



IMPACT OF NUTRITIONAL INTERVENTION ON IMMUNITY & THE INCIDENCES OF COVID -19

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ABSTRACT

The text in this publication looks at the current situation of the COVID-19 disease and how nutrition may be helpful in aiding recovery and prevention of the deadly disease. 5th January 2022, 00:00GMT has seen over 29.5 Cr cases of the viral disease. With no possible cure, the publication was aimed at reviewing how state of immunity affects the spread of COVID-10 disease and how immunity can be improved through means of nutrition. The publication looks at the rather limited reliable sources of information on COVID-19 disease and SARS-CoV-2 virus and what affects their spread. It was found that immunity plays a role in curbing the uncontrolled spread of the virus and in combating the same when it has entered the body. Few foods and nutrients supporting the same were also enlisted. Aimed at studying the effect of immunity and foods that boost immunity on SARS-CoV-2 virus, the study successfully concludes in controlling the spread of the disease, while studying nutrients and foods that help in boosting the immune system, which in turn helps to recover from as well as prevent the disease from happening.

KEYWORDS : Covid-19, Diet, Herbs, Immunity and Nutrition.

INTRODUCTION

A new, never known before type of viral pneumonia, found to be alarmingly contagious broke out in the Wuhan city of the people's republic of China in December 2019. Its identification has since been done and it has been called a zoonotic virus, or a virus that has originated from animals and has found its way to mankind. It has been ranked similar to SARS coronavirus and MERS coronavirus, nomenclature being done as COVID-19. [1] However, the naming doesn't stop at that. Official names have been concluded for the virus responsible for COVID-19, previously known as "2019 novel coronavirus", as well as for the disease it causes. The disease is named as Coronavirus Disease (COVID-19), whereas the name aptly given to the virus is "Severe Acute Respiratory Syndrome Coronavirus 2", abbreviated as "SARS-CoV-2". [2] With authorities looking into the monitoring as well as possible treatments for the COVID-19 disease frantically, there have already been 29.5 Cr. confirmed cases of the disease as of 00:00GMT, 4 January 2022 worldwide. The casualty toll stands at 54.6 Lakh confirmed deaths, with (5,474,599) 224 countries/areas being affected. [3] COVID-19 disease was named as a PHEIC, or a Public Health Emergency of International Concern on the 30th of January 2020; [4] and went on to further declare it as a pandemic come 11th March 2020. [5] The situations have much worsened since December. Lockdown, a term used for forced quarantine in order to break the chain of the SARS-CoV-2 virus and to prevent the spread of disease, has been implemented in as many as 43 countries; with suspension of movement on roads, in major cities, closing of businesses and airports and both domestic and international travel being ceased in these countries. [6]

With governments in India as well as around the world taking measures in order to contain the spread of the virus, frontline workers have had a major role to play, with their work being two-fold. It is necessary for frontline workers to "spread key messages in the community about measures to prevent the infection" and "take actions for the early detection and referral of suspected COVID-19 cases"; as per an advisory issued by the Ministry of Health & Family Welfare, Government of India. Common symptoms of the COVID-19 disease include fever, dry cough and difficulty in breathing. However, in recent weeks, asymptomatic cases have also been recorded. As per World Health Organization, one of six people, or 16.67% people who are patients of COVID-19 are known to become seriously ill with complications like severe pneumonia, which may only be treatable at higher facilities like multispecialty

private or district hospitals.

Transmission And Prevention Guidelines

As with other viral infections, there are two means of the SARS-CoV-2 virus spreading, namely direct close contact and indirect contact. Direct close contact refers to coming in contact with a person who is affected by the virus, typically within 1 meter range of the person in this context. Infected persons are required to cover their mouths with a tissue while coughing or sneezing. Soiled tissues must be discarded at once and properly. Indirect contact occurs when the droplets containing the viral infection survive on clothes or surfaces for hours, or even days at times. Transmission of this manner may occur if a healthy person comes in contact with such a surface and then touches their mouth, eyes or nose. Incubation period (of a disease) is defined as the time period from when the patient catches the disease/infection till the time he/she starts showing symptoms. The incubation period of COVID-19 disease is calculated at around 14 days. However, it may be longer or shorter, depending upon the health status or immunity of the person infected. Asymptomatic patients can also spread the disease. A higher risk factor is present for people who have travelled to other countries in the recent past as well as their families. People who have travelled to various states inside the country may also be at a higher risk of infection. Another social group very likely to have caught the infection is of the family of those infected with the disease. The elderly are also known to be prone to the disease more than their younger counterparts, due to lower immunity. Also, people with medical issues such as hypertension, respiratory problems, cardiovascular diseases or blockages, diabetes or cancer are posed at a higher risk of contraction of the disease. Multiple practices to be followed are mentioned in advisories issued by various governments, with the most common being social distancing, which means to avoid all mass gatherings like fairs, religious gatherings, functions, etc. When shopping for essentials, it is recommended that one maintains a distance of at least 1 meter from the person standing next to them. Physical contact like handshakes, hand holding and hugs must also be avoided. Also, it is important to avoid touching surfaces whenever possible. Another good practice to follow inside the safety of the respective households of people is to maintain good hygiene, mainly by washing hands, changing clothes after coming home immediately, washing hands before eating or feeding children, etc. While COVID-19 disease has symptoms that are common, it isn't necessary that a person with symptoms is ill with the disease,

thus terminating the need to immediately panic. If the symptoms increase in their severity, then the person must get checked and isolated. Help lines have been established across the world and in India, for information to be passed on in case of a suspected case, or queries. [7]

Respirators, or masks, are also known to be helpful in preventing the spread of the virus. However, in order to curb the problem of shortage of these surgical masks and respirators, it has been said that not everyone in the general public is required to wear them. Only people with a suspicion of the infection and people dealing with infected/suspected cases such as medical professionals and other frontline workers may need to wear these masks or respirators in regular practice. However, the general public must not roam around freely in such times, and may cover their faces with cloth or masks made out of clothes. This will help slow down the spread of virus from infected asymptomatic patients posing innocently and unknowingly as general public, as well as to healthy individuals. Surgical masks are known as loose fitting masks that create physical barrier between the mouth and nose of the wearer and the environment that may contain hazardous contamination. They are available in different thicknesses and abilities in order to prevent the wearer from liquids. Proper wearing of these masks has been known to prevent physical contact with contamination containing agents such as spit, cough droplets and sneezes which may be inclusive of viruses and bacteria in general. However, these masks do not block the smallest of particles and may still allow the passage of some germs to the wearer. The use of surgical masks must be made only once per unit and immediately discarded properly, with minimal human intervention. An N95 respirator, on the contrary, is a very closely fitting device designed to filter even airborne particles. N95 stands for the stringent testing methods that go into the making of these masks, blocking at least 95% of the small particles present in air, as small as 0.3microns. The filtration capabilities of N95 masks are greater than those of surgical masks if worn carefully and properly. In no circumstances must any of the masks, neither N95 nor surgical, be worn by two persons. [8]

Symptoms And Diagnosis

The most common symptom was recorded to be fever, with 88% of confirmed cases having it; closely followed by dry cough, fatigue, and sputum production. Other symptoms with lesser significance include loss of smell, shortness of breath, muscle or joint pain, sore throat, headache, chills, nausea nasal congestion, diarrhoea, haemoptysis (coughing up blood) and pink eyes. [9] Diagnosis of coronavirus disease is done by rRT-PCR, or real-time reverse transcription polymerase chain reaction. [10] The test is done on samples from the respiratory tract/organs. A nasopharyngeal swab may be used to collect the sample. In some cases, sputum sample may be used. Results take a few hours to days. [11] Chest x-rays are of little to no significance when the virus is in its earlier stages. Computed Tomography, or CT scans are much more useful even before the symptoms are seen. [12]

Immunity

Biology defines immunity as a balanced state of organisms that are multi-cellular with adequate defense mechanisms to combat infection, illness or any form of unwanted biological foreign particle entering the system, along with a display of tolerance to avoid autoimmune diseases and allergies. [13] It has been indicated by recent observations that coronaviruses are known to evade detection by immune system and dampen immune responses in humans. This is a possible explanation to their rather longer incubation period, ranging from 2-11 days on an average, as opposed to influenza, which has an incubation period of 1-4 days. [14] It has also been made clear that even though SARS-CoV-2 is a virus new to the human

ecosystem, a stronger immune system across multiple cell types is known to aid clinical recovery in otherwise healthy humans, as also seen in cases of influenza. [15] SARS-CoV-2 is suspected to act primarily on lymphocytes, with an inclination towards T lymphocytes. It induces a cytokine storm in the human body, thus generating a series of responses from the immune system. NLR and lymphocyte subset surveillance helps in the screening of the virus at an early stage, its diagnosis as well as treatment. [16]

Since vaccines aren't available yet, the human immune systems must adapt to the COVID-19 disease and overcome it in an unaided manner. The immune system is known as the defense network of the body that works at multiple levels to fight potentially harmful foreign entrants into the body, which may include viruses and bacteria. A healthier lifestyle is known to help in keeping the immune system fit in order to combat pathogens. However, stopping their entry still remains the best possible defense. Regular moderate exercises, not consuming tobacco, not smoking, controlled or no alcohol consumption and a stress free mind are some of the means that help in keeping the immune system in good shape. [17]

Nutritional status is another factor that affects the combined mechanisms that form the immune system in organisms. A prolonged positive balance of energy consumed versus the energy spent by the body leads to situations like obesity, thus ultimately resulting in negatively influencing specific and unspecific responses of the immune system. Also, evidence is that adipose tissue and immunocompetent cells share a link. This link may be illustrated in the condition of obesity, wherein excess adipose tissues have been linked to impairment of the immune function of human bodies. [19] There are multiple diseases that hamper the functioning of the immune system, such as diabetes, arthritis, AIDS, obesity, etc. Most of these, being lifestyle diseases, are preventable. Obesity is a condition in which the body fat of a person has increased to such an extent that it has adverse negative impacts on the body. BMI or Body Mass Index is considered to be a measure of whether a person is obese or not. BMI is measured in kg/m², with 25-30kg/m² being overweight and 30kg/m² and above being obese. [18] Characteristics specific to obesity include changes in the number of immune cells, their location as well as function. Pro-inflammatory immune cells are also recruited into adipose tissue. An overall inflammatory environment is promoted when these immune cells and adipocytes are recruited to adipose fat stores leading to secretion of pro-inflammatory hormones, chemokines and cytokines; resulting in paracrine and endocrine effects. This has adverse effects on health and promotes insulin resistance, consequently leading to Type-II Diabetes. Autoimmunity is also a risk here, along with impaired or delayed response to infection. There are an estimated 500 million humans worldwide that fall into the category of obese. The altered immune function thus discussed poses a major health problem on a large scale especially in the times when a pandemic is prying. [20]

Energy levels of the body also affect immune responses to a very big extent. Activated T-cells have been found to increase the uptake of glucose as well as aerobic glycolysis in order to function and survive. There is limitation of nutrients in conditions like malnutrition and starvation further associated with deficiencies of the immune system, which ascertains an increased susceptibility to infection. Albeit it is clear that immunity is impaired during times of nutritional stress, the exact mechanisms linking T cell function and systemic nutrition are unclear. [21] For proper efficiency of the defenses of the host organism, an adequate supply as well as balance of nutrients is almost a mandate. Multiple dietary factors have been linked to immune responses by research, such as amino acids, minerals, vitamins and fatty acids. When provision is

made at pharmacological doses, certain nutrients of these are proven to specifically act on immunity. [22]

Dietary Management

Harmful drug interactions must be avoided at all costs. Although there is no cure for COVID-19 disease at the moment, dietary modifications and changes in lifestyle can help boost immunity, thus preventing infection as well as aiding recovery. Complications include obesity and malnutrition. All nutrients in the diet must be kept a check on. The energy intake must be normal and in accordance with Recommended Daily Allowance (RDA). In case of severe impairment of the immunity, energy intake may be increased up to 125%. Calorie requirement remains at 25-30 Kcal per kg body weight per day. Carbohydrates are recommended as the main source of energy, with each gram providing 4 Kcal. Proteins provide 4 Kcal per gram too, whereas fats carry 9 Kcal per gram.

A carbohydrate and protein rich diet is recommended. Foods that are rich in carbohydrates include sweets, sugar, fruits, cereal, vegetables and milk and must be given. Carbohydrates should be provided to the body, intake being 250g or more per day, depending upon the condition of the patient. Protein sparing action is also carried out by carbohydrates along with the provision of energy. Fiber rich diet is prescribed, with an upper limit of dietary fiber being 35g, as higher amounts may provide satiety earlier resulting in overall reduced food intake. Protein intake must be 1g per kg of body weight. For example, if a person weighs 65 kilograms, 65g of protein must be provided per day.

Research has evidence that suggests a decrease in the mortality rate when protein intake is increased adequately. A high fat intake inclusive of saturated fats and Poly Unsaturated Fatty Acids (PUFA) is recommended for patients. Fat should contribute 15-25% of the total calories taken by the patient. Unsaturated fats from sources such as olive oil, nuts, avocados and vegetable oils must be provided in good amounts. Patients show a better tolerance to coconut oil. Omega-3 fatty acids are also necessary for intake.

Micronutrient deficiencies are common. Supplementation should be done. Excessive intake of fat soluble vitamins may cause toxicity and must be avoided at all costs. Thiamine, Niacin, Riboflavin, Folic Acid, Pyridoxine and Vitamins like A, C, D, E, K must be administered. Minerals like magnesium and selenium also need administration. Fluid intake must be checked too. Frequent but small meals must be given.

Natural immune boosters are foods/substances found as such in nature that help to increase the efficiency of the immune system. Some of these foods include green tea (*Camellia sinensis*), garlic (*Allium sativum*), purple coneflower (*Echinacea*), licorice (*Glycyrrhizaglabra*), Black Cumin (*Nigella sativa*), St. John's wort (*Hypericum perforatum*) and *Astragalus*. Protection against various foreign bodies and other menaces is provided by functional ingredients bestowed by nature upon the aforesaid plants. There are multiple modes in which they act, including boosting of the immune system, activating and suppressing immunized cells that are specialized; also interfering in multiple pathways that consequently lead to improvement in immune responses and the defenses. [23]

Antioxidants are used to enhance the immunity in immunity enhancing products, namely Vitamin C, Vitamin E, Selenium and Zinc. They are known to feed on free radicals, thus improving the overall inflammation of a cell. Inflammation in the lining of the intestines is detrimental to the immune response and curbing this inflammation has a positive effect in the direction of boosting the immunity. Inflammation of the intestinal lining hinders the optimum absorption of nutrients.

Proper nutrition is key to attain proper health. It has been shown in two recent studies that Vitamin E and Selenium have benefits in store for immune system in humans. Vitamin E supplementation is known to reduce the risk of infections in the upper respiratory tract, especially in elderly residents in nursing homes. Selenium is known to improve immune system response on cellular levels by increasing the production of interferon gamma along with other cytokines, increase in number of T helper cells as well as an earlier peak in T cell proliferation, as found by researchers. It has also been noted that low levels of selenium in the body leads to impairment of the immune system, thus hampering the ability of the body to combat viruses. Cultured drinks and yogurt are common sources of probiotics along with their immunity enhancing properties. Down-regulation effects (reducing inflammation), Immune enhancing effects (enhancement of the immune function), maturation of immune cells leading to a healthier immune system discouraging development of allergies are some effects observed with the intake on probiotics in the human body. *Echinacea* has been studied to find that it diminishes symptoms of cold as well as flu. Colostrum is termed as the first milk produced by the cow to feed the calf upon birth. It has a high level of components that are bioactive, thought to be beneficial for the immune system. Ingredients in the same are growth factors, immunoglobulins and lactoferrin. [24]

Certain herbs and traditional fruits including *Grifolafrondosa*, *Echinacea purpurea*, *Panaxginseang*, *Nigella sativa*, *astragalusmembranaceus*, *hydrastriscanadensis*, *Curcuma longa*, *Tinosporacardioflora*, *Hyreicumperforatum*, *Androga ohispeniculata*, *Allium sativum* and *Wilhania somnifera* are some select plants that are important from the point of view of immunity. Some phytochemicals and phytoconstituents are known to maintain health better by boosting the immune system as well as reducing inflammations and allergies, along with detoxification action upon contaminants and pollutants, while activating enzymes that do not constrain cell division. Oxidative stress has toxic effects on many organs and speeds up the process of ageing and harms the immune system, which can be prevented by nutritional intervention with some fruits, vegetables and beverages. [25]

CONCLUSION

SARS-CoV-2 is the virus behind the deadly pandemic namely COVID-19. It has accounted for millions of deaths globally and is still escalating at a great pace. Various methods have been followed by nothing is as efficient as increasing immunity. Lifestyle modifications, particularly diet therapy and moderate exercise, lead to improved immunity. Our bodily condition is directly linked with the type, quality, and quantity of the food we eat. Both macro and micro-nutrients help in boosting immunity via different metabolic mechanisms. We should consume a proper blend of all the nutrients to keep diseases at bay. Micro-nutrients, in particular vitamin A, B6, B12, C, D, E, Iron, Zinc, Selenium, Magnesium, and Copper have a direct role in enhancing the immune response of the body and helps in a speedy recovery from infections. Low carbohydrate and fat diet along with high protein diet have an immunomodulatory action on our body.

Overburdening the body with prolonged physical stress in the form of exercise is also linked to depression in the function of immune cells. Inadequate and improper nutrition can further the negative influence of this exertion on competence of the immune defenses. Immune dysfunction has been accounted for by prolonged dietary deficiencies of protein and some micronutrients. Adequate amount of certain nutrients being taken is important for immune function, which includes Iron, Vitamin E, Vitamin B12, Vitamin B6 and Zinc; however, excessive intake of certain nutrients may also have an opposite effect and impair immune function along with other

negative impacts on health. Immune system is known to be affected due to excessive intake of fat. [26] Foods that must be included in the diet are milk, fruits, vegetables, figs, coconut, berries, avocados, turnips, green peas, beans, seeds, and nuts. Fiber rich foods like besan, quinoa, oats and lotus stem are known to be useful. Certain foods must also be avoided, with the likes of packed foods, non-vegetarian foods, canned foods, alcohol, and fried food. Herbs are also known to help in reduction of complications from the disease and aid recovery, along with the diet. Herbs such as they may be administered to strengthen the immune system.

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