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### Review Article

## " EFFECT OF YOGA ON IMMUNITY- A REVIEW PAPER"

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#### ABSTRACT

The science of *Yoga* is of ancient origin rooting its presence right from the *Vedic* literature. According to *Patanjala Yoga Sutra*, there are eight limbs of *Yoga* which have been explained to have effect on various dimensions of human life and existence. *Bala* or strength has been explained to be a prime requisite for healthy and disease-free state of existence. Both, the texts of *Yoga* and *Ayurveda* have shared many technical terminologies where *Bala* or strength is one of them. The texts of *Ayurveda* vividly describe *Vyadhikshamatva* as one of the aspects related with physical and mental strength. Different *Yoga* practices, said to be having an effect on various aspects of physical, mental, social and spiritual well-being of a person would obviously be having an impact on the immune capacity of a person directly or indirectly either by regulating the flow of *Prana* in the body or by correcting the behavioral aspects through right mental attitude. The diet and lifestyle corrections also play a vital role in enhancing the strength and immune capacity of a person. In current era Mental health and stress are the most discussed concepts in every field which have a greater impact on an individual's personal and professional life. As a part of adaptive response to stress, various body systems including immune systems may be affected. As the immune system is the body's tool for preventing or limiting infection, it is very essential to protect and enhance it. Therefore, it is very essential to know and understand various dimensions of *Yoga* practices which can modulate the immune system of human body through non-invasive approach of *Yoga*. The aim and objectives of the study were to know and understand the dimensions of different *Yoga* practices with their possible effects on immunity through the scriptures and available data sources. In order to study the therapeutic effect of *Yoga* on immunity, classical texts were referred and data was searched through Pubmed, a database of scientific publications with the key words '*Yoga*' and '*Immunity*'. The articles and related classical texts of *Yoga* were critically reviewed and compiled. Out of total 207 articles found, only few articles are focused on discussing about the correlation of immunity with *Yoga/ Yogic* practices whereas maximum articles have discussed about the therapeutic effect of *Yoga* with regards of the aspect of immunity pertaining to different diseases. The full paper discusses about the direct and indirect effect of *Yoga* practices with their probable psychophysiological effects on immunity.

**KEYWORDS:** *Yoga, Yogic practices, Bala, Immune system, Immunity, Stress, Vyadhikshamatva*

## **INTRODUCTION:**

*Yoga* is a holistic ancient science. The word "*Yoga*" derived from the Sanskrit root 'Yuj' which means union or to join. It includes moral codes of the right way of living, physical postures, rhythmic breathing patterns, meditative practices, cleansing practices, and deep relaxations. *Yoga* consists of eight limbs: *Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana, and Samadhi*. (1) *Yama* literally means ethics, restraints, it denotes internal purification through moral training. According to *Patanjala Yoga Sutra*, *Yama* are five in number, which are *Ahimsa* (Non-violence), *Satya* (Truth), *Asteya* (Non-stealing), *Brahmacharya* (Righteous conduct/Celibacy), and *Aparigraha* (Non-accumulation/possession). *Niyama*, the second limb of *Yoga* refers to any observance or duty to be done. *Niyamas* evolves from individual practices necessary to build up the practitioner's own character. There are five *Niyamas* according to Pa. Y. Su. Namely, *Shaucha* (Cleanliness/purity), *Santosha* (Contentment), *Tapa* (Austerity), *Swadhyaya* (Self-study) and *Ishwarpranidhana* (Surrendering to God). *Asana* is a physical posture of *the body involving the mind and intellect*. In *Ashtanga Yoga of Patanjali*, it is placed 3<sup>rd</sup>, while in *HathaYogapradipika* it is placed on 1<sup>st</sup> position (2). *Asana* has been defined as "*Sthira Sukham Asanam*" which means a posture where a person is steady and comfortable. *Asana* is a specific positioning of the body which helps in cleansing of the energy channels and opening of the psychic centres. The 4<sup>th</sup> limb is *Pranayama* which is the regulation of incoming and outgoing flow of breath with retention. It is to be practiced after attaining command over *Asana*. *Pratyahara* is the 5<sup>th</sup> step of *Ashtanga Yoga*, which has been considered as an act of withdrawal of mind from sensory objects. The next step is *Dharana*. Localizing the function of the mind in particular area or concentrating the mind over a definite area is known as *Dharana*. The 7<sup>th</sup> step is *Dhyana* which is an uninterrupted or unbroken flow of thoughts towards the object of concentration. *Samadhi* is the 8<sup>th</sup> and final stage of *Ashtanga Yoga of Patanjali* where the consciousness merges. *Shatakarma*, one of the concepts described by various texts of *Hatha Yoga* comprises of *Purificatory measures that cleans the body and pacifies the mind*. According to *Gheranda Samhita* *Shodhana* is the first limb of *Hatha Yoga* in a concise form, there are six types of cleansing which are, *Dhauti, Basti, Neti, Nauli, Trataka* and *Kapalbhati* which help in removing unwanted/ waste material from the body (3). Regular practice of *Yoga* promotes strength, endurance, flexibility and facilitates characteristics of friendliness, compassion and greater self-control, while cultivating a sense of calmness and well-being(4). In the beginning, only psychospiritual aspect of *Yoga* was considered while practicing, but from early twentieth century, the aspect of utilizing *Yoga* as a therapeutic measure also started gaining popularity. Practice of *Yoga* has an impact on various physical and psychological factors of the body. In current era, mental health and stress are the most discussed concepts in every field and have a greater impact on an individual's personal and professional lives.

In *Ayurveda* immunity can be understood through concepts like *Vyadhikshamatva, Vyadhisahatva, Bala, Ojasa* etc. *Vyadhikshamatva* can be elaborated as the capacity of the body to fight against the manifested diseases (*Vyadhibala Virodhitvam*) and the capacity of the body to inhibit the disease's progress (*Vyadhiutpada Pratibandhakatvam*)(5). *Bala* is power of the body, which is responsible for health. (बलाधिष्ठानमारोग्यं)(6). There are 3 types of *Balas*- *Sahaja Bala* (hereditary, since birth), *Kalaja Bala* (seasonal or periodic) and *Yuktikrut Bala* (acquired)(7). Equilibrium state of *Kapha* promotes strength, hence normal *Kapha* is being used as synonym for *Bala* or *Ojasa*(8). *Ojasa* is the final and excellent essence of all the *Dhatus* which is responsible for *Bala* or *Prana*. *Oja* is of two types- *Para Oja*, which is located in the heart, in *Ashta Bindu* *Pramana* and *Apara Oja*, which is in *Ardhanjali* *Pramana* and circulates all over the body via vessels attached to the heart(9).

Stress is a common condition in response to a physical threat or psychological distress that generates chemical and hormonal reactions in the body as a part of the adaptive response to stress, various body systems like the autonomic, cardiovascular, gastrointestinal, and immune systems may be affected(10).

The immune system is the body's tool for preventing or limiting infection. Its complex network of cells, organs, proteins and tissues enables it to defend the body from bacteria, viruses, parasites and more. These cells and proteins do not form a single organ. Instead, the immune system is distributed throughout the body to provide rapid response to infection.

## **MATERIAL AND METHOD:**

In order to study the therapeutic effect of Yoga on immunity, database pubmed was searched using keywords like “Yoga”, “Immunity” with the help of Boolean operators like “And” and “Or. Classical texts of Yoga viz. *Patanjala Yoga Sutra, Hatha Yoga Pradipika, Gheranda Samhita. Shiva Samhita* and other classical texts of Ayurveda were also critically reviewed and compiled for the current article.

**RESULT:**

**Review of research articles:**

207 articles were found through the database using key words “Yoga”, “Immunity” with the help of Boolean operators like “And” and “Or”.

The details about the same is compiles under following:

Sl No.	Detail of article	No.
1	Article pertaining to Covid-19	50
2	Article pertaining to cancer	30
3	Article pertaining to direct effect of Yoga on Immunity	16
4	Article pertaining to physiological actions of Yoga	15
5	Article pertaining to Mental disorders	7
6	Article pertaining to Diabetes Mellitus	5
7	Article pertaining to Maternal health	5
8	Article pertaining to Multiple sclerosis	5
9	Article pertaining to Rheumatoid arthritis	5
10	Article pertaining to HIV	6
11	Article pertaining to Child health	4
12	Article pertaining to Asthma	3
13	Article pertaining to Itching	3
14	Miscellaneous	53

**Review of Yoga literature:**

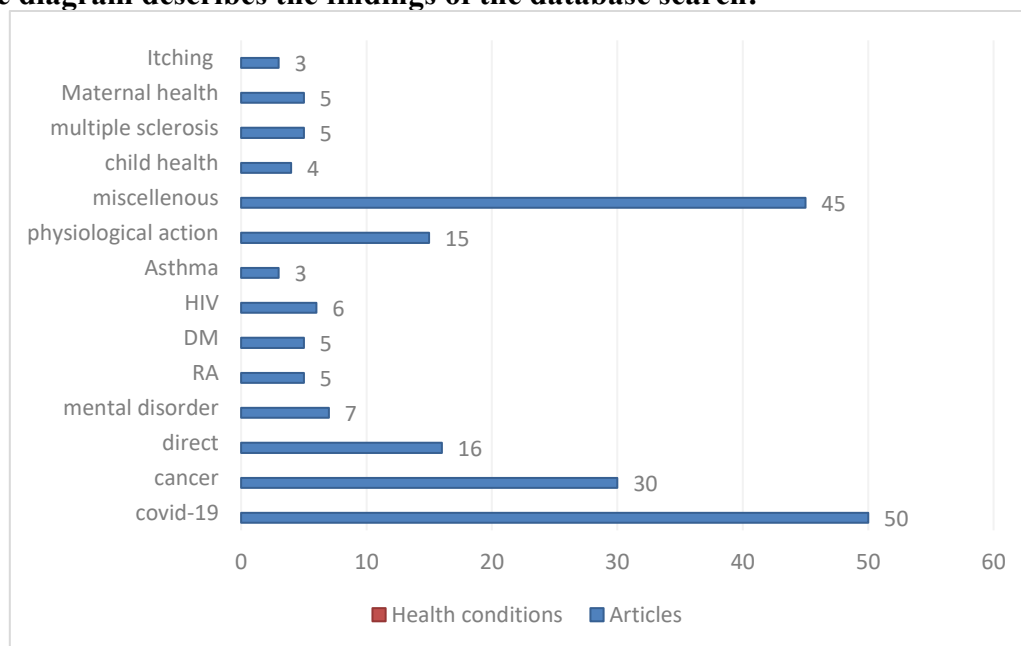
In Yoga classics the concepts like *Bala(11)(12), Sthairya(13)(14), Arogya(15)(16), Virya* were found which can be correlated with the concept of immunity.

**Review of Ayurveda literature:**

In Ayurvedic classic concepts like *Vyadhikshamatva(17), Bala(18), Ojas(19), Prakruta Shleshma(20)* , *Virya* were found which can be correlated with the concept of immunity.

**DISCUSSION:**

Following pie diagram describes the findings of the database search:



**Effect of Yoga on Immunity:**

- ❖ *Yama* and *Niyama* are ethics/restraints or observance which is to be followed by a *Yogi*. Regular practice of *Yama* and *Niyama* leads to mental stability.
- ❖ According to *Patanjala Yoga Sutra* Practice of *Asana* makes the body free from the influence of dualities(21). Having done *Asana* one can get steadiness of the body and mind, disease-freeness and lightness of the limbs(22). By practicing *Asana*, steadiness develops, *Prana* moves freely without obstruction and there is less chance of occurring diseases. It also improves the endocrine functions and respective metabolic activities in the body. That's how practicing *Asana* can enhance the functions of immune system.

**Some beneficial *Yogasana* practice for boosting immunity mentioned in the referred article(23)**

- Some key poses which benefit the immune function are:
  - ✓ *Kurmasana* (tortoise pose) is a posture in which the thymus gland gets pressure, so the blood circulation will increase in that area, which supports the thymus gland and ultimately helps in enhancing the production of immune cells.
  - ✓ Inversions and forward bends, e.g., *Yoga Mudra* improve the flow from the sinuses.
  - ✓ Chest and lung openers, e.g., *Ushtrasana* (Camel pose) *Bhujangasana* (Cobra pose), *Uttana Mandukasana* etc. increase lung mobility, lungs opening capacity, breathing capacity, and also enhance the functions of intercostal muscles. So, it helps in increasing the oxygen supply to the whole body which will ultimately help to boost immunity.
- *Yoga* poses that twist and compress the organs, massage and rejuvenate immune organs and channels. The practice of *Yoga* balances the vital energy in the body required by the immune system.
- In another article found the reference of effect of practicing *Yogabhyasa* on maternal mental health and improving Immunity(24).
  - Prayer
  - *Sukshma Vyayama*
  - *Asana practice for*
    - Standing *Asana*: *Tadasana*, *Ardhakatichakrasana*, *Trikonasana*
    - Sitting *Asana*: *Vajrasana*. *Vakrasana*. *Siddhasana*, *Baddhakonasana*, *Upavishtakonasana*, *Malasana*
    - *Supine Asana*: *Viparita Karani*, *Supta Baddha Konasana*
  - *Pranayama and meditation*
  - *Deep relaxation*
- ❖ With the practice of *Shatkarma* body becomes free from vitiated matters which ultimately helps to enhance the functions of different systems of the body
- ❖ The benefit of *Pranayama* has been stated to improve the intellect faculties(25). *Pranayama* is related with an awareness about different dimensions about the vital breath. It is stated that *Vata* and *Chitta* are interrelated in their movement i.e., when *Vata* moves *Chitta* also moves and the vice versa. By practising *Pranayama* *Yogi* attains steadiness(26). *Pranayama* regulates the flow of *Prana* throughout the body. *Pranayama* strengthens and smoothens the nervous system. It activates *Sushumna Nadi* and balances the energy flow of *Ida* and *Pingala Nadis*. When the *Nadis* are purified, body becomes lean, lustrous, digestive power increases, awakens inner sound or '*Naada*' and one will be free from diseases(27).
- ❖ *Bandha* means bondage, lock, joining together or to catch hold. *Mudra* refers to some specific positions of body which channelizes the energy produced by *Asana* and *Pranayama* in to various centres and prevents the loss of energy.
- ❖ Meditative practices such as *Pratyahara*, *Dharana*, *Dhyana*, *Samadhi*: By meditative practices body and mind get relaxed, concentration is improved, mind becomes focused, consciousness is clarified. The practice of meditation helps in managing chronic or long-term stress by regulating the cytokines, thus assisting people to overcome co-morbidities associated with diseases and improving the quality of life(28); Practice of *Shavasana* and *Yoganidra* generates deep relaxation in the body and mind, relieves the stress effectively and make the various systems of body works efficiently. Which eventually helps in boosting immunity.

- ❖ **Bala**- In *Vibhuti Pada*, Maharshi Patanjali mentioned the concept of *Bala* that is, by making *Samyama* on friendliness, various strength comes and by making *Samyama* on Elephants and others, that elephantine strength comes to the person(29). There is also a reference of *Bala* during the description of qualities of the perfection of the body (*Kaya Sampat*)(30)
- ❖ **Virya**: In *Sadhana Pada*, Maharshi Patanjali mentioned the concept of *Virya* while mentioning the benefit of establishment of *Brahmacharya*. - The result of firm establishment of *Brahmacharya* (Righteous conduct/celebacy) is the gain of *Virya* that is can be understand as potency or strength(31).
- ❖ There is also a concept of **Mitahara** in Yoga. Consistency in intake of *Snigdha*, *Madhura* (Sweet), *Chaturtha Amsa Vivarjita* (4<sup>th</sup> part of the stomach left), *Shiva Sampriti* (as an offering to Lord Shiva) is considered as *Mitahara*. Yoga practitioner should take *Pushtikara Ahara* (which enhances the strength of the body), *Madhura* (Sweet), *Snigdha* (Unctous), Products made out of cow's milk and ghee, which nourishes *Dhatus*, which is pleasing to the mind(32). Along with these qualities in *Gheranda Samhita* mentioned some more qualities like *Laghupakam* (light in digestion), *Yogyam* (proper) and *Priyam*(33). There is also reference of **Pathya** and **Apathya Ahara** (34). In *Shiva Samhita* it is mentioned that the Yoga practitioner should always take food when the air flows into *Suryanadi* (right nostril)(35) Another reference is found about **Yuktahara** in *Bhagvad Geeta* which means taking food with consideration of suitability to the self(36). In *Bhagvad Geeta* concept *Sattvika*, *Rajsika* and *Tamasika Ahara* is also found(37). The qualities of *Mitahara*, *Satvik Ahara* and *Pathya Ahara* is similar to the qualities of *Kapha*, so this kind of Ahara will increase the *Prakruta Kapha*, which is considered as *Bala* or *Ojas*. Thus, Regular consumption of diet with above stated considerations can helps in boosting and enhancing immunity.
- ❖ The concept of prevention is found In *Patanjala Yoga Sutra*, where it is mentioned that the *Dukha* (pain, misery, disease) which has not yet come can be avoided(38).
- ❖ The concept of prayer is also stated in *Yoga*. The goal of *Yoga* can be achieved through total surrender to *Ishvara*(39). The manifestation of *Ishvara* in the sound form is *Pranava (Om kara)*(40). *Ishvarapranidhana* (surrender to God) is also one of the *Niyama* mentioned in *Ashtanga Yoga*(41). Prayer is one of the modes to be with *Ishvara* or self and when the focus is internalised, it is relaxing. Thus, prayer can induce a relaxation state.
- ❖ Influence of *Yoga* on stress related changes in immune system(42).
- ✚ The ultimate aim of *Yoga* is to tranquillity. *Yoga* has been recommended and studied in its relationship to stress. It has been shown to create a sense of well-being, feeling of relaxation, improved concentration, self-confidence, improved efficiency, good interpersonal relationships, increased attentiveness, lowered irritability, and an optimistic outlook in life. Because it fosters self-awareness, *Yoga* is a promising approach for dealing with the stress response.
- ✚ It is well known that the hypothalamus and the limbic system are intimately concerned with emotional expressions. Yogic practices inhibit the areas responsible for fear, aggressiveness, and rage, and stimulate the rewarding centres in the median forebrain and other areas, leading to a state of bliss and pleasure. This shows lower anxiety, heart rate, respiratory rate, blood pressure, and cardiac output in several studies.
- ✚ Yogic practices probably inhibit the activity of the paraventricular nuclei of the hypothalamus, which in turn affects the anterior pituitary gland to produce less Adreno Cortical 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. The decreased levels of corticosteroids and catecholamines are known to decrease stress responses.

### **Immunity in Ayurveda:**

In *Ayurveda Vyadhikshamatva* can be correlated with immunity. The word *Vyadhikshamatva* is derived from the two words *Vyadhi* and *Kshamatva*. The word “*Vyadhi*” refers to the disease or non-equilibrium state of physiological entities. “*Kshamatva*” means tolerance or to resist. So *Vyadhikshamatva* means the capacity of the body to act against diseases which means it can prevent as well as fight against diseases. There is also the concept of *Vyadhisahatva* which means the body's capacity to fight against the disease. It is said that in the following conditions body will not be able to fight against diseases. that is- excessive stout, excessive lean, not properly nourished *Mamsa*, *Shonita* and *Asthi*, weak, taking *Asatmya Ahara* and weak minded(43). *Bala*

or strength is power of the body, which is responsible for health. There is a description of *Balavriddhikara Bhava* (factors responsible for enhancing Bala or strength) in the classics(44). Acharya Sushruta mentioned that the normal functions of *Bala* are as follows: firm and well-developed muscles, unobstructed activities, clarity of voice and complexion and normal functioning of *Bahya Karana* (external/motor) and *Abhyantara Karana* (internal/sensory organs). Firm and well-developed muscles are due to *Bala* which is the essence of all *Dhatu*s and is characterized by the growth and development of all *Dhatu*s. Flow of energy without obstruction in the activities of body, speech and mind is due to *Bala* which is characterized by load carrying etc. *Bahya Karana* (motor organs) are organs of speech, hands, feet, anus and genitals with assigned functions as speech, receiving, movement, elimination and enjoyment while *Abhyantara Karana* (sensory organs) are ears, skin, eyes, tongue and nose having functions as receiving sound, touch, sight, taste and smell- this is due to *Bala*. Other interpret as- *Bahya Karana* are all above ten (sensory and motor organs) and *Abhyantara Karana* is mind and intellect with *Ojas* being the supporting base of their strength(45). The equilibrium state of *Kapha* promotes strength, that's why *Prakruta* (normal) *Kapha* is used as a synonym for *Bala*(46). Use of all six *Rasas* in diet creates maximum strength in the body whereas consumption of one or two *Rasas* gives rise to minimum *Bala*(47). There is also a concept of *Rasayana* in *Ayurveda* which is considered as health promoter and rejuvenator(48). It strengthens the individual's capabilities at both physical and psychological levels. So *Rasayana* will also help in improving immunity of an individual.

#### **In modern science Immunity can be understand regarding the following aspects(49):**

- The immune system has two "lines of defence": Innate immunity and Adaptive immunity.
- An important function of innate immunity is the rapid recruitment of immune cells to site of infection and inflammation through the production of cytokines and chemokines.
- Key inflammatory cytokines released during the early response to bacterial infections are: Tumour Necrosis Factor (TNF), Interleukin 1 (IL-1) and Interleukin 6 (IL-6).
- These cytokines are essential for initiating cell recruitment and the local inflammation which is essential for clearance of many pathogens.

#### **Psycho neuro endocrine immunology:**

- ✚ The brain and immune system are closely related via functional neuroendocrine-immune pathways(50).
- ✚ The endocrine-immune system network involves the Hypothalamic Pituitary Adrenal axis (HPA), Sympathetic Adrenal Medullary axis (SAM), and the Hypothalamic Pituitary Gonadal (HPG) axis. These endocrine axes secrete hormones that bind to specific receptors on white blood cells and have diverse regulatory effects on their distribution and function(51).
- ✚ The network which connects nervous system and immune system involves sympathetic fibres descending from the brain to both the primary (bone marrow and thymus) and secondary (spleen and lymph nodes) lymphoid tissues(52).
- ✚ The hormonal alterations induced by stress are responsible for the changes in the cytokine concentrations.
- ✚ Yoga inhibits the posterior or sympathetic area of the hypothalamus, optimizing the body's sympathetic responses to stressful stimuli, and restores autonomic regulatory reflex mechanisms associated with stress. Activity of the parasympathetic system may increase(53).
- ✚ Yoga most probably acts via the psycho-neuro-immunological axis, which creates a homeostatic balance between sympathetic and parasympathetic limbs of the autonomic nervous system during the aggressive symptomatic phase and helps to normalize the flare and achieve remission(54).

#### **Some studies related to yogic practices and immune-system mediated disorders**

- ✚ Many studies involving *Yogic* practices and similar techniques have shown favourable results in immune-system mediated disorders. The technique of meditation studied seems to have a significant effect on immune cells(55).
- ✚ Some studies generated strong evidence for the benefits of yoga on the levels of circulating cortisol and classical inflammatory markers, such as C-reactive protein (CRP) and cytokines such as interleukin-1 beta (IL-1 $\beta$ ), interleukin 6 (IL-6), tumour necrosis factor-alpha (TNF- $\alpha$ ) and interferon-gamma (INF- $\gamma$ ).(56)
- ✚ In many cancer studies *Yoga* has proven as improving Quality of Life of patients, improvement in psychological outcomes, generates a robust Immune response and attenuates expression of key

inflammatory cytokines(57)(58) the study on breast cancer patient undergoing surgery suggests possible benefits for yoga in reducing postoperative distress and preventing immune suppression following surgery(59) In another study it is found that the yoga group had lower morning and 5 p.m. salivary cortisol and improved emotional well-being and fatigue scores(60) Cortisol levels decreased systematically over the course of the follow-up(61) Perioperative Yoga exercise improved QoL, promoted an immune response, and attenuated inflammation in men with prostate cancer(62).

- ✚ Practices such as Qigong, Tai Chi and yoga have been shown to help to reduce and prevent the effects of common diseases and might be powerful tools to promote lung function and virus-specific immune response(63).
- ✚ The findings of the RCTs on pregnancy suggests antenatal yoga may increasing maternal immunity and emotional-wellbeing(64)(65). In another study it is found that the intervention group had lower salivary cortisol ( $p < 0.001$ ) and higher immunoglobulin A ( $p < 0.001$ ) levels immediately after yoga than the control group(66).
- ✚ One study determined the effect of yoga on mucosal immune function and mental stress. The secretory immunoglobulin A (SIgA) concentration and secretion rate were significantly higher and cortisol concentration and secretion rate were lower after *Yoga* than before ( $p < .05$ )(67).
- ✚ A statistically significant relationship has been observed between mind-body therapies (Transcendental meditation and visual imagery without the use of any kind of medications) and the patient's recovery from dermatomyositis, which could possibly be mediated by influences on the humoral immune system. As dermatomyositis is a humoral mediated immune micro vasculopathy, the benefits of meditation and imagery in patient comport with a growing body of evidence showing that these techniques influence immune system function(68).
- ✚ A study carried out on MBBS students, 35 min daily practise of *Yoga* in the presence of trained *Yoga* teacher for 12 weeks. Decreased serum IFN- $\gamma$  levels indicate decline in cellular immunity. The decrease in serum IFN- $\gamma$  in *Yoga* group was less significant compared with that in the control group which indicated a decline in cellular immunity with examination stress more among the control group than the *Yoga* group students(69).
- ✚ Few clinical trials were done on the effect of *Yoga* on RA-  
Rheumatoid arthritis (RA) is a complex progressive multisystem autoimmune disease. In RA, the autoimmunity is linked with a disturbed immune system in which the distinction between foreign and self-antigen is not absolute. In few studies it is found that ESR, CRP, IL-6, IL-17A, and TNF alpha showed a significant ( $p < 0.05$ ) decline, whereas TGF beta and soluble HLA-G ( $p < 0.05$ ) showed a significant increase in *Yoga* group as compared to control.(70)(71)
- ✚ It was observed in one study that 8 weeks of Hatha *Yoga* training had beneficial effects in allergic rhinitis by improved clinical allergic rhinitis and cytokine profiles(72).
- ✚ *Yoga* has positive effects on immune system of diabetics. - Type II DM is influenced by psycho-neuro-endocrine and immune mechanisms where *Yoga* has important positive role in combating stressors and improving these systems to regain health(73).
- ✚ In COVID-19 pandemic, *Yoga*, meditation, and *Ayurveda* emerged as complementary immune boosters(74). It is observed that a variety of *Yoga* interventions along with meditation and *Pranayama*, in different combinations were used by the practitioners regarding Covid-19. However, all these studies unanimously reported improvement in immunological profile of an individual with *Yoga*(75). *Yoga* may lead to risk reduction of COVID-19 by decreasing stress and improving immunity(76) In covid 19 patients study conducted on *Sudarshana Kriya* which suggest that it balances the autonomic nervous system and thus can alleviate anxiety, routine stress, depression, stress-related medical disorders, and posttraumatic stress. It potentiates natural host immune defenses(77).
- ✚ *Sudarshana Kriya and Pranayama* increased natural killer (NK) cells significantly ( $P < 0.001$ ) at 12 and 24 weeks of the practice compared to baseline(78).
- ✚ *Yoga* has therapeutic benefits on inhibiting the replication of haematopoiesis in HIV-1 infected patients. The practice of *Yoga* is also shown to prevent infection by increasing the salivary human  $\beta$ -defensin 2 (HBD-2) levels(79). In another study, it is found that CD4 and viral load significantly improved, with CD4 cells increasing and viral load reducing. CD4/CD8 ratio moved to a normal range(80). One study

result suggests that regular structured physical activity improves the inflammatory profile of antiretroviral therapy-treated HIV-infected children(81).

- ✚ There are several lines of evidence that depression may be associated with increased inflammation, including increased levels of pro-inflammatory cytokines (which amplify inflammatory processes) and other markers of inflammation. IL-6, in particular, emerged as one inflammatory marker that was observed to decrease over time in persistently depressed participants in the hatha Yoga condition relative to health education control participants(82).
- ✚ Study on schizophrenia patients suggest that improvements in schizophrenia psychopathology with *Yoga* interventions are associated with immuno-modulatory
- ✚ It is seen that there is a reduction of these inflammatory cytokines by practicing yoga in daily life with a reversible effect on depression and stress-related periodontitis(83)

## CONCLUSION:

In classical texts of Yoga an inclusion of terms like *Virya, Bala, Arogya, Sthairya etc.* and in classical text of *Ayurveda terms like Shleshma, Bala, Virya, Ojas, Vyadhikshamatva, Vyadhisahatva, etc.* have been referred which can be helpful to understand the concept and dimensions of immunity. As stress is a burning issue in present time, which has a typical role in compromising one's immunity. There is a need for such intervention which stabilizes the body and tranquil the mind in non-invasive and cost-effective manner. *Yoga* may be considered as drugless intervention which serves this purpose in many ways. Thus, it may be concluded through this paper that *Yoga* has positive impact on Immunity and can be important tool to prevent diseases of various origins

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