brain and biological development: Implications for mental health research, practice and policy. J Can Acad Child Adolesc Psychiatry 20(4): 298-304.
8. Beishuizen A, Thijs LG (2003) Endotoxin and the hypothalamo-pituitary-adrenal (HPA) axis. J Endotoxin Res 9(1): 3-24.
9. Goldstein DS (2010) Adrenal responses to stress. Cell Mol Neurobiol 30(8): 1433-1440.
10. Dhabhar FS (2009) Enhancing versus suppressive effects of stress on immune function: implications for immunoprotection and immunopathology. Neuroimmunomodulation 16(5): 300-317.
11. McEwen BS (2007) Physiology and neurobiology of stress and adaptation: central role of the brain. Physiol Rev 87(3): 873-904.
12. Saul AN, Oberyszyn TM, Daugherty C, Kusewitt D, Jones S, et al. (2005) Chronic stress and susceptibility to skin cancer. J Natl Cancer Inst 97(23): 1760-1767.
13. Collins C (1998) Yoga: Intuition, preventive medicine, and treatment. J Obstet Gynecol Neonatal Nurs 27(5): 563-568.
14. Feuerstein G (2011) The path of yoga: An essential guide to its principles and practices. Shambhala Publications.
15. Kamei T, Toriumi Y, Kimura H, Ohno S, Kumano H, et al. (2000) Decrease in serum cortisol during yoga exercise is correlated with alpha wave activation. Percept Mot Skills 90(3 Pt 1): 1027-1032.
16. McCaffrey R, Ruknui P, Hatthakit U, Kasetsomboon P (2005) The effects of yoga on hypertensive persons in Thailand. Holist Nurs Pract 19(4): 173-180.
17. Mehta M, Taneja P (2013) Effect of short-term yoga practices on psychological general well being in medical students. Journal of Evolution of Medical and Dental Sciences 2(12): 1812-1820.
18. Infante JR, Peran F, Rayo JI, Serrano J, Dominguez ML, et al. (2014) Levels of immune cells in transcendental meditation practitioners. Int J Yoga 7(2): 147-151.
19. Meera S, Rani MV, Sreedhar C, Robin DT (2020) A review on the therapeutic effects of NetiKriya with special reference to JalaNeti. J Ayurveda Integr Med 11(2): 185-189.
20. Achilles N, Mösges R (2013) Nasal saline irrigations for the symptoms of acute and chronic rhino sinusitis. Curr Allergy Asthma Rep 13(2): 229-235.
21. Van Assche M (2012) The Thymus Gland.
22. Sakthivel R, Hemamalini M (2020) Hatha yoga-boosts immunity. TNNMC Journal of Community Health Nursing 8(2): 37-40.
23. Lewis L Give Your Immune System a Yoga Boost!.
24. Thakur A, Mandal SC, Banerjee S Alternative Approaches to HIV Treatment.
25. BirS (Edt.), (2016) Principles and Practice of Yoga in Health Care. Handspring Publishing Limited.
26. Monro RD, Nagarathna R, Ford KN (1990) Yoga for common ailments. Fireside.
27. Makwana K, Khirwadkar N, Gupta HC (1988) Effect of short term yoga practice on ventilatory function tests. Indian J Physiol Pharmacol 32(3): 202-208.
28. Qu S, Olafsrud SM, Meza ZLA, Saatcioglu F (2013) Rapid gene expression changes in peripheral blood lymphocytes upon practice of a comprehensive yoga program. PloS one 8(4): e61910.

29. Eftedal I, Flatberg A, Drvis I, Dujic Z (2016) Immune and inflammatory responses to freediving calculated from leukocyte gene expression profiles. Physiol Genomics 48(11): 795-802.

30. Campbell D, Moore K (2004) Yoga as a preventative and treatment for depression, anxiety, and stress. International Journal of Yoga Therapy 14(1): 53-58.

31. Maestroni GJ, Conti A, Pierpaoli W (1986) Role of the pineal gland in immunity: circadian synthesis and release of melatonin modulates the antibody response and antagonizes the immunosuppressive effect of corticosterone. J Neuroimmunol 13(1): 19-30.