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Yoga Therapy for Immunomodulation (Prevent & Cure) of COVID-19

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ABSTRACT

Corona virus disease (Covid 19) is newly discovered viral infectious disease; which has spread all over the world. World Health Organization (WHO) has declared it as a Public Health Emergency of International Concern (PHEIC) on 30th January 2020. This study is a literature review; searches were carried out to find out the role of yoga; on immunomodulation related to the prevention and cure in Covid 19, by using popular search engines, including Google and Google Scholar within the period of 04 months. The results were interpreted as percentages of collected total articles. Seventy articles were reviewed and 100 % of the articles showed (directly or indirectly) yoga has immunomodulatory role. Thirty nine articles (56%) were proved that yoga is beneficial in reducing sign and symptoms of Covid 19.

The present study found that yoga has immunomodulatory role and yoga therapy can be applied for the prevention and cure of Covid 19 ("Novel Corona Virus").Yoga, meditation & other yogic practices enhance the overall immunity, specially Jala Nethi and Pranayama are very important yoga therapies for the prevention and cure of Covid 19.

Keywords: Corona virus, Jala Neti, Pranayama

INTRODUCTION

COVID 19 is newly identified viral disease; which has spread all over the world. First case of Novel Corona Virus was present from Wuhan city, China in December 2019. World Health Organization (WHO) has declared it as a Public Health Emergency of International Concern 0n 30th January 2020. Corona virus disease announced as a pandemic in 11th March 2020 by WHO. The incubation period of this disease was reported as 2-14 days at that moment [1].

In this situation the countries like America and United Kingdom with strongest health system s in the world also became helpless. Among South-East Asian countries India has the highest reported laboratory-confirmed COVID-19 cases and deaths. There are countries with community transmission such as UK and America. Clusters of cases were reported in Sri Lanka [2]. Among the confirmed total Covid 19 patients (2815) in Sri Lanka imported cases were 951 in number and total number of recovered patients were 2439; while total number of deaths from Covid 19 in Sri Lanka were 11 patients up to 01.08.2020 [1]. Kiribati, Marshall Islands, Micronesia , Nauru, North Korea, Palau, Samoa, Solomon Islands, Tonga, Turkmenistan, Tuvalu and Vanuatu are countries that have not reported any cases of the coronavirus so far (up to 31 July 2020) [3].

"Occurring over a wide geographic area and affecting an exceptionally high proportion of the population" or "an outbreak of a disease that occurs over a wide geographic area and affects an exceptionally high proportion of the population are the definitions for pandemic outbreak of a disease [4]. The meaning of Immunomodulation is modification of the immune response or the functioning of

the immune system by the action of an immunodulator [5].

The stress can be introduced as a response to a physical threat or psychological distress. Stress increases the transportation of oxygen and glucose to the skeletal muscles and heart. Then the fight or flight reaction occurs in the body. As a result of that autonomic, cardiovascular, gastrointestinal, immune system also affected [6]**.** The immune system protects us from bacteria, virus, fungi, protozoa and other harmful organisms. There are many effects of stress induced immune dysregulation. Some of them are impaired wound healing, reduction of the immune response to vaccines, reactivation of latent herpes viruses (such as Epstein–Barr virus) and enhance the risk for more severe infectious disease [7]. Stress induced immune dysregulation plays a role in cell to cell interaction. It releases mediators from reacting lymphocytes. Stress and central nervous system lesions affect thymus-derived lymphocytes [8].

If a person is living with stress he/she is more susceptible to the infectious diseases such as common cold, influenza, COVID 19 (SARS-CoV-2), severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS).

Corona virus droplets are mainly entered by nose, eyes and mouth. For some hours virus stays in the throat region and then enters in to lungs .According to the findings Heneghan and others of there are about 5% - 80% asymptomatic patients although they are positive for Coronavirus [9]. Fever, dry cough, and tiredness are most common symptoms of Covid-19 according to the WHO. Aches and pains, nasal congestion, headache, conjunctivitis, sore throat, diarrhea, loss of taste or smell or a rash on skin or discoloration of fingers or toes are less common symptoms. They are usually mild and begin gradually. Some patients show very mild symptoms while most people (80%) recover from the disease without hospitalization. Around 1 out of every 5 COVID-19 patients becomes seriously *insidious* and develops breathlessness. The people who are in danger of life due to COVID 19 infection are with hypertension, heart problems, lung problems such as COPD (chronic obstructive pulmonary disease), diabetes, cancer and elderly people. If person suffer with fever with or without cough associated with difficulty in breathing/shortness of breath, chest pain/pressure or loss of speech or movement should immediately be hospitalized [10].

Modern medicine was failed in this situation at present. Therefore the world is looking at Ayurveda, Naturopathy and Yoga for prevent & cure COVID 19.Specially yoga therapy can be used for immunomodulation (prevent & cure) in COVID 19 at present. A scientific study in 2001 reported; increase in Natural Killer cells activity during yoga practices pointing to the relationship between a calm mind and better cellular immunity [11]. Research studies on Pranayama (breathing techniques of yoga), Asanas (postures) & Yogic Kriya (procedures including Shat Karma) had shown the effectiveness of yoga for prevention and cure in such diseases via enhancing the immunity and improving of Respiratory health.

A study in 2015 proved that poor mental health conditions, including stress and depression increase the risk of acute respiratory infections [12]. Social distancing measures, quarantine process, information of cases and deaths, using masks always in outside , special arrangements for get rid of Coronavirus infection and stay at home without doing occupation lead to developing stress and anxiety among people. There for yoga practices (including yogic meditation and relaxation) should be done at home and quarantine places to get rid of this stressful situation.

The state of balance of body and mind is called Yoga [13]. Ashtanga yoga includes Yama (ethical rules), Niyama (Obsevances), Asana (postures), Pranayama (control of breathing), Pratyahara (withdrawal of mind from sense objects),

Dharana (concentration), Dhyana (meditation) and Samadhi (absolute contemplation) [14]. Practicing of Yama & Niyama in day today life lead to avoid stress & gain mental relaxation. Pranayama improve lung vital capacity and immunity of the respiratory system. Sooryabhedana (vitality stimulating breath), Ujjayee (psychic breath), Seethkaree (hissing breath), Seethali (cooling breath) Bhrasthika (bellos breath),Bhramari (humming bee breath), Moorja(swooning breath) and Plawani (gulping breath) are eight types of Pranayamas [14].

Examples for Asanas which has immunity enhancement functions are Bhujangasana (cobra pose), Adhomukha Shavanasana (downward dog) and Dhanurasana (bow pose). They stimulate the thymus gland. Shishuasana (child pose) helps to decongest the chest. It builds a better immunity defense system. Ananda Balasana (happy baby pose) relaxes the body. Viparita Karani (legs up the wall pose) boosts nerve connections, improves blood flow and vitalizes the body. Hastapadasana (forward bend pose) relieve congestion and protect the sinuses and mucus membranes (the first form of defense). This pose rejuvenates the immune system. Setu Bandhasana (bridge pose) improves blood circulation and increases energy in the body to gain better resistance against pathogens. Matsyasana (fish pose) expands the chest and stimulates the thymus. It improves the body's immunity level [15].

All types of Pranayama improve lung vital capacity and immunity of the respiratory system. Among them Sooryabhedana, Ujjayee, Bhrasthika & Bhramari can be used for prevention and cure COVID 19. Soorya Bhedana makes body get warmth, purify the blood, cleans the frontal sinuses, cures and prevents from cold, cough and asthma. Ujjayi increases oxygenation, balances and calms the breath, stimulates Nadis (energy channels), brings mental clarity and focus, increases body heat. This heat gives strength to the inner organs to cleanse of any toxins that have accumulated. Bhramari cleans the sinuses, nasal canal and ear canals, helps to relax the mind, gives energy to the body and mind, maximizes the lung capacity and helps to remove toxins and impurities. Bhrastika cures sinusitis, bronchitis and other respiratory diseases, improves awareness and perceptive power of senses**,** balances Doshas, strengthens the immune power, reduces episodes of cold, cough and flu and improves thyroid function & tonsils. Anuloma Viloma Pranayama(alternate nostril breathing) increases the resistance of sinuses, relax the mind & boosting immunity. These Pranayamas can be used in prevention & cure in Coronavirus infection because of their functions [16].

Dharana, Dhyana and Samadhi makes relax mind and act as immunity boosters.

Shat Karma (six procedures) help in keep the body strong, clean and healthy. They remove toxins and anything blocking the flow of Prana (vital energy of the body) and enhance the immunity in the body. Neti (nasal wash), Dhauti (cleansing of the whole digestive tract), Nauli (self-administered abdominal massage) using only muscles of the abdominal wall, Basti (a colonic irrigation), Kapalabhati (rapid abdominal breathing), and Trataka (eye cleansing technique in yoga) are Shat Karmas in yoga. Some of them can be used as prevention & cure in Coronavirus infection. Jala Nethi means cleansing of the nasal passage with using slightly salted (non-iodized) purified water for clean the upper respiratory passage [17]. Therefore Jala Nethi can be used as preventive measure & treatment for Corona virus infection.

Sutra Neti helps in clearing excessive mucus from the heavy nostrils (reduce nasal congestion), cleans the sinuses, ease headache & sinusitis. It reduces symptoms of cough, cold and headache. Vamana Dhauti purifies and enhances the immunity in the digestive tract, respiratory tract, external ears and eyes. It cures cough & asthma. Nauli makes

internal organs healthy, increases mental clarity & body immunity, stimulates the digestive fire, and removes toxins, indigestion & constipation. Basti detoxifies the large intestine and enhances the immunity. Kapal Bhati removes the toxins in the body through the exhalation, increases the resistance of the respiratory tract and improves blood circulation and nervous system functioning. Therefore these Shat Kramas can be used to cure Corona virus disease. Trataka increases blood circulation to the eyes and help strengthen them. It cleanses tear glands and purifies the optical system. Therefore entering Corona virus through eyes can be avoided by using Trataka.

Yoga Nidra (yogic sleep) is a state of consciousness between waking and sleeping. It reduces stress, rejuvenates the body, improves sleep, reduces insomnia, helps in activating the relaxation response and improves the functioning of the nervous system and endocrine system, which effects on hormones. Yogic diet cleanses the body and helps it to get rid of harmful toxins. It strengthens the body's immunity power. Consequently Yoga Nidra and Yogic diet also has therapeutic effect in this situation.

Methods to enhance the immunity of total body and some parts of the body according to Ayurveda are prescribed in Charaka Samhitha (daily regimen, seasonal regimen, therapeutic cleansing procedures, rejuvenation therapy and etc.) also play a major role in prevention and curing Coronavirus infection [18].

MATERIALS AND METHODS

Literature searches were carried out to find out the role of yoga; on immunomodulation related to the prevention and cure in COVID 19, by using popular search engines, including Google and Google Scholar within the period of 06 months.

Statistical Methods

The results were interpreted as percentages of collected total articles.

RESULTS

Benefits of yoga; (Related to the prevention and cure in Covid 19).	**Examples of researches**	**Relevant part of conclusions.**
Improve total body immunity	Sarika A & Jayashri B 2008	"Meditation, yoga, hypnosis, and muscle relaxation have been shown to reduce the psychological and physiological effects of stress according to the results of scientific studies" [19].
	Rocha KKF et al. 2012 West et al. 2004	"Yoga and/or meditation practice have been shown to reduce psychological stress" [20], [21].
	Bijlani R.L et al 2005	"Brief low cost lifestyle intervention based on yoga reduces oxidative stress" [22].
	Sharma V.K et al 2013	"Both types of pranayama practice are beneficial in reducing perceived stress scale in the healthy subjects" [23].
	Taspiner B et al 2014	"..Hatha yoga and resistance exercise may affect different aspects of mental health and well-being" [24].
Enhancing immunity in the respiratory system	Vempati R et al 2009	" ..The trial supports the efficacy of yoga in the management of bronchial asthma" [25].
	Shodi C et al 2009	" Yoga breathing exercises used adjunctively with standard pharmacological treatment significantly improves pulmonary functions in patients with bronchial asthma" [26].
	Sing S et al 2012	"Pranayama & yoga breathing and stretching postures are used to increase respiratory stamina, relax the chest muscles, expand the lungs, raise energy levels, and calm the body [27].
	Yadav A et al 2015	"Yoga regimen was found to improve lung functions and diffusion capacity in patients ... " [28].
	Soni R et al 2012	"Yogic breathing exercises improve diffusion capacity. They are beneficial to COPD patients.." [29].
	Fulambarker A et al 2012	"Yoga when practiced by patients with COPD results in improvement in the quality of life & lung function on a short-term basis" [30].
	Swami G et al 2010	"Pranayama & meditation has beneficial effect on pulmonary functions.." [31].
	Malhotra V et al 2002	"Better glycemic control & pulmonary functions can be obtained in NIDDM cases with yoga asanas and pranayama " [32].

Table continued		
	Balaji R et al 2019	"Yoga is even more significant in routine clinical management of diabetes, improving physical condition and pulmonary function" [33].
	Dinesh T et al 2015	"Pranayama training improved pulmonary function.." [34].
beneficial effects in allergic rhinitis	Chanta A et al 2019	" Hatha yoga training had beneficial effects in allergic rhinitis by improved clinical allergic rhinitis and cytokine profiles" [35].
Reducing fever/body temperature	Telles S et al 2020	"..Especially since the oxygen consumption decreased after both *Sheetali* and *Sitkari Pranayamas(because body temperature get decreased.).*" [36].
	Thanalakshmi J et al 2014	" As it brings the cooling effect on the body and is easy to perform (Sheetali and Sheetkari Pranayama) it will be beneficial in tropical countries like India to abate the heat, and keep the body and the mind cool and calm" [37].
Reducing inflammation	Vijayaraghava A et al 2015	"Regular practice of yoga reduces the resting levels of inflammatory cytokines like TNF-α and IL-6. * Increase in the duration of practice of yoga favorably affects pro-inflammatory cytokine levels when exposed to unaccustomed stress/physical activity. *An excess of pro-inflammatory mediators is a predisposition to pro-inflammatory disorders, exacerbation, complications of metabolic disorders and cardiovascular disease" [38].
	Shete S.U et al 2017	" A yoga-based lifestyle intervention seems to be a highly promising alternative therapy which favorably alters inflammatory markers and metabolic risk factors" [39].
Reducing upper respiratory tract infections.	Meera S et al 2020	" Upper respiratory tract infections can be greatly reduced by the practice of *Jala Neti*. Researches support its efficacy in managing sinusitis, allergic conditions.." [40].
Reducing cold	Rastogi S et al 2007	"Jala Nethi application is recommended as adjunct to the conventional therapy of common cold and sinusitis.." [41].
Reducing cough	Arora M et al 2018	"Overall results in both groups based on the parameters of Nasal Congestion, Rhinorrhea, Headache) and Cough, there was almost similar results noted. Whereas based on the parameters of Sneezing, Nature of onset & Frequency of Attack, it revealed that group A i.e. Jala Neti & Pranayama showed better results than Group B. "[42].
Reducing tiredness	Beera T.K et al 1998	".. Shavasana can establish a psychophysiological relaxation in such a way that the induced physiological stress is reduced significantly in a shorter time as compared to chair sitting or lying down in a supine position" [43].
Reducing aches and pains	Bartlett S .J 2013	" This holistic approach .. reduces pain and enhance function and participation, as part of a comprehensive disease management approach" [44].
	Sharma G et al 2007	"Shavasana can successfully reduce the physiological effects of stress" [45].
Reducing nasal congestion	Pandey A & Tiwari M 2015 .	"…Jala Neti,..can help in preventing and managing sinusitis in an effective manner by improving mucociliary clearance, thinning the mucus, and by decreasing the inflammation that blocks the sinus ostia " [46].
	RaniR.N & Venkateswaran S.T 2018	" Practicing Jala Neti alone could improve the overall hygiene of nasal cavity and its function. Nasal hygiene has been shown to relieve congestion, reduce the viscosity of mucus and keep nasal cavity clean and moist" [47].
	Arora M et al 2018	"Jala Neti cleanses the nasal passage and improves the sensitivity of the nasal mucosa to allergens so as to reduce the frequency of disease recurrence. Pranayama a breathing technique helps in improving the functions of the respiratory system, which is worst affected by allergic rhinitis. " [42].
	Abishek K et al 2019	" Integrating regular practice of Bhramari pranayama along with the conventional management of chronic rhinosinusitis is more effective than conventional management alone" [48].
	Agnihotri S et al 2018	" The practice of Jala Neti and Pranayama can be helpful in Allergic Rhinitis with asthma" [49].
Reducing headache	Sethi B.B et al 1981	" Yoga system shows that this is as effective as biofeedback in tension headache " [50].
	Anheyer D et al 2020	"This review found preliminary evidence of short-term efficacy of yoga in improving headache frequency, headache duration, and pain intensity in patients suffering from tension-type headaches " [51].
	John P.J et al 2007	" .. Integrated yoga therapy can be an effective treatment for migraine" [52].
	Kisan R et al 2014	" Yoga therapy showed an additional beneficiary effect on patients with migraine by reducing frequency and intensity" [53].
	Kim.S.D 2015	" Yoga practice can effectively alleviate symptoms associated with primary headaches" [54].
Reducing conjunctivitis	Gopinathan G et al 2012	" Trataka is effective ocular fatigue according to the results of this study" [55].

Table continued		
	Telles S et al 2006	" Yoga practice(including Trataka) appeared to reduce visual discomfort " [56].
Reducing sore throat & bronchitis	Chandran R et al 2016	" Neti removes all the dirt and bacteria filled mucous from within the nose. It is also beneficial for illness such as asthma and bronchitis as it reduces the tendency of mouth breathing by freeing the nostrils of mucous. Since we use lukewarm water in Neti procedure, the increased temperature will inhibit replication of rhinovirus since the virus can replicate above temperature 37°C. The lukewarm water will irrigate nasal passages & create a correct flow pressure & will cause shedding of virus" [57].
	RaniR.N & Venkateswaran S.T 2018	" Regular practice of Jala Neti maintains healthy secretory and drainage mechanisms of the entire ear, nose and throat area. This helps to ward off colds and coughs, allergic rhinitis, hay fever, catarrh, and tonsillitis" [47].
	Balakrishnan R et al 2018	" These findings also indicate the possibility of using the practice of Kunjal Kriya (voluntarily induced vomiting) in the management of motion sickness and restrictive pulmonary disorders like bronchitis and bronchial asthma" [58].
Inhibiting replication of virus in nasal passage.	Chandran R et al 2016	"Since we use lukewarm water in Neti procedure, the increased temperature will inhibit replication of rhinovirus since the virus can replicate above temperature 37°C. The lukewarm water will irrigate nasal passages & create a correct flow pressure & will cause shedding of virus" [57].
Reducing diarrhea	Kuttner L et al 2006	"..Adolescents had significantly lower scores for gastrointestinal symptoms and emotion-focused avoidance following the yoga intervention. Adolescents found the yoga to be helpful and indicated they would continue to use it to manage their Irritable Bowel Syndrome (IBS)" [59].
	Kavri V et al 2015	"Remedial Yoga Module intervention could be a feasible stand-alone treatment or an integrative option within conventional treatment for IBS patients with addressing IBS and associated conditions" [60].
Reducing loss of taste and loss of smell	RaniR.N & Venkateswaran S.T 2018	" Jala Neti alone could improve the overall hygiene of Nasal cavity and its function. Regular practice of Jala Neti maintains healthy secretory and drainage mechanisms of the entire ear, nose and throat area…" [47].
	Chandran R et al 2016	"Neti improves sensitivity of the olfactory nerves, helping to restore lost sense of smell, and thereby benefits the relationship with taste and the digestive process" [57].
Reducing rash on skin	Sing S et al 2015	" Different Yogic practices reduce the physical and mental stress and help in immunomodulation which is the mainstay in the etio-pathogenesis of psoriasis. These yoga practices increase the quality of life in the patients of psoriasis which results in reduction in the frequencies of flares of psoriasis, improvement in clinical symptoms and increase ability to cope up with psoriasis" [61].
	Ramya R 2018	" Out of the patients (with Psoriasis) who underwent yoga therapy along with the medication, it was found that 85% responded well" [62].
Reducing discoloration of fingers or toes.	Not found (Asana, Kunjal Kriya (special technique for cleaning the digestive system by induced vomiting), Lagushanka Prakshalana (special yogic bowel cleansing technique) and Vamana Dauthi are effective for reducing discoloration of fingers or toes according to the yoga text books because they promotes blood circulation. [63, 64].	
Improve quality of life in chronic disease conditions.	Singh V.P & Khandelwal B 2020	" Yoga is superior to exercise alone as a lifestyle modification program in improving glycemic control, anxiety, depression, and quality of life as well as exercise self-efficacy" [65].
	Venkatesh H.N et al 2020	"We have emphasized the efficacy of yoga in improving physical and mental well-being. Now, the time has come to scientifically validate this and implement this as an alternative treatment method for stress-related chronic disease" [66].
	Sharma R .et al 2008	"Yoga based lifestyle intervention leads to remarkable improvement in the subjective well being, make an appreciable contribution to primary prevention as well as management of lifestyle diseases" [67].
Reducing the risk and improving management of CVD (cardio vascular diseases)	Yadav R et al 2014	"A yoga-based lifestyle intervention appears to be a promising option in reducing the risk for CVD as well as management of patients with CVD…" [68].

Table continued		
	Heider T et al 2017	"...Yoga has as an alternative and complementary means to improve cardiovascular disease risk " [69].
	Sarvottam K et al 2013	" Even a short-term yoga-based lifestyle intervention may be an important modality to reduce the risk for CVD…" [70].
	Bijlani R L et al 2005	" Yoga reduces risk factors for cardiovascular disease". [22].
	Vijayaraghava A et al 2015	"Regular practice of yoga decreases…CVD " [38].
Reducing anxiety	Gupta N et al 2006	"Short educational programme for lifestyle modification and stress management (yoga based lifestyle intervention)leads to remarkable reduction in the anxiety scores.. " [71].
	Singh V.P & Khandelwal B 2020	"Yoga is superior to exercise alone as a lifestyle modification program in improving..anxiety, depression, .." [65].
	Dhungel K.U et al 2008	"Regular practice of Alternate Nostril Breathing increases parasympathetic activity (It reduces anxiety and stress)" [72].
Reducing cancer symptoms.	Kashla D.S.S 2005	"A case history demonstrating rapid onset of acute relief of intense fear in a terminal breast cancer patient using a Kundalini Yoga (KY) technique specific for fear is presented. A second case history is reported for a surviving male diagnosed in 1988 with terminal prostate cancer who has used KY therapy long term as part of a self-directed integrative care approach" [73].
	Yagli N.V & Ulger O 2015	"Yoga is valuable in helping to diminish depression, pain, fatigue and helps cancer patients to perform daily and routine activities, and increases the quality of life in elderly patients with breast cancer " [74].
	Buffart L.M et al 2012	"Yoga appeared to be a feasible intervention and beneficial effects on several physical and psychosocial symptoms were reported. In patients with breast cancer, effect size on functional well-being was small, and they were moderate to large for psychosocial outcomes" [75].
	Reed SNC 2006	"Yoga has significant potential and should be further explored as a beneficial physical activity option for cancer survivors" [76].
	Armer J.S & Lutgendorf S.K 2020	" Results suggest yoga may be beneficial as a component of treatment for both fatigue and depression in cancer survivors" [77].
Reducing pain & Rheumatic Diseases	Bartlett SJ.2013	" Yoga is a reasonably safe and feasible option for many people living with rheumatic conditions…, reduce pain and enhance function and participation, as part of a comprehensive disease management approach" [78].
Reducing Hyperlipidemia	Nagarathna R et al 2019	" Although the available evidence proves the significance of the beneficial impact of Yoga on the cholesterol levels, Tg, LDL, and VLDL" [79].
	Vijayaraghava A et al 2015	"Regular practice of yoga decreases the levels of cholesterol, triglyceride and VDL.." [38].
Reducing Hypertention	Hagins M et al 2013	" Yoga was associated with a modest but significant reduction in blood pressure (≈4 mmHg, systolic and diastolic) in this population. " [80].
ReducingBronchial Asthma	Mossie A & Mekonnen D 2010	"Yoga decreased the number of day and night asthma attacks,.. " [81].
Reducing Diabetes Mellitus	Bijlani R L et al 2005	" The changes were more marked in subjects with hyperglycemia according to the findings.. " [22].
	Malhotra V et al 2002	"Better glycemic control and pulmonary functions can be obtained in NIDDM cases with yoga Asanas and Pranayama " [82].
	Balaji R et al 2019	"Yoga has a definite role as an adjuvant therapy as it enhances standard medical care and hence is even more significant in routine clinical management of diabetes, .." [33].
	Singh V.P & Khandelwal B 2020	"Yoga is superior to exercise alone as a lifestyle modification program in improving glycemic control, …" [65].
Reducing risk factors for diabetes mellitus	Bijlani R L et al 2005	" Yoga reduces risk factors for diabetes mellitus" [71].
Reducing respiratory diseases	Soni R et al 2012	"Pranayamic breathing exercises when used adjunctively with standard pharmacological treatment, can significantly improve gas transfer test in yoga with mild-to-moderate grades of chronic obstructive pulmonary disease " [83].
	Balaji R et al 2019	"..it enhances standard medical care and hence is even more significant in routine clinical management of diabetes, improving physical condition and pulmonary function" [33].
	Liu X. C et al 2014	"The current limited evidence suggested that yoga training has a positive effect on improving lung function and exercise capacity and could be used as an adjunct pulmonary rehabilitation program in COPD patients" [84].
	Katiyar S.& Bihari S 2006	"Pranayama has an overall positive effect on patients with moderate-to-severe COPD. There was improvement in the lung function parameters. Patients had reduced symptoms, became more actively involved in their own health care" [85].
	Guptha A et al 2014	" Pranayam has been demonstrated as useful for individuals with moderate to severe COPD. " [86].
Reducing stress	Yadav K.R et al 2012	"This brief yoga-based lifestyle intervention reduced the markers of stress … " [87].

Seventy articles were reviewed and 100% of the articles showed (directly or indirectly) yoga has immunomodulatory role to prevent and cure from Covid 19. Seventeen articles (24%) were mentioned directly that yoga helps to increase immunity in the human body; while ten articles (14%) were mentioned that yoga enhances the immunity in the respiratory system. Thirty nine articles (56%) were proved that yoga is beneficial in reducing sign and symptoms of Coronavirus disease. Thirty articles (43%) showed yoga improves quality of life in chronic disease conditions.

DISCUSSION

Jala Neti helps to remove the Corona virus from nasal cavity according to the findings. It is very important in prevention of Covid 19.

Jala Neti can be applied to reduce nasal congestion, sinusitis, common cold, catarrh, tonsillitis, sore throat, bronchitis, bronchial asthma and to improve mucociliary clearance. It helps to restores lost sense of smell and taste. These activities are beneficial in curing signs and symptoms related to nasal area and upper respiratory passage in Coronavirus infection. Jala Neti can be used to reduce the frequency of disease recurrence in COVID 19. Therefore Jala Neti is very important treatment for Covid 19.

Headache in Coronavirus disease can be reduced using Jala Neti and Pranayama according to the findings. Pranaayama and Kunjal Kriya can be used to improve the functions of respiratory system in COVID 19.Trataka is useful in reducing watering from eyes**, b**urning sensation of eyes and ocular fatigue. Therefore Trataka can be used to cure conjunctivitis in Covid 19.

Yoga therapy is useful in reducing diarrhea, aches, pains, skin rashes, mental stress and physical stress. Asana, Kunjal Kriya, Lagushanka Prakshalana and Vamana Dauthi are effective for reducing discoloration of fingers or toes according to the concepts of yoga text books (but it couldn't find from any study). These findings from present study are useful in curing COVID 19.

Yoga improves quality of life in chronic disease conditions such as CVD and diabetes mellitus. It is also an important finding; because these diseases lead to COVID 19 infected person in to more dangerous situations including death.

CONCLUSION

The present study found that yoga has immunomodulatory role in COVID 19 and yoga therapy can be applied for the prevention and cure of Coronavirus disease. Especially Jala Neti and Pranayama are very important yoga therapies for the prevention and cure of COVID 19.

REFERENCES

1. Coronavirus disease 2019 (COVID-19) - Situation Report [Internet] . 2020. Available from https://www.epid.gov.lk/web/images/pdf/corona virus report/sitrep-sl-en-01-08 10.pdf
2. Coronavirus disease (COVID-19) Situation Report193 by WHO. Data as received by WHO from national authorities [Internet]. 2020. Available from https://www.epid.gov.lk/web/images/pdf/corona virus report/sitrep-gl-en-01-08 10.pdf
3. Al jazeera news[Internet] .2020. Available from https://www.aljazeera.com/news/2020/04/countries-reported-coronavirus-cases 200412093314762.html
4. Webster M. Medical Dictionary [Internet].2020.https://www.merriam-webster.com/dictionary/pandemic
5. Webster M. Medical Dictionary [Internet].2020. Available from https://www.merriam-webster.com/medical/immunomodulation
6. McEwen BS, Stellar E. Stress and the individual: Mechanisms leading to disease. Arch Intern Med. 1993;153: 2093–2101.
7. Marucha PT, Glaser KJK. Favagehi M. Mucosal wound healing is impaired by examination stress. Psychosomatic Medicine: 1998 ; 60 (3): 362-365.
8. Solomon GF, Moos RH. Emotions, immunity and disease: A speculative

theoretical integration. Arch Gen Psychiatry. 1964;11:57–67.
9. Heneghan C, Brassey J, Jefferson T. Covid 19: What propotions are asymptomatic? [Internet].2020. Available from https://www.cebm.net/covid-19/covid-19-what-proportion-are-asymptomatic.
10. WHO. Coronavirus disease (COVID-19) pandemic[Internet].202. Available fromhttps://www.who.int/emergencies/diseases/novel-coronavirus-2019/coronavirus-disease.
11. Kamei T, Toriumi Y, Kimura H et al. Correlation between alpha rhythms and natural killer cell activity during yogic respiratory exercise. Stress & Health.2001; 17(3),141-145.
12. Maxwell L, Barrett B, Chase J et al . Self-Reported Mental Health Predicts Acute Respiratory Infection. HHS Public Access.2016; 114(3): 100–104.
13. Geeta press. Shrimad Bhagavadgita, English translation. Gorakphur: Geeta press; 2006.
14. Swami Prabhavananda. Patanjali Yoga Sutra. Madras: Sri Ramakrishna Matha; 2001.
15. Yoga-The Natural Immunity Booster [Internet].2020.Available from https://www.artofliving.org/yoga/health-and-wellness/yoga-natural-immunity-booster.
16. Breathing exercises for boosting immunity [Internet].2020. Available from https://goqii.com/blog/5-breathing-exercises-for-boosting-immunity.
17. Muktibodhananda S. Hatha Yogo Pradipika. Munger India: Bihar School of Yoga; 2012.
18. Sharma, RK, Dash B. Charaka Saṃhita, Varanasi :Chaukambha Orientalia ; *2014* .
19. Arora S , Bhattacharjee J .Modulation of immune responses in stress by Yoga, International journal of Yoga 2008;1(2): 45–55.
20. Rocha KKF, Ribeiro AM, Rocha KFC et al. Improvement in physiological and psychological parameters after 6 months of yoga practice. Consciousness and Cognition 2012; 21:843–850.
21. West J, Otte C, Geher K et al. Effects of Hatha yoga and African dance on perceived stress, affect, and salivary cortisol. Annals of Behavioral Medicine 2004; 28:114–118.
22. Bijlani RL , Vempati RP, Yadav RK et al. A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus. J Altern Complement Med 2005; 11(2):267-74.
23. Sharma VK, Trakroo M, Subramaniam V et al. Effect of fast and slow pranayama on perceived stress and cardiovascular parameters in young health-care students. Int J Yoga 2013; 6(2):104-10.
24. Taspinar B , Aslan UB , Agbuga B et al. A comparison of the effects of hatha yoga and resistance exercise on mental health and well-being in sedentary adults: a pilot study. Complement Ther Med 2014 ;22(3):433-40.
25. Vempati R, Bijlani RL,Deepak KK. The efficacy of a comprehensive lifestyle modification programme based on yoga in the management of bronchial asthma: a randomized controlled trial. BMC Pulm Med 2009; 9: 37.
26. Sodhi C , Singh S, Dandona PK. A study of the effect of yoga training on pulmonary functions in patients with bronchial asthma. Indian J Physiol Pharmacol 2009;53(2):169-74.
27. Singh S , Soni R, Singh KP et al. Effect of yoga practices on pulmonary function tests including transfer factor of lung for carbon monoxide (TLCO) in asthma patients. Indian J Physiol Pharmacol 2012; 56(1):63-68.
28. Yadav A , Singh S , Singh KP et al. Effect of yoga regimen on lung functions including diffusion capacity in coronary artery disease patients: A randomized controlled study. Int J Yoga 2015 ; 8(1):62-67.
29. Soni R , Munish K, Singh KP et al. Study of the effect of yoga training on diffusion capacity in chronic obstructive pulmonary disease patients: A controlled trial. Int J Yoga 2012 ;5(2):123-7.
30. Fulambarker A, Farooki B, Kheir F et al. Effect of yoga in chronic obstructive pulmonary disease. Am J Ther 2012; 19(2):96-100.
31. Swami G, Singh S, Singh KP et al.Effect of yoga on pulmonary function tests of hypothyroid patients. Indian J Physiol Pharmacol 2009; 54 (1) : 51–56.
32. Malhotra V , Singh S, Singh KP et al. Study of yoga asanas in assessment of pulmonary function in NIDDM patients. Indian J Physiol Pharmacol 2002; 46(3):313-20.
33. Balaji R, Ramanathan R, Bhavanani AB et al. Effectiveness of adjuvant yoga therapy in diabetic lung: A randomized control trial.

International journal of Yoga 2019; 12(2):96-102.
34. T Dinesh, GS Gaur, VK Sharma, T Madanmohan, KT Harichandra Kumar, AB Bhavanani, Comparative effect of 12 weeks of slow and fast pranayama training on pulmonary function in young, healthy volunteers: A randomized controlled trial. Int J Yoga 2015 ; 8(1): 22–26.
35. Chanta A, Klaewsongkram J, Timothy D et al. Effect of Hatha yoga training on rhinitis symptoms and cytokines in allergic rhinitis patients. Asian Pacific Journal of Allergy and Immunology 2019; DOI 10.12932/AP-260419-0547.
36. Telles S, Gandharva K, Sharma SK et al. Body Temperature and Energy Expenditure During and After Yoga Breathing Practices Traditionally Described as Cooling. Med Sci Monit Basic Research 2020; 26: e920107-1–e920107-9
37. Kshmi JT, Ravindran T, Sembulingam P.Impact of Sheetali and Sheetkari Pranayama on the Topographic Mapping of the Brain Waves. IOSR Journal of Pharmacy 2014; DOI: 10.9790/3013-04010051057.
38. Vijayaraghava A, Doreswamy V, Subbaramajoisnarasipur O et al.Effect of Yoga Practice on Levels of Inflammatory Markers After Moderate and Strenuous Exercise. Journal of clinical and diagnostic research 2015; 9(6):08-12.
39. Shete SU, Verma A, Kulkarni DD et al. Effect of yoga training on inflammatory cytokines and C-reactive protein in employees of small-scale industries. Educ Health Promot J 2017; 6: 76 doi: 10.4103/jehp.
40. Meera S, Rani V, Sreedhar C et al. A review on the therapeutic effects of Neti Kriya with special reference to Jala Neti .Journal of Ayurveda and Integrative Medicine 2020;11(2):185-189.
41. Rastogi S, Ranjana, Rastogi R et al. Jala Neti application in acute rhino sinusitis.Indian journal of Traditional Knowledge 2007;6 (2):324-327.
42. Arora M, Ravindra P, Shrikant G et al. Efficacy of Jalaneti and Pranayama in management of Vataja Pratishyaya (allergic rhinitis). World Journal of Pharmaceutical Research 2018; 7(07): 925-935.
43. Bera TK,Gore MM,Oak JP et al.Recovery from stress in two different postures and in Shavasana - a yogic relaxation posture. Indian J Physiol Pharmacol 1998; 42 (4) : 473-478.
44. Susan J, Bartlett, Haaz S et al. Yoga in Rheumatic Diseases. Curr Rheumatol 2013; 15(12): 387.doi: 10.1007/s11926-013-0387-2
45. Sharma G, Mahajan KK, Sharma L et al. Shavasana-relaxation technique to combat stress. Journal of Bodywork and Movement therapies 2007; 11(2),173-180.
46. Pandey A, Tiwari M. Yogic management of chronic sinusitis w.s.r. to neti Kriya. World journal of pharmacy and pharmaceutical sciences 2015; 4 (03):1534-1542.
47. Rani RN, Venkateswaran ST .Immediate effect of Jala Neti(nasal irrigation) on nasal peak inspiratory flow on healthy volunteers. [Internet]. 2018. Available from http://repository-tnmgrmu.ac.in/10176.
48. Abishek K, Bakshi SS, Bhavanani AB et al. The Efficacy of Yogic Breathing Exercise Bhramari Pranayama in Relieving Symptoms of Chronic Rhinosinusitis. Int J Yoga 2019 ; 12(2): 120–123 .
49. Agnihotri S, Kant S,Verma1VK et al.Role of Jalaneti and Pranayama in Allergic Rhinitis with Asthma.International Journal of Yoga - Philosophy Psychology and Parapsychology 2018;IP 47.8.222.131.
50. Sethi BB ,Trivedi JK, Anand R et al.A Comparative study of relative effectiveness of biofeedback and Shavasana (yoga) in tension headache. Indian J. Psychiat 1981; 23(2): 109-114.
51. Anheyer D , Klose P , Lauche R et al. Yoga for Treating Headaches: a Systematic Review and Meta-analysis. J Gen Intern Med 2020 ;35(3):846-854.
52. John PJ, Sharma N, Chandra M et al. Effectiveness of Yoga Therapy in the Treatment of Migraine without Aura: A Randomized Controlled Trial. American Headache Society Published by Blackwell Publishing 2007; doi: 10.1111/j.1526-4610.2007.00789.
53. Kisan R, Sujan MU, Adoor M et al. Effect of Yoga on migraine: A comprehensive study using clinical profile and cardiac autonomic functions. Int J Yoga. 2014 ; 7(2): 126–132.
54. Kim.S.D. Effects of yoga exercises for headaches: a systematic review of randomized controlled trials. J Phys Ther Sci. 2015 ; 27(7): 2377–2380.

55. Gopinathan G, Dhiman KS, Manjusha R et al. A clinical study to evaluate the efficacy of *Trataka Yoga Kriya* and eye exercises (non-pharmocological methods) in the management of *Timira* (Ammetropia and Presbyopia). Ayu 2012 Oct-Dec; 33(4): 543–546.
56. Telles S, Naveen KV, Dash M et al. Effect of yoga on self-rated visual discomfort in computer users. Head & Face Medicine 2006; 2:46 doi:10. 1186/1746-160X-2-46.
57. Chandran R, Rajan G, Reddy KVR et al.Influence of Cleansing Technique (Neti) on Allergic Rhinitis, Common Cold and Sinusitis. Tradi Med Clin Natur 2016 5:e121. doi:10.4172/2167-1206.1000e121.
58. Balakrishnan R, Nanjundaiah MR, Manjunath KN et al. Voluntarily induced vomiting – A yoga technique to enhance pulmonary functions in healthy humans. J Ayurveda Integr Med 2018 ; 9(3): 213–216.
59. Kuttner L, Chambers CT, Hardial J et al. Randomized trial of yoga for adolescents with irritable bowel syndrome. Pain Res Manage 2006; 11(4):217-223.
60. Kavuri V, Selvan P, Malamud A et al. Remedial yoga module remarkably improves symptoms in irritable bowel syndrome patients: A 12-week randomized controlled trial, European Journal of Integrative Medicine 2015; 7 : 595–608.
61. Singh S, Tripathi JS, Rai NP . Potential application of yoga therapy in psoriasis.World journal of pharmacy and pharmaceutical sciences 2015; 4(10): 1959-1966**.**
62. Ramya R, An open clinical trial of psoriasis with Siddha (Herbal) medicine and Yoga Therapy. J Yoga Phys Ther 2018; 8 OI: 10.4172/2157-7595-C1-003.
63. Prabhavananda S. Patanjali Yoga Sutra. Madras: Sri Ramakrishna Matha; 2001.
64. Tripathi HP. Swatmarams' Hatha Yoga Pradeepika Hindi Translation. Mumbai: Shri Krishnadas Publication; 2006.
65. Singh VP, Khandelwal B. Effect of yoga and exercise on glycemic control and psychosocial parameters in type 2 diabetes mellitus: A randomized controlled study. Int J Yoga *2020* ;13:144-51.
66. Venkatesh HNV, Ravish H ,Silvia CRWD et al.Molecular Signature of the Immune Response to Yoga Therapy in Stress-related Chronic Disease Conditions: An Insight. International Journal of Yoga 2020;13 (1):9-17.
67. Sharma R, Gupta N, Bijlani RL. Effect of yoga based lifestyle intervention on subjective well-being. Indian J Physiol Pharmacol 2008; 52 (2) : 123–131.
68. Sarvottam K, Yadav RK.Obesity-related inflammation & cardiovascular disease: efficacy of a yoga-based lifestyle intervention.Indian J Med Res 2004, 139(6):822-34.
69. Haider T, Sharma M, Branscum PJ.Yoga as an Alternative and Complimentary Therapy for Cardiovascular Disease: A Systematic Review. Evid Based Complementary Altern Med. 2017; 22(2):310-316.
70. Sarvottam K , Magan D, Yadav RK et al. Adiponectin, interleukin-6, and cardiovascular disease risk factors are modified by a short-term yoga-based lifestyle intervention in overweight and obese men. J Altern Complement Med 2013; 19(5):397-402.
71. Gupta N, Khera S, Vempati RP et al. Effect of yoga based lifestyle intervention on state and trait anxiety. Indian J Physiol Pharmacol 2006; 50 (1) : 41–47.
72. Dhungel KU, Malhotra V, Sarkar D et al. Effect of alternate nostril breathing exercise on cardiorespiratory functions. Nepal Med Coll J 2008; 10 (1): 25-27.
73. Khalsa SSD.Patient perspectives: Kundalini yoga meditation techniques for psycho-oncology and as potential therapies for cancer.2005;4(1):87-100.
74. Yagli NV , Ulger O,The effects of yoga on the quality of life and depression in elderly breast cancer patients. Complement Ther Clin Pract 2015; 21(1):7-10.
75. Buffart LM, Jannique GZ, Uffelen V et al. Physical and psychosocial benefits of yoga in cancer patients and survivors, a systematic review and meta-analysis of randomized controlled trials. BMC Cancer 2012. [Internet] available at http://www.biomedcentral.com/1471-2407/12/559.
76. Reed CNS , Carlson LE, Daroux LM et al. A pilot study of yoga for breast cancer survivors: physical and psychological benefits. 2006 Oct; 15(10):891-897.
77. Armer JS, Lutgendorf SK.The Impact of Yoga on Fatigue in Cancer Survivorship: A Meta-Analysis JNCI Cancer Spectrum

2020; 4(2): pkz098, doi: 10.1093/jncics/pkz09
78. Bartlett SJ, Haaz S, Mill C et al.Yoga in Rheumatic Diseases**.** Curr Rheumatol Rep. 2013; 15(12): 387.
79. Nagarathna R,Tyagi R, Kaur Get et al. Efficacy of a Validated Yoga Protocol on Dyslipidemia in Diabetes Patients: NMB-2017 India Trial. Medicines. 2019; 6 (100): doi:10.3390/medicines6040100[Internet] available at www.mdpi.com/journal/medicines
80. Hagins M, States R, Selfe T et al.Effectiveness of Yoga for Hypertension: Systematic Review and Meta-Analysis. Hindawi Publishing Corporation Evidence-Based Complementary and Alternative Medicine 2013; [Internet] available at http://dx.doi.org/10.1155/2013/649836
81. Mekonnen D, Andualem, Mossie. Clinical Effects of Yoga on Asthmatic Patients.Ethiopian journal of health sciences 2010;20 :107-112.
82. Malhotra V , Singh S, Singh KP et al.Study of yoga asanas in assessment of pulmonary function in NIDDM patients. Indian J Physiol Pharmacol 2002; 46(3):313-320.
83. Soni R, Munish K, Singh KP et al.Study of the effect of yoga training on diffusion capacity in chronic obstructive pulmonary disease patients: A controlled trial. Int J Yoga 2012 ; 5(2): 123–127.
84. Liu XC , Pan L, Hu Q et al. Effects of yoga training in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. Journal of Thoracic Disease 2014 ; 6(6):795-802.
85. Katiyar SK, Bihari S. Role of Pranayama in Rehabilitation of COPD patients - a Randomized Controlled Study.Indian J Allergy Asthma Immunol 2006; 20(2) : 98-104.
86. Gupta A, Gupta R, Sood S et al. *Pranayam* for Treatment of Chronic Obstructive Pulmonary Disease: Results From a Randomized, Controlled Trial. Integr Med (Encinitas). 2014 ; 13(1): 26–31.
87. Yadav RK , Magan D, Mehta N et al. Efficacy of a short-term yoga-based lifestyle intervention in reducing stress and inflammation: preliminary results. J Altern Complement Med. 2012 ;18(7):662-667.

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