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COVID-19 And Lifestyle Challenges: A Rapid Review.

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ABSTRACT

The emergence of Covid-19 pandemic has resulted in a massive impact on entire human population, causing a sudden change in their lifestyle, with social and economic consequences. Lockdown measures were implemented in several countries to limit the spread of this pandemic. However such restrictions and confinements could precipitate unintended negative consequences on lifestyle behaviors. We reviewed the data available on the impact of this pandemic. The main objective of this review was to assess the effect of imposed lockdown on the changes in general population all across the globe. The data available todate indicates that the society has undergone changes during lockdown to mitigate the spread of infection and such changes have become part of the lives of people- hygiene and health consciousness, work from home, online teaching, digital shopping, changing internet habits are just a few to name. This pandemic may have both positive and detrimental impact on the psychological health and various other aspects of lifestyle behaviors of people.

Keywords: Covid-19; lifestyle changes; diabetes; anxiety; psychological health

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a serious public health threat and has been declared an International Health Emergency by World Health Organisation[1-3]. Until now, the virus has spread to over 100 countries, infecting millions of people globally with increasing death tolls. This novel virus has made a large impact all across the globe, halting almost all nations. This pandemic has brought the whole world on lockdown to combat the spread of the disease with halt in the economy.

Coronavirus is a type of RNA virus positive-sense single strand that can cause mild to severe respiratory tract infection [4]. A mild coronavirus infection often resembles the common cold, showing symptoms of flu, fever, and sore throat [5]. However, patients with mild disease can become severe [6]. A severe infection from coronavirus causes inflammation of the lung mucous membranes, leading to pneumonia, bronchitis, and ultimately shortness of breath [7]. These accumulated symptoms are known as severe acute respiratory syndrome, or SARS. Poor pulmonary functions may be the primary cause of death due to severe coronavirus infections [6]. The envelope of coronavirus is covered with spikes all around that are made of glycoproteins and these act as receptor for binding to the host cell [4,8]. Its natural reservoir is found in bats and birds [9], and most probably the virus crosses the human species barrier via consumption of infected bats or birds [5]. The virus spreads itself through the aerosol route and infects the host's close contact [5]. All it takes is a simple cough. If a person coughing is infected with the novel coronavirus, it comes along for the ride on droplets and it enters into the lungs as and when it is inhaled by a person. Once inside, it uses a spike protein on its surface to target an enzyme-Angiotensin Converting Enzyme 2 (ACE2) - scattered over the outside of the airways' cells. If the spike protein connects with its targets, the coronavirus uses ACE2 as a door to slip inside the cell. Thus begins an infection.

The virus has caused a large and massive impact on human health, causing sudden lifestyle changes through isolation at home due to social distancing, with social and economic consequences, thereby affecting the physical and psychological well being of the people. All these conditions lead to weight gain (due to irregular eating habits) and slight increase in indoor physical activity (particularly body weight training).

In 2002, there was an outbreak of SARS-CoV-1 in Guangdong, China that resulted in 8422 infected cased and 916 deaths [8]. Later in 2012, the Middle East respiratory syndrome coronavirus (MERS-CoV) emerged in Saudi Arabia, and it caused almost a thousand fatalities [6]. Both these events were of bat origin that crossed over to humans[8]. COVID-19 or coronavirus-2019 outbreak in late 2019 caused a global pandemic presumably originated from Wuhan, China. A burst of pneumonia cases was recorded there, and the virus soon spread all over the world. The nucleotide sequence has an 89% match with human SARS virus, thus this new strain is called SARS-CoV-2[6]. The incubation period of the virus varies from two to fourteen days.

NON- RESPIRATORY SYMPTOMS

Though literature suggests the occurrence of respiratory symptoms in patients suffering from COVID-19, certain reports also point towards the prevalence of non-respiratory symptoms also during this viral infection. These include digestive symptoms such as diarrhea, diminished appetite and nausea[10]. Such patients may unknowingly contribute to spread of virus. Researchers found that gastrointestinal symptoms may be the only evidence of COVID-19 coronavirus in certain group of cases. These digestive symptoms occur because the virus invades the target cells through ACE2 [11] - a receptor found in both upper and lower gastrointestinal tract where it is expressed several fold higher than in respiratory organs [12]. So, there will be increased permeability and diminished barrier function and hence easier invasion of pathogens across a vast intestinal surface area.

CIRCADIAN RHYTHM

Although the standard operating protocols issued by the government i.e. maintaining social distancing and hand hygiene have taken a header in fighting against COVID-19 infection, there is another important factor i.e circadian rhythm – that has to be taken care of to protect against this deadly virus. Light and darkness is must for maintaining an internal clock, i.e. a circadian rhythm. At night, the hormone melatonin is generated by the body and in sunlight, its level falls. Because of lockdown and due to extended stay at home, people had less exposure to sunlight and this has led to decreased levels of vitamin D in them and this deficiency has become the cause of other clinical problems. Also these factors led to decrease in the ability to secrete melatonin, a sleep hormone, at right time. Similarly at night, people are busy with latest news updates as well as on social media.

This will stimulate the rod and cone cells in the retina and thus has an impact on sleep [12]. Thus suppression of natural production of melatonin and excess sleep time may be the reason for sleep disorders under such pandemic conditions. Desynchronized circadian rhythm altered immune system that may lead to increased susceptibility to infections [13].

Stress and worry caused by this pandemic put strain on our physical and psychological health and this condition leave us more vulnerable to viruses and other health issues [14]. So, stress should be laid on boosting our immunity that can mainly be done by maintaining a healthy circadian rhythm i.e. by developing and maintaining a daily routine. Circadian rhythms are self containing internal biological rhythms. Examples include cortisol and melatonin secretion, body temperature, and urine volume etc. Human mental and physical health depends on the circadian rhythms of physiological functions and sleep- wake rhythm [15].

SLEEP AND ANXIETY

Anxiety and irregular sleep are the major effects of pandemic- both of these are interdependent. The main advantage of having a sleep is that it allows the brain and the body to relax and refresh. Solid night rest not only empowers an effective immune system, but it also heightens brain function, enhances mood and improves mental health conditions like anxiety disorders, bipolar disorders, depression, fatigue and post traumatic stress disorder [16,17]. These effects may be due to job insecurity, well being of their loved ones in different cities and due to extensive hearing of news on COVID-19. All such unprecedented changes are occurring so fast that it affects their sleeping pattern a lot. There are three stages in the sleep period: N1 stage when there is transition from wakefulness to sleep; stage N2 when breathing and heart rate begin to slow down; and N3 stage when the body regenerates itself and goes into deep sleep. During anxiety, stress and during sleep disorder, duration of N1 and N2 stages increases at the cost of N3 stage. Other effect of the pandemic is oversleeping. Again, this is due to changed routine as many people are doing work-from-home. Therefore, the consequences of the coronavirus pandemic have spread far and wide, and pose significant barrier to sleep.

There are lot of worries and anxiety due to COVID-19 pandemic as people fear catching infection. Also they are worried about health and safety of their close friends and family members who are older or in high risk group. Over and above all these anxieties and worries, there are so many unanswered questions- how much the disease will spread, how long lockdowns will last, insecurities about jobs- that further aggravate anxiety and disrupts sleep as a racing mind keeps the body tossing and turning. Moreover, financial concerns due to any impending recession are other reasons for anxiety and worry. The lockdown life may also lead to high blood pressure- may be from stress or less exercise or eating differently.

DIETARY PATTERN

This pandemic has also altered the dietary pattern. Due to extensive pressure of work and household chores, most of the people skip breakfast, do brunch, lunch becomes an afternoon snack and dinner also shifts to late hours. This too has tremendous effect on sleep as eating late at night may cause digestive disorders like gastro esophageal reflex disease that aggravates insomnia. Such eating disorders disrupt the body's circadian rhythm and weaken organs, including gut, liver, muscle, heart, kidney and lungs, making it harder to fight an infection. Moreover, insufficient amount of sleep and other changes in the lifestyle changes has been found to be associated with a large number of metabolic disorders, most predominant being obesity, high blood pressure, high cholesterol and diabetes [18]. This might be due to disturbance in circadian rhythm of many processes that affect metabolism.

Coronavirus pandemic also had a major impact on the eating and drinking habits of people. With little or no option to eat out, the trend of cooking and eating at home- cooked food is clearly growing. People have become more health conscious i.e. they plan to eat and drink healthier as they want to boost their immunity and reduce vulnerability to disease and illness. People now tend to have increased consumption of fruits, reduced sugar intake and increased protein intake. Further, healthy diet results in modulation of inflammation and oxidative stress [19]. However, there is another set of people who have different approach. Staying home and disruption of work routine also lead to boredom that is associated with greater calorie intake [20] as a means to escape monotony [21, 22]. In addition to this, hearing and reading continuously about COVID-19 from media leads to fear of disease and death and this can be stressful. Stress, in turn, leads to food craving that leads to over-eating especially comfort food, rich in sugar [23, 24]. Actually these foods can lead to the production of

serotonin that has positive effect on mood [25]. However, this effect of carbohydrates, that have high glycemic index, is associated with increased risk of developing obesity and cardiovascular diseases and these effects are developed to increase the risk for more severe complications of COVID-19 [26-28]. Obesity results in adipokine secretion from the adipose tissue with immuno-modulatory effects [29] which favours to the onset of several metabolic diseases such as insulin resistance, type 2 diabetes mellitus, dyslipidemia and hypertension. These conditions challenge the immune system for down-regulation of the innate and adaptive immune response. Thus patients have been reported to be less responsive to vaccinations, antiviral and antimicrobial drugs [30]. Such immune-modulatory effects result in aggravation of respiratory viral infections [27]. Although there is no evidence in literature till date regarding the relation of obesity with risk of getting COVID-19, however, more severe forms of respiratory failures are present in patients with obesity. Therefore, it can be said that the individuals with obesity may be at higher risk of severe illness if infected.

Also the lockdown during the pandemic may lead to scarcity to fresh foods especially fruits and vegetables. People therefore may have inclination towards processed food- such as junk food, snacks, and ready-to-eat cereals, which are found to be high in fats, sugars and salts.

Association between sleep disturbances and obesity has been reported to increase in the secretion of pro- inflammatory cytokines by the increased visceral adipose that could contribute to alter the sleep- wake rhythm [31, 32].

HYPERTENSION

People with high blood pressure, diabetes, cancer or lung disease show higher risk of COVID-19 infections and complications. Those with high blood pressure have 6% higher risk to disease from coronavirus. The main reason for this is a compromised immune system. Any co-morbidity or existing medical condition like diabetes or heart disease may result in a more severe impact of the virus on the body due to a weaker immune system. Earlier in the pandemic, researchers thought that the drugs that are used to treat high blood pressure- i.e. ACE inhibitors and Angiotensin Receptor Blockers (ARBs) - raise the levels of an enzyme called ACE2 in the body and COVID-19 virus attaches to ACE2 to infect. These two drugs are also given to diabetic patients to help protect their kidneys. This way these patients are more prone to infection. On the other hand, Council on Hypertension of the European Society of Cardiology and the European Society of Hypertension - both do not find any tie between the use of these drugs and severity of COVID-19 [33, 34]. As more and more research emerges, this idea has been flipped: the scientists now wonder if these blood pressure medicines might help to fight COVID-19. These medicines affect the rennin- angiotensin system for long-term blood pressure regulation. ACE regulates a hormone called angiotensin II which may cause severe lung damage and runaway inflammation in COVID-19 patients.

DIABETES

According to the statistics available, India has a very high prevalence of diabetes. So if diabetic people come under the influence of viral infection, it becomes difficult to treat them. One reason for this is weaker immune system. These patients have impaired immune response in relation to cytokine profile and to changes in immune responses including T- cell and macrophage activation [35]. At the same time, the virus is insensitive to an environment where high blood glucose levels are being reported. Diabetes is also a primary risk factor for the development of severe pneumonia and a septic course due to virus infections and has been reported in around 20% of the patients [36, 37]. It is a risk factor for hospitalization and mortality of the COVID-19 infection. Zinc, that has been reported to play a positive role during diabetes [38], has also been found to have an important role in cell- mediated immune response [39]. It is a fact that people with diabetes are at increased risk of infections such as secondary bacterial pneumonia. Moreover, many patients with type 2 diabetes are obese and obesity is also a risk factor for severe infection [40]. Lastly, late diabetic complications such as diabetic kidney, diabetic ketoacidosis, ischemic heart disease, adult respiratory distress syndrome and multi organ failure- may complicate the situation for people with diabetes, thus increasing the severity of the disease. Some findings indicate that COVID-19 could cause acute cardiac injury with heart failure, leading to deterioration of circulation [41]. Scientists also believe that the novel coronavirus may complicate the condition of pre-existing diabetes or may lead to the start of diabetes in healthy individuals. Thus, there is a bidirectional relationship between COVID-19 and diabetes. However, the exact mechanism by which the virus influences glucose metabolism still remains

unclear. Further, diabetes in older age is associated with cardiovascular disease, which could help to explain the association with fatal outcomes of COVID-19.

There are at least two specific mechanisms through which the viral infection may occur. First, this deadly virus may enter into the target cells via an endocrine pathway which might play a role in the regulation of blood pressure and metabolic pathways [42]. This occurs via ACE2 receptor protein. A second potential mechanism involves the dipeptidyl peptidase-4 (DPP-4) enzyme, which is commonly targeted pharmacologically in people with type 2 diabetes. This enzyme is a ubiquitously expressed type II transmembrane glycoprotein that plays a major role in glucose and insulin metabolism but also increases inflammation in type 2 diabetes [43].

Thus variable glycemic control, burden of end- organ damage, impaired and altered immunity- all contribute to poor outcomes in people living with diabetes.

OBESITY

Obesity is a global public health disease which is recently cited to be associated with the amelioration of COVID-19. Obesity is linked with defective immunity which is one of the main contributing factors for COVID 19. In obese people, the consumption of total body oxygen to the respiratory work is elevated, thus marking a reduction in the pulmonary compliance, functional residual capacity and expiratory reserve volume. Therefore, even if there is any slight pulmonary variations it will lead to a reduction in the ventilatory reserve with subsequent ventilation-perfusion abnormality by which obesity becomes a predisposing factor to respiratory collapse [44]. The decrease in the diaphragmatic excursion causes a decrease in the respiratory function after which ventilation becomes challenging. Another contributing factor is the elevated levels of inflammatory cytokines associated with obesity leading to an increase in the mortality[45]. Obesity possibly subsidizes hypoxemia by decreasing the end-expiratory lung volume and augmenting positive pleural pressures at end-exhalation which can deteriorate hypoxemia in COVID-19 pneumonia. Obesity can also impair the cytokine storm in COVID-19 pneumonia, leading to acute respiratory distress syndrome and multi-organ failure[45].

CONCLUSION

The pandemic of novel COVID-19 has been a global catastrophe. How the virus is spreading across the globe and its effect on the mortality in different countries is a big mystery. Eating habits and lifestyle modifications may threaten our health. To maintain a healthy immune system, one has to keep up a healthy nutritional and energy status. People who eat healthy balanced diet tend to be have a stronger immune system and therefore are at a lower risk of chronic illnesses and infectious diseases. Moreover, these healthy eating habits and other micronutrients (e.g. vitamin, trace elements, nutraceuticals and probiotics) may be beneficial especially for vulnerable populations, such as the elderly. So one should eat fresh and unprocessed food daily to get all essential nutrients including vitamins, minerals, dietary fiber, proteins and antioxidants that body needs. One should also drink sufficient water. And lastly sugar, fat and salt should be avoided so that the risk of overweight, obesity, heart disease, stroke, diabetes should be minimized. It is believed that COVID-19 will continue to influence day-to-day lives of people for at least 12 months and this will drive or increase demand for food that is healthy, sustainable and offers moment of comfort. It is sure that eating habits will not be the same even if this pandemic gets over. Because people have become more cautious about the nutrition and other eating habits, they will give more preference to the home made healthy food in times to come- the culture that was lost in this busy and materialistic world. Because of the wide range of symptoms in non respiratory organs, one should better understand both the prevalence and clinical characteristics of these patients. Also the patients with new-onset diarrhea after a possible COVID-19 contact should be suspected for the illness, even in the absence of cough, shortness of breath, sore throat and even fever.

There have been suggestions that elderly, frail people living with diabetes and hypertension - the two main components of metabolic syndrome- and people with co-morbidities have worse clinical and survival outcomes. Although there is no firm evidence that hypertension or blood pressure drugs will increase a person's risk of contracting the virus, however, a person with high blood pressure or other heart diseases, who is exposed to the virus, is more likely to require hospitalization and even ventilation, as opposed to infected patients without blood pressure. The most frequent diseases that occur during COVID-19 infection are hypertension and diabetes. Both diseases are often treated with ACE inhibitors. Coronavirus binds to target cells through ACE2 enzyme, which is expressed in the epithelial cells in the lungs, blood vessels and in the intestine. Therefore, it has been

suggested that ACE2 expression may be increased in these two group of patients with hypertension and diabetes, which could facilitate infection with COVID-19 and increase the risk of severe disease and fatality. Thus, patients with diabetes need intensive attention to reduce the risk of fatalities. Diabetic patients should strictly follow the advice given by the health authorities so that they remain protected and prevented from the infection by COVID-19.

Thus diet, exercise, medicine and monitoring are four pillars for effective management of diabetes and hypertension and other related diseases. The current COVID-19 pandemic calls for a strict adherence to standard operating protocols so as to ensure that each one of these parameters are looked after adequately.

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