

Balancing Immune System

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Abstract

The immigrant community in temperate climate zones from tropical or subtropical countries is observed to have a higher infection rate of COVID-19. This finding has posed many questions about the vulnerability factors of ethnic minority members to COVID-19 and many unconfirmed views are in circulation. Environmental factors appear to be the chief orchestrator of this anomaly. The recent findings about the durability of COVID-19 antibodies in the infected people has put some concerns about the prospects of long-term immunisation methods. Safe immunisation, effective medications to block the cytokine storm responsible for the complications of COVID-19 are sure ways of combatting the current pandemic, but these might take some time to come into reality. So, another option to deal with the toxic pathogen is optimising our immunity which in itself is another dimension of surviving the pandemic. It seems to be a neglected or forgotten aspect of combatting the pandemic. There ought to be more public and political awareness of harmonizing immunity. Adherents of integrated medicine seem to have more awareness of different facets of immunity and they go beyond the conventional methods. According to the principles of integrated medicine, there may also be an extra-physiological immunity that can be brought into action in times of physiological crisis.

Keywords: immunity, diet, sleep, exercise, destressing, abstinence, homeostasis

Introduction

World COVID-19 cases exceed 20 million as of today and the number of deaths surpass 733103. Behind these statistics is a great deal of pain and suffering. It is now increasingly getting recognized that COVID-19 is not just a respiratory disease at all. The face of COVID-19 is changing from a pulmonary disease to an inflammatory disease which particularly affects the blood vessels, the coronary vessels, the kidneys, the liver, brain and elsewhere. Its duration is also much longer with long term impact than initially speculated. Sufferers report a huge spectrum of problems beyond the three NHS-approved symptoms (persistent cough, fever and loss of taste or smell). These include fatigue, breathlessness, muscle aches, joint pain, 'brain fog,' memory loss, lack of concentration, and depression.

More morbidity is recognised in cases of infections among the aged populations and patients with suppressed immunity. The high incidence of complications among ethnic minority apparently points toward environmental factors of immunity rather than genetic factors. Underactive immune responses in cooler temperature and diminished synthesis of vit D and the genetic factors linked with these anomalies might explain only part of the higher incidence of COVID-19 among Black, Asian, and Minority Ethnic (BAME) communities.

Research on the first British patients to contract COVID-19 has shown that BAME people are more prone to critical impacts and care compared to white people. This research, conducted by the Intensive Care National Audit and Research Centre, observed that of nearly 2,000 COVID-19 patients, 35% were non-white, though people of BAME heritage only comprise 13% of the UK's population.¹ The study included

data drawn from 286 critical care units across the UK and collected until 3 April 2020. According to another study from the UCL Institute for Global Health, Bangladeshi, Pakistani, Indian, Black African and Black Caribbean ethnic groups all had a substantially increased risk of death in comparison to white British and white Irish groups. Cook et al. pinpointed that of 119 NHS staff who died from COVID-19, 64 were from ethnic minority backgrounds.² They also noted fewer deaths among critical care staff, highlighting PPE's usefulness.

The UK BAME population's mortality rate for the 2009 influenza A (H1N1) epidemic was nearly twice that of the white population.³ The Pakistani and Bangladeshi ethnic groups are now 1.8 times more likely to have a COVID-19-related morbidity than white males of a similar age, when other sociodemographic and health characteristics were compared.⁴ Studies have also specified that Black men are 4.2 and Black women 4.3 times more likely to die from a COVID-19-related death than white people.⁵ Doherty et al. suggested that socioeconomic disadvantages and other circumstances only partially explicate this discrepancy, and that there are missing gaps that have not yet been expounded.⁶

There is some confusion regarding the cause of this higher incidence of morbidity and mortality among the BAME community, due to media propaganda failing to assess this relation's intricacies. Higher morbidity and mortality have been observed among first-generation migrants to the UK, but not necessarily among the second generation, who were born and raised in the UK. Five months is a short period to develop any form of genetic immunity or susceptibility to a new viral infection. Each person's genetic code differs only by 1% of

25,000 genes. The gene cluster largely responsible for our health is called the human leukocyte antigen (HLA), also known as the major histocompatibility complex (MHC). It also takes much longer for any sort of adaptation or mutation to occur. Suppressed general immunity due to various factors appears to be the main reason for the higher COVID-19 incidence among the BAME population. The following discussion examines the possible factors responsible for this anomaly.

a. Immunity and Temperature

Some data has suggested that immune cells are more active in higher temperatures, as supported by the fact that fevers are a bodily mechanism activated by the immune system to defend against pathogens. It has been established that if the body temperature is increased by 1°C, immunity instantly increases 5–6 times. Likewise, if the body temperature is reduced by 1°C, immunity decreases 5–6 times. This observation has some value in explaining the higher incidence of COVID-19 infection and mortality among BAME groups who were born and raised in warmer areas, then migrated to colder regions.

Temperature-dependent immune responses are linked to genetics. One probable explanation is that BAME individuals' immune cells are genetically wired to function better in hot weather and are unable to optimally function in cold weather. Such a genetically determined immunological build-up means that their immune cells are slow to react to viral invaders. BAME individuals' immune cells are well-adapted to warm weather but not so to cold weather, in comparison to white individuals who were born and raised in colder climates and adapted to lower temperatures. BAME individuals' immune cells may even become underactive in cold weather. Though COVID-19 thrives equally well in hot and cold weather, the BAME population has immunity shortcomings in surviving colder months; this insight might prompt them to take special precautions in future cold seasons.

Low temperatures have been recognized as immunosuppressive. It has been observed that even coldblooded animals migrate to warmer places when they become ill. An increase in body temperature has long been a defence mechanism against infection and inflammation. The generation and differentiation of the lymphocytes CD8+ cytotoxic T-cells are enhanced by hyperthermia. Elevated body temperature changes T-cells' membranes, which may help mediate micro-environmental temperature's effects on cell function. Sub-thermoneutral laboratory housing temperature was shown to induce immunosuppression in mice experiments: when the mice were housed at a thermoneutral ambient temperature, striking reductions in tumour formation, growth rate and metastasis were observed.⁷

Mice experiments with antigens demonstrated that mice with antigen-induced raised temperatures showed a greater number of the CD8 T-cells capable of destroying infected

cells.^{8,9} Parallels were observed in teleost fish.¹⁰ Higher temperatures also seem to interfere with microbe replication. This is particularly noticeable when a host has a high fever and their immune system temporarily enhances as their temperature rises. Hong Kong's persistent cold weather was attributed to the rapid spread of SARS in 2003. BAME communities whose immune mechanisms are genetically evolved for survival in higher temperatures are compromised in Western countries' lower temperatures. The cold weather puts additional stress on their immune cells, which give in to viral invaders.

This argument is further supported by the spread of the flu. During flu season, immune cells become less efficient and flu viruses, unaffected by low temperatures, are in an advantageous position to defeat these cells. Such a hypothesis explains the higher incidence of flu in the winter and challenges the misconception that the flu virus is killed by hot weather and thrives in cold weather. The 1918 Spanish flu that broke out in the United States in the winter seemed to ease off during the summer, but returned with a deadlier strain in the autumn, and a third wave followed the next year. The problem then seems to be in humans, as viruses are unaffected by seasonal temperature variations.

b. Diminished Vitamin D Synthesis

Other mitigating factors can explain the higher COVID-19 incidence among BAME people. Nearly all immune cells have vitamin D receptors that connect to vitamin D networks in the immune system. Vitamin D helps regulate both the innate and adaptive immune systems, and is critical for balancing immune function. Vitamin D has been demonstrated to reduce the production of pro-inflammatory cytokines associated with lung damage caused by acute viral respiratory infections, such as influenza and COVID-19.¹¹ BAME communities are prone to vitamin D deficiency because higher melanin levels in their skin cause lower vitamin D absorption. Consequently, prolonged exposure to sunlight is required to accrue the equivalent vitamin D quantity produced in the white population. This is further exacerbated in colder countries like the UK, which see less sunlight, meaning BAME individuals spend more time indoors without much opportunity to absorb vitamin D. So, there may be a connection between lower vitamin D levels and more frequent COVID-19 cases in BAME communities, though there is no firm data defending this link.

Virtually all immune cells have vitamin D receptors, indicating vitamin D interacts with the immune system. Vitamin D is required to regulate both the innate and adaptive immune systems and its deficiency is associated with immune dysregulation. Many of the ways this vitamin affects the immune system are directly relevant to the body's ability to defend against viruses. For example, vitamin D triggers the production of cathelicidin and other defensins, which are natural antivirals capable of preventing viruses from replicating and entering cells. Vitamin D also increases the number of CD8+ T-cells, which play a critical role in clearing acute viral

infections in the lungs. Further, vitamin D suppresses pro-inflammatory cytokines and may also alleviate the cytokine storms occurring in the most severe COVID-19 cases. This vitamin plays an essential role as well in glucose homeostasis, insulin sensitivity and the regulation of adipokines, such as leptin and inflammatory cytokines.¹²

Evidence from randomized controlled trials suggested that regular vitamin D supplements may help protect against acute respiratory infections. Admittedly, the direct evidence of vitamin D's role against COVID-19 is still scant. One study from the United States and another from Asia found a strong correlation between low vitamin D and severe COVID-19 infection. It is well-recognized that the elderly and people with pre-existing conditions are more vulnerable to COVID-19. Notably, people with existing medical conditions are also often vitamin D-deficient. Studies assessing ICU patients have reported these patients' low vitamin D levels even before COVID-19. It appears logical to hypothesize a link between the high COVID-19 infection rates in UK and US BAME groups and their observed lower vitamin D levels. Moreover, it is not possible to gain a sufficient vitamin D supply through food alone, making exposure to sunlight indispensable.

c. Weakened Immunity

COVID-19's spread in the UK is disproportionately high compared to its spread in the countries of origin of many BAME communities. BAME people should be mindful of their genetics in a new environment. These demographics also have higher rates of cardiovascular disease, type-2 diabetes and hypertension, conditions that have been linked to severe COVID-19 symptoms and complications. There may also be other genetic links that warrant further exploration.

Current evidence has illustrated that chronic stress can increase infection susceptibility by suppressing the T-helper 1 immune response in favour of the T-helper 2 immune response.⁴⁰ Stress management, lifestyle changes and career management may reduce infection susceptibility in turn. When people are less mobile, food becomes a distraction and they can overindulge. Obesity is also an adaptation to cold weather, as fat protects against low temperatures. Black and South Asian populations in the UK have 3–5 times the prevalence of type-2 diabetes compared to the white population and are diagnosed 10–12 years sooner on average.¹³

Human immunity is generally fixed by age 5, as contributed to by bacterial flora, among other factors. Several trillion bacteria exist within our body, with the gut considered this bacterial colony's front yard. We have 25,000 genes, but up to 3 million bacterial flora genes are the real immune cell trainers.¹⁴ Bacterial worlds came into existence well before humans evolved. When people migrated to Western countries from tropical regions, their bacteria had to adjust to their host's new lifestyle, with some even replaced. Others may not have survived at all; consequently, these individuals' immunity may have weakened.

The high incidence of diabetes and coronary heart disease in the British Asian population has been well-recognized, along with many other risk factors and comorbidities, including obesity, chronic obstructive pulmonary disease, chronic kidney disease, hypertension, and age. These may partly account for this population's increased COVID-19 mortality^{15,16}, but warrant further exploration. Vitamin D level is also likely to drop with rising BMI and age.¹⁷ Obesity is strongly associated with vitamin 19-22D deficiency.¹⁸ Admittedly, there are weaknesses in these data collections and interpretations, which are theoretical speculations yet to be confirmed, modified or falsified.

There are diverse genetically linked immune responses in a given population, and the spread and survival of complications in a pandemic like this are not well-defined. Research has suggested that people living in close communities, like certain regions of Lombardy, Italy, have a poor genetically linked immune response to COVID-19. Like our fingerprints, immunity genetics contribute to our physical identity, but our immunity is not permanently fixed by genetics. There thus remain many unknowns in immunity research.

It is now increasingly recognized that immune ageing and organismal ageing are intimately inter-related. Aging weakens the immune system and immunity decline further accelerates the aging process. Immune system protects the individuals against viruses and bacteria and it also helps identify and remove cancer cells and toxins. The potential for these elements to cause damage in the body increases as age advances. Critical cells in the immune system decrease in number and become less functional as people get older. COVID-19 affects seriously the aging people of the BAME community as in the case of general population, but they are more disadvantaged in terms of health care access.

d. Social Factors

Alongside these factors, many BAME individuals work in fields that carry a high risk of infection, such as healthcare, transport services and retail. In the UK, 40% of doctors, 20% of nurses and a large number of social care and unskilled migrant workers belong to BAME backgrounds. Another reason why these infections may become more prevalent among ethnic minorities is that BAME community members tend to spend more time indoors clustered together, often in cramped accommodations, which increases the likelihood of person-to-person transmission. A multigenerational family set-up is not helpful either to social distancing in a pandemic, so this lifestyle could contribute to higher infection rates. Some people living in this arrangement may also become stressed and obese due to unhealthy nourishment.

Migrant communities tend to visit and keep in contact with their country of origin, which involve international air travel and thus increased infection risk. Family studies demonstrate that BAME people living in the colder countries develop COVID-19 at a faster rate, but most of their family members

living in the tropical climate in the countries of birth are spared from the infection. Such an observation point towards extrinsic factors like lifestyle and weather conditions rather than intrinsic genetic links-nurture than genetics. The second-generation immigrant population are less affected and the mixed-race individuals because of diversity of immune cells appear more resilient to the viral pandemic. There appears to exist an epidemiological trend of transmission concentrations within BAME communities living in colder countries, such a situation runs the risk of racial stigmatisation and discrimination and also risks to social cohesion.

BAME individuals should be cognizant of the additional risks and take preventive and precautionary measures. They should also adapt to balance their immunity. Enough sleep, healthy diet, moderate exercise, abstaining from excess alcohol and smoking and de-stressing are the cornerstones of enhancing immunity. Immunity is not absence of a specific disease or illness; rather, it is a balanced physiological and psychological state, the most sophisticated and elegant system of human physiology. Vaccines are pathogen-specific, and they do not bestow an overall balanced immunity.

Supporting Immunity

To defeat the tiger, one may need to become stronger than the tiger. To do this with COVID-19, we may need to foster our existing immune system, which can be done in many subtle ways. We all must grapple with the unprecedented threat posed by COVID-19, and frontline health workers must be mindful of their own immune systems when advising their patients to do the same. Unreasonable fear of COVID-19 only weakens the immune system, and fear attracts that which is feared. According to many COVID-19 survivors, remaining positive is a crucial factor in combatting this illness. Knowledge about the enemy and our potential resources lessens fears and helps us to plan strategies to defeat the adversary. With a quarter of the world's population in the grip of COVID-19, it is a highly challenging period to learn to survive and strengthen our body and mind and enhance our immune system, even using the wisdom of unconventional medicines and faith traditions. We will have to battle with this invisible enemy until an effective vaccine is identified. Anything that fosters self-immunity should be encouraged in this time of a global medical emergency.

The two functions of immune system are defending the body's health and maintaining health. The immune system is depicted as having two components: the innate and adaptive immune responses. The innate system is the more primitive and less specific. It is the body's first line of defence against foreign substances that may lead to disease. The adaptive system, found only in vertebrates, is a much more specific, delayed response and requires sanction from the innate system to be instigated. Though considered separate, each interacts with the other in critical and complex manner. A basic understanding of both responses facilitates to clarify and further substantiate the significance of immune balance.

There are many myths surrounding immunity enhancement. Enrichment of the immune system is possible so that it becomes vigilant and active in the event of an invasion by pathogens and it may possibly prevent immunity anomalies. It is defending the defenders of the body. Immune system is our protective shield. Metaphorically, immune cells are the guardian angels of the body. Balancing of immunity can be achieved by focussing on ample sleep, healthy diet, moderate exercise, weight monitoring, restricting alcohol, free of smoking and destressing. In the nutshell, it warrants lifestyle changes- one size may not fit all and immune balancing has to be adjusted on an individual basis.

a. Restful Sleep

One healthy habit vital to preventing sickness is getting a full eight hours of sleep each night, which may help regulate immune function.¹⁹ Studies reveal that people who are deprived of quality sleep are more likely to get sick after being exposed to a virus. Respiratory infection has been linked to poor sleep.²⁰ One study of over 22,000 people, for example, found that those who slept less than six hours per night or had a sleep disorder were more likely to suffer colds and other respiratory infections.²¹ Lack of sleep can affect immune system adversely.

During sleep, immune system releases cytokines, some of which even help promote sleep. Certain cytokines need to increase during an infection, or under stress. Sleep deprivation may decrease production of these protective cytokines. In addition, infection-fighting antibodies and cells are reduced during periods when person is deprived of ample sleep. Sleep and the circadian system are strong regulators of immunological processes.²² There is a bidirectional communication between CNS and immune system. This is mediated by shared signals though neurotransmitters, hormones and cytokines and direct innervations of the immune system by the autonomic nervous system. Differentiated immune cells with immediate effect or functions, like cytotoxic NK cells and terminally differentiated CTL, peak during the wake period.²³ These chemicals permit an efficient and fast combat of obtrusive antigens and reparation of tissue damage. The more slowly evolving adaptive immune response is initiated during nocturnal sleep and undifferentiated or less differentiated cells like naïve and central memory T cells peak during the night.

It is during sleep, the immune system heals, repairs, and prepares for the challenges of wakeful periods. During the deep stages of NREM sleep, the body repairs and recuperates, and this deep sleep also reinforces immunological memories of previous pathogens.²³ The endocrine milieu during early sleep critically supports (a) the interaction between APC and T cells, as evidenced by an enhanced production of IL-12, (b) a shift of the Th1/Th2 cytokine balance towards Th1 cytokines and (c) an increase in Th cell proliferation and (d) probably also facilitates the migration of naïve T cells to lymph nodes.²² A feeling of lethargy when fighting an infection may be a signal from the body—which produces chemicals that act on the

brain—to sleep, so that the body can recover. A single night of poor sleep can lead to a dramatic reduction in NK cells, the first line of defence against viruses and cancer cells, which negatively impacts other immune cells.

b. Nutrition

The size of the inoculum, the virulence of the exposure, the immune response of the host, and the health of the host are the four vulnerability factors of an infection. The former three ingredients are beyond the control of the host and the fourth one is within the control of the host and is very much based on the nutritional status. Food is generally viewed in terms of calories, but nutritionists have started appreciating the noncaloric micronutrients in the food, including those that are neither vitamins nor minerals, but phytochemicals (plant-chemicals) that strengthen and support normal immune function. The recent research discovery that food is not only a calorie supplier, but also adds to disease resistance and longevity benefits, has rekindled an interest in phytochemicals that support defensive and self-reparative functions. Modern diet consists of processed food mixed with additives, colouring agents, and preservatives; there is no room for unrefined vegetables in the dietary pie. Nutritional excellence can be achieved through green vegetations and fruits.

Antioxidants are vitamins, minerals and phytochemicals that support the clearance of free radicals and controlling its production in the body. Free radicals are molecules that contain an unpaired electron which causes them to be highly chemically reactive and these unstable molecules are destructive as they come in contact with structures and other molecules within the cells.²⁴ Antioxidants are the natural enemy of free radicals which creates inflammation leading to dysfunctional immune system and to premature aging. Vitamin C, E, folate, selenium, and alpha and beta-carotene, as well as various other phytochemicals have antioxidant properties. They are available in plentiful amounts in vegetables and fruits and consumption of them enhances the immune functions. The Namboothiri caste of Kerala are famous for their strict vegetarian dietary habits and disease-free life, and longevity. The nutritional status of the host is critical in permitting or prophylaxis against viral and bacterial infections as well as the nutritional deficiencies in the host allow mutation of viruses into more lethal forms.²⁴ This is evident in the meat-eating food markets where the SARS-Cov-2 initially began to breed and mutate.

Pro-inflammatory foods can sabotage the immune system and should thus be checked in its quantity of consumption. Thirty minutes after they are consumed, carbohydrates may begin suppressing the immune system, and this effect may last for up to five hours. Foods with extreme diuretic properties also have detrimental effects on the immune system, which functions better when well hydrated. Drinking plenty of water facilitates efficient cell operation and allows the body to process food and eliminate waste. Following a diet rich in antioxidants is also essential to supporting the immune system, so eating fruits and

vegetables is recommended. Fruits and vegetables are rich in antioxidants that combat free radicals—chemical by-products known to damage DNA and suppress the immune system.²⁵ Choosing healthy fats—such as the omega-3 fatty acids found in oily fish, flaxseed and krill oil—over the saturated fats found in meat and dairy products is generally recommended by health authorities. These oils may help increase the body's production of compounds involved in regulating immunity.²⁶

Dietary supplements and medicines may be required for people who suffer from micronutrient deficiencies. Vitamin D is linked with a healthy immune system, and a large body of well-established data highlights its antiviral effects; it not only directly interferes with viral replication but also has immunomodulatory and anti-inflammatory effects.²⁷⁻²⁹ A research study in the U.S. suggests that having low levels of vitamin D doubles the risk of death due to heart attack compared to having higher levels.³⁰ It is therefore recommended that all UK citizens take a vitamin D supplement between October and March to help maintain healthy levels during less sunny months. Such supplements are available in several forms, including capsules, sublingual sprays, and liquid drops, that are usually oil-based, as the vitamin is fat-soluble.

Nutritional excellence is in one's own individual control. An over-boosted immune system, however, can lead to autoimmune reactions, so it is important to balance supplements and not over-boost. Moreover, vitamin D toxicity can cause hypercalcemia, which may lead to excess calcium deposits in the kidneys, lungs, or heart. A well-balanced diet is crucial in balancing immunity. An ideal immunity diet maintains caloric balance and consists of healthy fats, phytonutrients, fibre, quality carbs and diverse protein sources. Multiple micronutrients, including lutein, lycopene, folate, bioflavonoids, riboflavin, zinc, selenium, and many others have immune modulating functions.³¹ In general, the Mediterranean diet pattern has been praised as anti-inflammatory and good for fortifying immunity.³² The Mediterranean diet is associated with older age, as well as increased activity and reduced stress

c. Hygiene

Simply keeping the hands clean is one of the best ways to ward off illness, according to the Centres for Disease Control and Prevention (CDC). By washing the hands for 20 seconds using warm water and soap before preparing food or eating, as well as after coughing, sneezing, using the bathroom, or touching public surfaces can prevent the invasion of several pathogens. Hygiene hypothesis in medicine is quite often misinterpreted and misunderstood. It does not suggest that having more infections during childhood would be an overall benefit.

The hygiene hypothesis promulgates the view that early childhood exposure to particular microorganisms such as the gut flora and helminth parasites shields against allergic diseases by contributing to the maturation of the immune system. Lack

of exposure is thought to lead to defects in the establishment of immune tolerance. The time period for exposure to microbes commences in utero and probably terminates at school age.

d. In Praise of Microbes and Nature

The preindustrial lifestyle that made available for the daily intake of trillions of friendly microbes is now replaced by a world of sanitisers and wet wipes. Alternative medicine takes into account the friendly bacterial flora inhabiting human body and we ought to be mindful of their role in balancing immunity. Even though humans are controlled by 25000 genes, the genes of the microbes cohabiting with ours are taken into account, it would be more than 3 million. In fact, these genes of the microbes are the immunity trainers and coaches of human immunological genes. Conventional medicine also takes into account the existence of intestinal microbes and their role in health and illness. Approximately, 95 percent of the total number of cells in the human body are constituted by these GI tract microflora and play a prominent role in the health of our immune system. In fact, these guts bacterial flora is the meeting point of alternative medicine and modern medicine.³³

The intestinal microflora serve several useful functions that may include the supplementation of the digestive process, produce vitamins, short-chain fatty acids, protect against the overgrowth of pathogenic bacteria and yeasts, strengthen immune abilities and generate beneficial nutrients that stop weight gain.²⁴ Pathogenic bacteria, on the other hand, produce toxic substances, become bacterial invaders, cause digestive disturbances, trigger immune system dysfunctions, and even stimulate weight gain.

Modern urban life is at a low level on microbial variety and has poor contact with helpful environmental microbes.³⁴ Asthma and allergies are found to be much less among children brought up in farm and drunk farm milk.³⁵ People living in urban areas are more susceptible to allergies and inflammatory diseases. Children exposed to outdoor microbes have more robust immunity. Obese people with 30% fewer intestinal microbes tend to gain more weight.³⁶

People should enjoy the smell of green grasses and appreciate the healing powers of mother nature. Ecopsychology, which is the study that explores the connection between the world of nature and the world of humans, is a new branch of psychology. Studies have revealed that spending some time outdoors, in the nature, can actually reduce stress, as well as improve our overall emotions and feelings of happiness and wellbeing, raise the levels of energy, and enhance immunity. It is healthier to do exercises outdoors than indoors. A lifestyle admirably adapted to mother nature alone can guarantee robust mental and physical health.

e. Antibiotic Overuse

Research findings suggest that antibiotic abuse can result in damage to the immune system, and memory problems caused

by a lack of growth in new brain cells. Overusing antibiotics, which happens when antibiotics are overprescribed or prescribed inappropriately, has many negative outcomes. In the first place there is no relief of symptoms or rationale in prescribing antibiotics for a viral rather than bacterial infection. It results in disruption of the normal, healthy flora in the digestive system, which can take nearly two years to correct and lead to other infections. Antimicrobial resistance is another established complication of overprescribing antibiotics. Antibacterial adverse effects are attributed to 25% of all drug reactions in hospital patients.³⁷

Even a single course of antibiotics has a detrimental effect on the gut flora and can result in harmful alterations in the composition and diversity of gut flora disrupting ecosystem.³⁸ Antibiotic exposure in children have long standing impact on the health and is linked with increased risk of immune system disorders. Antibiotic induced autoimmunity has been reported. Low levels of antibiotic administration lead to fatter mice by up to 40%.³⁹

f. Physical Activity

To enjoy a good night sleep, one has to be pleasantly tired. Being active reduces stress and causes individuals to feel more energetic and alert, thereby helping the body prepare for better sleep. The main principle underlying exercise is keeping the body moving. Stress hormones are slowly released during exercise, which has a favourable effect on the immune system.⁴⁰ Physical activity can also facilitate clearing of bacteria from the pulmonary system and can alter levels of white blood cells and antibodies. It is believed that during exercise, leucocytes and antibodies move faster in the circulatory system, allowing them to detect internal threats and diseases sooner; however, there is not yet proof that infections are prevented by these changes. Bacterial growth may also be blocked by the increased body temperature during and after exercise, which may help the body fight infection in a way similar to a fever.

Keeping muscles active releases high levels of interleukin 7 into the blood, which helps to stop the thymus from shrinking. This would help production of new T cells and balance our immunity. Maintaining a healthy basal metabolic rate is crucial. Walking is the simplest but highly effective exercise. Regular walks strengthen our immune system. It improves the mood and energizes the body. Walking in green spaces could give a big mood boost. Walking has no set rules and can be carried out in the busiest cities and in the sprawling countryside. Too much of exercise can become a stressor for the body and turn out to be counterproductive.

g. Immunity and Obesity

Obesity is the result of a disruption of energy balance that leads to weight gain and metabolic disturbances that cause tissue stress and dysfunction.⁴¹ Metabolic syndrome is a cluster of metabolic disorders and is rampant in the 21st century. It results in conditions combining diabetes, hypertension, and obesity.

Metabolic syndrome is also linked to several types of cancers and it has strong inflammatory underpinnings linked to dysregulated immunity.

Obesity and immunity are inversely related. It has been observed, for example, that the same amount of vaccine generates different immune responses from obese and lean people. Obesity has been identified as a modifiable risk factor of severe COVID-19, but weight loss also brings other health benefits. Having a healthy body weight is important in maintaining strong immunity because the presence of too many fat cells suppresses immunity. Obesity can depress the immune system by reducing the body's ability to produce leucocytes, generate antibodies and locate infection sites. Persistently enlarged fat cells place a body in a constant state of inflammation, keeping the immune system permanently on the go. Maintaining the right amount of body fat is crucial to immunity and health.

h. Alcohol Impairs Immune Cells

Much remains unclear about the impact of alcohol consumption to immune system. Alcohol abuse result in diminished liver and pancreas functioning which can lead to immune system problems. Chronic alcohol abuse and pneumonia are linked. Alcohol has an immunosuppressant effect, and binge drinking is particularly detrimental. One study reports that after four shots of vodka within a 20-minute period, blood samples reveal initial ramping of the immune system followed by sluggish immune responses a few hours later. Acute and chronic alcohol use impedes cellular immune function, placing binge drinkers at greater risk for bacterial and viral infections. A multi-layered interaction between alcohol and immunity exists, and alcohol abuse has negative effects on both innate and adaptive immunity.⁴²

Drinking alcohol immoderately can cause damage to the immune system in two ways. First, it reduces the availability of nutrients, thus depriving the body of resources that strengthen immunity. Second, it can hinder the ability of white blood cells to destroy microbes. It is well recognised that excessive alcohol consumption suppresses white blood cell replication, inhibits the action of killer white cells on cancer cells and hampers macrophages' production of tumour necrosis factors. Immune system damage increases in proportion to the quantity of alcohol consumed. While wine promoters assert that one daily glass of red wine may be helpful to maintaining health, any amount of alcohol large enough to cause intoxication is also large enough to suppress immunity.

There is a perilous myth circulating among the inner quarters of the public that consuming high-strength alcohol can kill the COVID-19 virus and it has stemmed from fear and helplessness and is totally unfounded. Consuming any alcohol poses health risks, but consuming high-strength ethyl alcohol (ethanol), particularly if it has been adulterated with methanol, can result in severe health consequences, including death. Alcohol

consumption is associated with a range of communicable and noncommunicable diseases and mental health disorders, which can make a person more vulnerable to COVID-19. In particular, alcohol compromises the body's immune system as described above and increases the risk of harmful health effects. Though there is still limited data on the link between alcohol and COVID-19, past evidence shows alcohol consumption can worsen the outcomes from other respiratory illnesses by damaging the lungs and gut and impairing the cells responsible for immune function.

i. Avoiding Substance Use

Marijuana, cocaine, heroin, and other opiates are widely used illegal drugs. Drug abuse compromises immunity, so it is imperative to stay clear of illicit drugs during a pandemic. Numerous clinical reports indicate the association between infectious diseases and the use of illegal drugs. These drugs alter not only neurophysiological and pathophysiological responses but also immunity responses. Thus, it is vital to determine the mechanisms through which drugs compromise immune responses both independently and in concert with immunosuppressive viruses.⁴³

Snorting cocaine harms mucous membranes in the nasopharynx and pulmonary areas. This increases the chance of upper respiratory infections.⁴⁴ Marijuana affects several kinds of cells in the body, which can ultimately harm the immune system. Smoking marijuana reduces the body's ability to resist infections from viruses, bacteria, fungi, and protozoa. Because of the suppressed ability of the immune system, it may also reduce the ability of an immune system to be able to destroy cancer cells. Drugs of abuse include heroin, morphine, fentanyl, opium, and prescription painkillers. While all narcotics have some effect on the immune system, injecting drugs into the veins increases the risk of viral infections like HIV and hepatitis B or C (due to sharing needles) and bacterial or fungal infections. This is especially dangerous in people whose immune systems are already compromised. Crushing and snorting narcotic drugs can also increase the risk of upper respiratory infections due to damage to the mucous membranes in the nasopharyngeal regions. Morphine and related opioids have been found to directly impact white blood cells, which can reduce the ability of the immune system to react to diseases.⁴⁵

j. Pulmonary Health

As with marijuana and crack cocaine, smoking cigarettes can lead to upper respiratory problems and a lowered immune system response to infections in the pulmonary system.⁴⁶ Studies indicate that smoking increases the risk of more severe lung disease in cases of SARS-CoV-2 infection. It has been argued that exposure to cigarette smoke increased the number of infected and apoptotic cells in the airway and that SARS-CoV-2 prevented the usual repair response to airway injury.⁴⁷ SARS-CoV-2, the causative agent of the COVID-19, infects cells by binding to the angiotensin-converting enzyme 2

(ACE2) receptor present on host cells. ACE2 is highly expressed in ciliated cells of the upper airways. Smoking is linked with both a negative progression and adverse outcomes of COVID-19.⁴⁸

Smokers touch their lips frequently, which may accidentally pass the virus to their mouths, and they tend to have existing respiratory conditions consequent to their smoking habit. These factors make them more vulnerable to viral respiratory infections and more prone to COVID-19-related complications. Indeed, smoking has been linked to a plethora of respiratory diseases and poor disease prognosis.⁴⁹ Smokers are more vulnerable to infectious diseases because smoking harms the immune system, adversely affecting how it responds to infections.⁵⁰ During the previous MERS-CoV epidemic, for example, smokers were found to have high mortality rates.⁵¹ One retrospective analysis of 78 patients in China found that smoking was correlated with greater COVID-19 severity and poorer prognosis. Though analytical studies conflict,⁵² smoking continues to be linked with higher risk.⁵³

k. Balancing Bodily Temperature

It has been recognised that an increase in body temperature by 1°C than normal would result in an instantaneous increase of immunity by 5 to 6 times. On the contrary, as soon as the body temperature drops, the activity of white blood cells will be retarded, resulting in a decrease in immunity. Low temperature is well recognised as immunosuppressive. It is an accepted fact that fever is the body's defence mechanism that activates the immune system in response to inflammation. The immune system functions optimally at higher comfortable temperatures and becomes underactive in cold environments. This is why seasonal infectious diseases like influenza are more prevalent during lower temperatures. Warm temperature restricts viral replication through type I IFN-dependent and -independent mechanisms *in vitro*.⁵⁴ In addition, both humidity and temperature affect the frequency of influenza virus transmission among guinea pigs.⁵⁵ One way to warm the body is to be metabolically active while keeping a relatively high room temperature and/or wearing warm clothes. The significance of thermal balancing to maintain healthy immunity has been discussed in preceding paragraphs.

l. Destressing

Good relationships protect mental health and wellbeing. People who are more socially connected are happier, physically healthier and have longevity. One should put more time aside to connect with friends and family, learn to live in the present and switch out of work mode whenever possible. It is important to invest time on and value relationships and make them a priority, listen to others, and speak openly about feelings. People should be good listeners and concentrate on the needs of other people. Happiness is the reflection of what one does for others. People should make an effort to be surrounded by positive individuals and allow themselves to be listened and

supported. The key to destressing and happiness is being honest and respecting others.

Severe anxiety suppresses the immune system and the coronavirus may thus literally feed on fear. Relaxing and focussing on the present, however, can improve mental health and counteract negative feelings. Various forms of meditation and progressive muscle relaxation techniques, for example, can help one unwind from the assault of daily stressors, and such post-work relaxation may enhance the immune system. Incorporating relaxing practices like meditation, yoga or deep breathing into a daily routine has been found to be helpful. Psychological health and immunity are causally related. The current pandemic is forcing us all to adjust to new and strange ways of life, which can adversely affect mental wellbeing.

While short-term exposure to stressors can accelerate immune defence, prolonged stress may wear down the immune system, increasing vulnerability to illness.⁵⁶ In this way, chronic stress can be a killer. Immuno-psychiatry is a fledgling sub-speciality which deals with the immunological components of psychosis and depression.⁵⁷ The autoimmune aetiology of schizophrenia is gaining ground⁵⁸⁻⁶⁰ and the neurotoxic effects of cytokine storm due to COVID-19 have recently caught high attention.

Extra-physiological Immunity?

The chemical effects of allopathic medicines are a scientific reality, but their therapeutic effects are also partially due to placebo effect. Placebos are aimed at the symptomatic relief of illnesses. Disease and illness have different connotations; disease is understood scientifically in terms of pathophysiology and illness is understood phenomenologically, as a lived experience.⁶¹ It is increasingly being recognized that what we call the 'placebo effect' may involve changes in brain chemistry induced by quantum bioenergy fields. That implies the placebo effect may be a quantum reality that is created by the mobilisation of quantum bioenergy fields.⁶² The placebo effect is believed to be brought about when the subjective mind produces medicinal agents and accelerates the healing process. It is estimated that up to 40 per cent of the effects of medicinal drugs may be a placebo effect. The placebo effect often seems to be associated with measurable changes in brain chemistry and there have been observed quantifiable changes in neurotransmitters, hormones, and immune regulators.⁶³ Placebos also relate to the disposition to heal, no matter what treatment is offered, if those being treated believe the treatment is helpful.⁶⁴ Regarding the effects of drugs, expectations appear to have a significant influence. The very existence of placebos offers an indirect proof for the existence of extrasomatic energy system and we need to incorporate their effect in the immune balancing. A quantum conceptual model of placebo is essential to understand certain hidden channels of medical sciences. The placebo component of immunity is highly significant and needs further evaluation.

Immunity is not a single entity; it is a system, and for a system to function well, it requires balance and harmony. Not everything about the immune system is known to science, and according to integrated medicine, immunity may not be confined to physiology alone, but may have non-physiological aspects as well. Numerical age and physiological age are two different things. This is particularly so if extra-physiological energy system is brought into the equation of immunity. It is true that the existence of extra-physiological systems is not scientifically well established, but they are strong hypothetical possibilities.

Studies of quantum bioenergy fields should be an integral part of the science of human physiology and homeostasis should be redefined as the state of steady internal physical and chemical conditions maintained by different regulators, including extrasomatic energy fields.⁶⁵ Humans are multidimensional or psycho-spiritual entities with several layers of energy bodies with increasing subtilty.⁶⁶ Complementary medicines work on the assumption that humans are associated with a subtle energy system, in addition to their material body. Even though such extrasomatic energy systems are not recognised in the modern medical sciences, there are energy fields that cannot be explained by the classic Maxwell–Schrodinger equation.

The material body and energy bodies are in a complementary relationship: if the material body is the container, vital energy is the content.⁶⁷ Beverly Rubik postulated that biological systems may be regarded as complex, non-linear, dynamic, self-organising systems of energy and field phenomena.^{68,69} Many researchers have attempted to bring the existence of extrasomatic energy fields into the arena of mainstream sciences.^{70–73} If such quantum bioenergy fields really exist, they may play a major role in maintaining homeostasis in the human physiology, and it would be of great clinical interest to evaluate their role in immune system functionality, as long as they do not overrun the scientifically accepted views. To bring the concept of extra-physiological immunity into immunology, we may also have to accept the possibility of ‘nano immune cells’ and a ‘nano-level immune mechanism’.

Conclusion

The high incidence of complications among ethnic minority points toward the thermal conditioning and the role of immunogenetics. Underactive immune responses in cooler temperature and diminished synthesis of vit D and the genetic factors linked with these anomalies might explain part of the higher incidence of COVID-19 among BAME. It is the physically and psychologically resilient people of a community who normally migrate to overseas countries. If migrants are to develop mental health problems, it would manifest within 6 months of migration, but physical health problems come about any time of their stay abroad as the weakening of immunity is a slow process. COVID-19 has a direct impact on co-existing disease processes worsening them because of the added immunity impairment. There are still missing gaps in the

pervasive occurrence of this viral affliction among the BAME people. They should be mindful of the vulnerability factors and special precautionary measures should be adapted to prevent the infection.

COVID-19 appears to be a test of self-immunity. To combat COVID-19, efficient tests, novel treatments, and vaccines are the three means. An effective and safe vaccine would drastically change the pandemic situation for good. Vaccination and developing novel form of medication would take some time to become available. In such circumstances, one way of protecting from COVID-19 is by balancing one’s own immune mechanisms. It is a good thing that there is ample promotion of preventive measures of the contagion, there should be more awareness of improving personal immunity. More research works are warranted in immunology including extra-physiological immunity. Strengthening immunity is achievable for everybody if sufficient attention is paid. A safe and effective vaccine with long term immunological properties would drastically change the pandemic situation for good. Thus far, the research findings of the pandemic are inconsistent, and many dimensions of this pandemic warrant further clarification. COVID-19 will have a serious impact on virology and the neurotoxic effects of cytokine storm may be a stimulus for the growth of immuno-psychiatry.

Science is good enough to study the physical and visible, but it has obvious limitations when it comes to the unphysical and non-physical. Unphysical is undetectable only because they cannot be identified with the present-day instrumentation but can become detectable when our technology advances and their presence should not be stubbornly denied. The well-established placebo effects may point towards the existence of quantum bioenergy fields. Existence of extrasomatic energy system indirectly support the concept of extra-physiological immunity. Placebo effects are not psychological artefacts, but quantum manifestations. If extra-physiological immunity exists, it may be guarding and supervising the physiological immune system.

Competing Interests

None declared

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