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Dysosmia and Dysgeusia in COVID-19 Patients

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ABSTRACT

Background: Coronavirus disease 2019 or COVID-19 is the evolving disease that has grappled the whole world. Clinical manifestation of COVID-19 is still under lens as novel coronavirus is constantly evolving. Mutations are one of the key features of the viruses which happen at times. Changing clinical; manifestation of COVID-19 creates a new challenge as no one solution can be applied among infected individuals. The viral behavior is constantly changing and one must be vigilant about it. Dysosmia and dysgeusia are impairment in taste and smelling sensation. These can occur due to chemotherapy, drug abuse and so on. But it has been now associated with onset of COVID-19. Lot of patients of COVID-19 is complaining about these conditions. These conditions can coexist with the disease and can persist, post recovery too.

Objective: Generally, both of these conditions are not life threatening and fade away after the recovery from the disease. Psychological impact of these conditions has been registered among certain patients as these are the sensory impairments which are part and parcel of daily life. This review pinpoints the motive of further exploring them.

Methods: Original papers, reviews, preprints, and letters to editors relating to our topic were reviewed using MeSH terms in PubMed, Google Scholar electronic databases.

Conclusion: Dysosmia and dysgeusia can be used as indicator for the onset of the COVID-19. The hypothesis of extreme exposure to disinfecting chemicals must be examined further to bring and solid correlation. Professional help is needed post recovery from COVID-19 to regain the balance in life.

Key words: COVID-19, Dysosmia, Dysgeusia, Parosmia, Olfactory, Gustatory nerves

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INTRODUCTION

Coronavirus disease 2019 or COVID-19 is the evolving contagious disease which is wreaking havoc all over the world. Every individual is affected by the pandemic in one way or the other. The health impact of the pandemic is huge long with widespread adverse socioeconomic impact as large number of industrial and financial units was stopped for considerable amount of time. Since its inception from Wuhan city of Hubei province in China, the disease has evolved in many aspects. As of June 17, 2021, 177,124,860 infection of COVID-19 has been reported and 3,835,018 case fatalities related to it also been reported [1,2]. Such huge number casualties were reported for the first time in past hundred years of human history. World Health Organization (WHO) had to declare it as the pandemic by upgrading its status from public health emergency of international concern (PHEIC) after noticing the havoc unleashed by the COVID-19. Unites States of America, India, Brazil, France, Turkey and Russian federation are top affected countries having maximum number of cases and case fatality rate [3]. Mutation in the novel coronavirus has created the new challenge of second and third waves of COVID-19 and many countries are reeling under the pressure of increased cases. Countries and institutions are resorting once again to measures of lockdown

and movement restrictions to curb the spread as mutant version is more transmissible and lethal as compared to its previous counterpart. Many vaccine candidates got approved from competent authorities around the world and vaccination drives has been initiated [4]. Till now 2,476,361,838 dosage of vaccine has been administered all over the world. But the speed of vaccination is slow as compared to the viral spread. The mutant version is creating new complications which are becoming difficult to deal with. Many symptoms are now considered as indicator of onset of COVID-19 infection as early medical intervention helps in easing the burden on sophisticated medical equipment's. Dysgeusia and dysosmia are two conditions which are considered otherwise harmless but are prevalent among the COVID-19 infected population all around the world. It exists prior, during and post infection. The physiological impact needs to be monitored as nervous system comes onto lay. Olfactory and gustatory indicators are important for the body as they provide two important sensation of taste and smell [5]. These senses are helpful in detecting various smells and odors including harmful one and ignite the appetite. Apart from physiological impact, psychological impact of these impairments have been seen among patients. All these aspects related to Dysgeusia and Dysosmia are comprehensively overviewed in this article.

Clinical manifestation OF COVID-19

Coronavirus disease 2019 which is caused by novel coronavirus has once again resurged from its dormancy and bestowed the wrath of second wave of COVID-19. The disease is continuously evolving and no one size fits all approach is working here. The constantly changing manifestations of COVID-19 is making it more difficult to clinically mange. The symptoms have tremendously changed so far from its inception in China. Medical professionals are afraid of diagnosing from symptoms and taking refuge to Reverse Transcription Polymerase Chain Reaction (RT-PCR) test as large spectrum of symptoms has been shown by the COVID-19 infected persons [6]. In the initial phase of the COVID-19, the symptoms were very basic and included fever, cough and cold. It was considered as influenza like illness till it was categorized as coronavirus causing disease. Later on the list of symptoms got many additions on specific interval of times. Diarrhea, dyspnea, nausea, loss of taste and smell, dysosmia, dysgeusia, anosmia were the prime indicator of the presence of COVID-19. The list goes on to headache, fatigue, body pain, sore throat and so on. These symptoms were distributed among vast population and different set of symptoms were reported from different age groups and medical background. Internally, novel coronavirus was found to be damaging vital organ systems of the human body. After entering into the host cell, the rapid multiplication and hostile takeover of the function of cell has adversely affected the process of protein synthesis. The spike protein of the novel coronavirus gets attached to the angiotensin-converting enzyme 2 (ACE 2) receptors in the body. These receptors act as gateway for the novel coronavirus to enter into the cell. These receptors are present on various viral organs include heart, kidney, lungs, liver, neurological system and so on [7]. Therefore these organs systems are extremely vulnerable of direct attack by novel coronavirus. The increased viral load which can be assessed by the critical threshold value (CT) which is calculated during RT-PCR test. The less is the CT value, the more is the viral load present in the body. If the viral load is greater, that means there more viruses in the body which are eventually capable of multiplying itself faster and cells are destroyed in the process in the body. Another indicator through which one can assess their COVID-19 positivity is saturated oxygen level (spo2). The drop in oxygen level may occur due to COVID-19 which is a serious cause of concern if the drop is too high. Therefore suspected person should regularly check the spo2 level at times so that early medical intervention which is critical in case of COVID-19 can be ensured. Early medical intervention is extremely necessary in case of COVID-19 as patients tend to dip in critical situation very fast [8]. Need of Sophisticated medical intervention increases as number of days delayed in seeking treatment. The collapse of health care infrastructure indicates the lack of these resources and it is important to contain the spread of disease as soon as possible. The case fatality rate is rising in some instances inly due to non-availability of the necessary infrastructure which is distressing. Preliminary indications should be taken seriously and every case must be treated as positive case so as to create a foolproof system health care delivery [9].

Dysosmia in COVID-19 patients

Dysosmia is the disorder of the smelling capacity of the person in which it gets distorted or altered. The Olfactory indicators which are present in the nose picks up various smell from surrounding and categorize it as specific type of smell. Also in some cases the memory is also gets attached to the particular fragrance and next time whenever one smells that smell again, the memory gets activated. There are two types of dysosmia. In first type, the quality of the odor is perceived as distorted by the nose which is also called as parosmia and cacosmia. In second type, the odor is replaced by another odor which is of strange kind while there is no actual stimulation. This condition is called phantosmia or olfactory hallucinations. These are the preconditions which prevail for many weeks before one gets anosmia in normal scenario [10].

In case of COVID-19, the olfactory dysfunction has been prevalent among the infected individuals. Many infected individuals have complained about the distortion in their smelling ability and experienced a strange phenomenon which was not very common, especially in influenza like illnesses. This raised an alarm among scientific and researcher community as olfactory function is mainly governed by nervous system, which is crucial for proper function of the body. Affected olfactory function means COVID-19 also affects the nervous system in some way or the other. Therefore it is necessary to monitor all the related symptoms associated with the COVID-19. The affected olfactory indicator indicates the attack of virus on central and peripheral nervous system of the human body which can be detrimental in due course of treatment. The source of infection for the human body is the entry points which are nose, mouth, eyes and so on. Nose is the primary entry point for the virus as breathing is the continuous process. Many olfactory nerves are present in the nasal cavity to sense the smell and foreign bodies and provide protective mechanism in the form of mucous and nasal hair. When the virus enters through nose, various nerves gets clogged and these nerves along with blood vessels may transport the load of virus to brain. The brain injuries like demyelination and immune response mediated by T cells are the result of novel coronavirus invasion into the nervous system. Dysosmia might be associated with it as more studies are underway to prove any correlation [11].

In a study conducted in Iran, large number of people complained either partial loss of smell or complete inability to smell anything. These are directly associated with onset of COVID-19 or in some cases persistence of symptoms even after recovering from COVID-19. The condition of Dysosmia was found to be extremely contagious as if one member of family experiences the dysosmia, rest of the members will definitely experience it in few days if the first person does not get isolated or quarantined. There is another hypothesis suggesting that the dysosmia which is considered as the prime symptom before onset of COVID-19 is in fact due to hyper use of disinfecting chemicals and sanitizing liquid. It needs through study as it has weak support across the board [12].

In a study conducted in Taiwan, 217 patients were identified as subjects for study to identify dysosmia and dysgeusia. Among them, almost 36 percent reported the dysosmia which stands at 78.53 out of 78 patients reporting dysosmia found to be reporting it as a pre COVID-19 symptoms. 59 patient were closely monitored, out of which 41 patients recovered in the time frame of three weeks, average duration being twelve days. The study also found out that younger persons and females were more susceptible to dysosmia than elderly and other counterparts among the studied pool of patients. In a south Korean study, where a telephonic interview conducted among 3191 patients of COVID-19, 68.9 PERCENT of patients experiencing dysosmia and dysgeusia were female and rest were male. This interesting fact may guide the diagnosis and early detection and worsening of symptoms can be prevented. The median age was in the range of 35 to 37 which indicates the trend of younger victims of dysosmia. The reason behind the dysosmia is still unclear as many other diseases such as upper respiratory tract infection and other viral attack can also cause the distortion of smell. Angiotensin converting enzyme 2 (ACE 2) receptors have a crucial role in COVID-19 infection as it has direct participation in acting as a gateway to the novel coronavirus to the host cell. These ACE 2 receptors are widely present on the epithelium layer of nasal passage therefor creating ease for the virus to penetrate further. The damage that happens to mucosal epithelial

cells in the process can offer explanation behind the dysosmia [13].

Anosmia on the other hand is the complete loss of taste and smell. Anosmia succeeds in some cases, dysosmia. Later is the precondition where some smell can be expected by the affected individual. It is a short term temporary phenomenon which can be weird as it can, in rare case land you in difficult position where you would not be able to detect the gas leaks and harmful smells which compels you to move around [14]. Fortunately it is a temporary condition and can be cured. In case of COVID-19 it has been found in many cases. It existed prior to infection, during and post infection too. Wide range of occurrence along with COVID-19 makes the case interesting as it supposedly has correlation with pathophysiology of novel coronavirus. Large number of COVID-19 infected patients reported that they were not able to smell or taste. In many cases this was prior to the symptoms like fever, cough and cold [15].

COVID-19 and dysgeusia

Dysgeusia also known as parageusia is the distortion in tasting capability of the human body. It is associated with the taste buds. Dysgeusia is an umbrella term which covers a whole range of quantitative and qualitative impairment in taste. Ageusia and hypogeusia are the quantitative taste impairment while hypergeuia is the qualitative reduction in the taste. In some cases there can be hallucinations about the taste and made up taste by mind can also manifest resulting in false taste manifestation either in presence or absence of food stimulation. The testing cells are present on the tongue which is a strong cartilaginous part present in the oral cavity. The test buds are distributed all over the tongue and sense the taste of the substance entered into the oral cavity. Dysgeusia is also related with ageusia in which there is complete lack of tasting ability and hypogeusia in which there is partial or decreased taste is sensed by the taste buds.There is wide array of causes which are supposed to be behind the dysgeusia and associated condition. These include chemotherapy which is administered in chronic disease like cancer, distortions or disorder of taste buds, zinc deficiency, pregnancy, usage of certain drugs and othercauses [16].

In COVID-19 pandemic, some of the symptoms are indicator of the oncoming disease and dysgeusia is one of them. Dysgeusia or broadly loss of taste is often accompanies with loss of smell in the COVID-19 infected persons. It is found out that dysgeusia is highly contagious and transmit among family members quickly if patient zero is not isolated in time. Usually the symptoms like cough, cold and fever arrives later than loss of taste and smell and often not taken seriously [12]. In some cases all the previously mentioned symptoms can coexist with each other. In the recently reported and increasing phenomenon of long COVID-19, persistence of these symptoms may be found post recovery too. Although these conditions are not life threatening but can have major repercussions which are discussed later in the article. The mechanism which is being deliberated as cause behind dysgeusia mainly includes invasion in central nervous system as all the nerves and indicators are connected to CNS [11]. CNS damage can have the debilitating impact on the taste sensation. The ACE 2 receptors which act as the gateway for the SARS-COV-2 are present in the oral epithelial tissues which may trigger a rapid transmission of infection into other parts of the body. The oral mucosa which has abundant amount of ACE 2 receptors needs to be studies further. Some studies suggest that the elevated levels of pro inflammatory cytokines like IL6 can hinder the maturation of taste buds and in turnimpairs the taste sensation. Viral invasion in the salivary glands by SARS-COV-2 can adversely affects salivary flow which can influence the taste sensation. Another study suggests that novel coronavirus may cause demyelination of the olfactory nerves which can cause alteration in senses. Gustatory sensation deficits may be behind the disorder of dysgeusia. All these mechanism discussed needs more comprehensive analysis to provide empirical correlation [17].

Psychological impact of dysosmia and dysgeusia

Apart from the physiological impact of dysosmia and dysgeusia, psychological impact too is adversely affecting the COVID-19 individuals. Smell and taste are taken for granted and it is connected to lot of emotions and memories. Specific type of smell evokes the emotional response connected to it and same follows for tastesensation. Absence of these sensations can be very strange and taxing on mind as one would never imagine without these senses. The

ability to detect harmful smells helps us to get away from such places so that we can protect ourselves from toxic substances. But after dysosmia, one can find itself in difficult situation as he or she cannot distinguish among smells or odor. Similarly taste enhances the experience of food assimilation and ignites the appetite. Taste also makes various enzymes to be released from glands like saliva. Without these enzymes, food is not digested properly and can affect the overall wellbeing. This can induce anxiety and depression. These symptoms like loss of taste and smell are extremely rare and prior to COVID-19, it had only few subjects, therefore most of the people will experience first time in their lifetime creating more anxiety. Senses are the point of contacts for the body to sense surrounding. Any impairment can lead to perceived distress which often culminates into depression. The loss of taste and smell continues to be with the infected individual even after the recovery from the disease. A condition of long COVID-19 is responsible behind it, in which large number of symptoms persist seven after getting recovered from COVID-19. Intermittent loss of taste and smell can agitate some patients are other long COVID-19 conditions like fatigue and muscle pain are already haunting them. Conditions like parosmia in which taste is distorted. Food tastes like plastic or gasoline which affects the appetite of the patients. Instances of non-detection fire due to malfunctioned olfactory indicators among whole family have been reported and are a serious cause of concern. These conditions have no time limit and can persist for considerable amount of time. No fixed timeline has been found among patients infected from COVID-19 [18].

CONCLUSION

Mutations are inevitable among the viruses. Therefore we have to be more vigilant about them. Genome sequencing must be done at regular intervals among samples from different geographical background so that all the mutations are listed and studied. Viral behavior is still evolving and pandemic is still far from over. Although the condition of dysosmia and dysgeusia is not life threatening but the spillover effect attached to it must be taken seriously. They can be used as indicator for the onset of COVID-19. Early medical intervention among the patients of COVID-19 helps to present the patient from slipping into severe and critical condition. Both the condition is also otherwise found among non-COVID-19 patients. These patients must be examined regularly for COVID-19. Complacency in such situation can lead to worsening of the health of the patients. Instances of non-detection of smell of burning in some parts of the world are really frightening as it can invite to a larger danger. Proper precaution must be taken to avoid such mishaps. Psychological associated with dysosmia and dysgeusia must be dealt with professionally and proper help must be provided to pull out the patient from anxiety and depression. Condition of long COVID-19 is becoming a common phenomenon and post COVID-19 rehabilitative care must be on top of priority list while dealing with the pandemic.

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