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World Food Safety Day: In the Midst of the Pandemic

MANSIMRANJIT KAUR UPPAL 

The World Food Safety Day (WFSD) is celebrated on the seventh day of June every year. Its primary aim is to draw attention and inspiring actions that help prevent, detect and manage foodborne risks, contribute to food security, human health, economic prosperity, agriculture, market access, tourism and sustainable development. The theme for the year 2021 is aptly chosen as “**Safe food today for a healthy tomorrow**”¹

This day was first celebrated in the year 2018 by the WHO and the Food and Agriculture Organization of the United Nations (FAO) in collaboration with member states and other relevant organizations.

As I was going through materials on food safety to write this editorial, I stumbled upon a video by the WHO which stated that “Food safety is everyone’s business” and support the statement. The safety of our food is a shared responsibility between governments, producers, as well as the consumers. In this editorial, I would like to share a few thoughts with consumers regarding food safety.

When the World Health Organization (WHO) declared the COVID-19 outbreak as a Public Health Emergency of International Concern on 30th January 2020, and a pandemic on 11th March 2020,¹ it was time for governments and people to swing into preventive action. Governments starting enforcing lockdowns and people were limited to the comfort of their homes and the world was brought to a standstill. As a precautionary measure, people started paying proper attention to materials bought to their homes. People were sanitizing their laptops, smartphones, clothes, etc. Food items, especially vegetables were being washed in soap, bleach, sanitizers and detergent before being consumed and was supported by false, misleading statements by various people.³

The public should be advised that soap and detergent is meant for crockery and not for washing vegetables. The biggest risk in doing so is the possibility of getting

exposed to other contaminants and subsequent poisoning. Scientists have stated that the virus is fragile in nature and while most fruits and vegetables are peeled and boiled during the cooking process, thereby killing the virus, fruits like apple can be simply washed under running water before consumption.

There is no evidence from the WHO and other agencies that state that food is a vehicle for the virus and hence, unsafe. The CDC further clarifies that the risk of getting COVID-19 from food cooked at home or from handling and consuming food from restaurants and takeout or drive-thru meals is thought to be very low; and hence, most countries have allowed either take away and dine-in or both.⁴

In the case of a food delivery, one can reduce the risk of packaging contamination simply by just emptying the contents into a clean dish, followed by proper disposal of the packaging into a refuse bag and washing hands immediately thereafter. I advise the readers to take food out of a container with a spoon and eat it with a knife and fork – and not one’s hands. Given the present circumstances, it is better to only order hot, freshly cooked food and avoid cold or raw items (although if handled properly, the risk of contamination remains low). It is also advisable to reheat the food for a couple of seconds in the microwave before consumption.⁵

With the world battling the brutal onslaught of the virus, vaccinations are helping people in bringing the world slowly and gradually to pre-pandemic levels. I request all hesitant people to get themselves vaccinated as well as practice safe social distancing norms as the fight is not over but slowly and gradually, we are inching towards defeating this virus.

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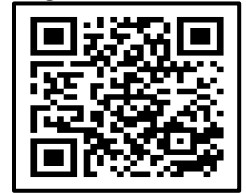
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COVID-19: Oral Manifestations-A Dentist's Perspective

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COVID-19 is a global pandemic disease which has crippled health care system and economics worldwide. According to WHO, an acute respiratory infection, fever and cough are the most valid diagnostic clinical features. Some common orofacial manifestations of this viral infection may contribute to early diagnosis of covid-19 infection. Oral manifestations include olfactory and gustatory disturbances, dry mouth, facial pain, vesicobullous lesions such as erosion, pustule, macule, papule, plaque, pigmentation and depapillated tongue with whitish areas, haemorrhagic crust, necrosis, swelling and erythema. The most common sites of involvement in descending order are tongue (38%), labial mucosa (26%), and palate (22%). Oral lesions are symptomatic in 68% of the cases who test positive for SARS Co-V. Lack of oral hygiene, opportunistic infections, stress, immunosuppression, vasculitis, and hyper-inflammatory response secondary to COVID-19 are the most important predisposing factors for onset of oral lesions in COVID-19 patients.

KEYWORDS: COVID-19, Dysgeusia, Oral, Ulcer

INTRODUCTION

Corona virus disease 2019 (COVID-19) is an infection caused by Severe Acute Respiratory Syndrome (SARS) CoV- 2 which is the seventh type belonging to the coronavirus family to affect human beings.¹ The novel coronavirus (COVID-19) pandemic plaguing the entire world originated from Wuhan city, China in the month of December 2019. This SARS-CoV-2 is a respiratory zoonotic disease having both bats and pangolins as the most probable origin and intermediate host.^{2,3} Initially, the identification and sequencing of the virus responsible for COVID-19 led to the conclusion that it is a novel Coronavirus (CoV) that shared an astonishing 88% sequence identity with two bat-derived SARS-like CoV, suggesting its origin in bats.

Further testing and full-length genome sequencing revealed that the 2019-nCoV shares 79.5% sequence identity with SARS-CoV; and consequently, protein sequence analysis divulged that the virus belonged to a class of SARS-related coronaviruses. The 2019-nCoV is believed to spread through close person-to-person contact of about 2 metres, a distance at which the respiratory droplets from an infected person either asymptomatic or symptomatic person (who coughs, sneezes, or speaks) can spread to other people who do not have adequate barriers (Proper distancing and masks). Another probable route of transmission occurs

indirectly, when saliva droplets fall on other surfaces, such as the ground and objects made of different materials, and people come into contact with them.⁴ COVID -19 has an incubation period of 1 to 15 days with most ranging from 3 to 7 days.⁵ Upon global protest, the World health Organization (WHO) declared COVID-19 as a global pandemic.

SARS COV AND ACE INHIBITORS

As with any infection, the entry of the virus in host cells is the first step in the initiation of the infection; with the presence of a spike glycoprotein on the viral envelope of the coronavirus binding to specific receptors on the membrane of host cells. Laboratory based studies have documented that ACE2 is the specific functional receptor for SARS-CoV. It was further revealed that this virus can enter ACE2 expressing cells, as the virus did not affect cells without ACE2 receptors or other cells expressing coronavirus receptors [which include aminopeptidase N and dipeptidyl peptidase 4 (DPP4)].^{6,7}

The receptor-binding domain of the spike glycoprotein was reported to bind itself to the tip of subdomain I of ACE2. The fusion of the virus to the cell membrane of the host cell is activated after binding, which leads to viral RNA being subsequently released into the



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cytoplasm, and thus manifesting infection. In this process, a few transmembrane proteinases [disintegrin and metallopeptidase domain 17 (ADAM17) particularly], transmembrane protease serine 2 (TMPRSS2), TNF-converting enzyme and proteins (which include vimentin and clathrin) are documented to be involved in the processes of binding and membrane fusion.

The ACE2 receptor is expressed in differing degrees in all human organs and in the respiratory system, it is mainly expressed in the type II alveolar epithelial cells of the oral and nasal mucosa and nasopharynx, indicating that the lungs are in fact the primary target of SARS viruses. In addition, the ACE2 receptor is also reported to be highly expressed in myocardial cells, proximal tubule cells of the kidney, the urothelial cells of the bladder, and abundantly expressed on the enterocytes of the small intestine. The virus, which is cell-free, and is macrophage phagocytosis-associated might possibly spread from the lungs to other vital organs with a high ACE2 expression through blood circulation. Figure 1 depicts the diagrammatic representation of virus attaching to host cell.

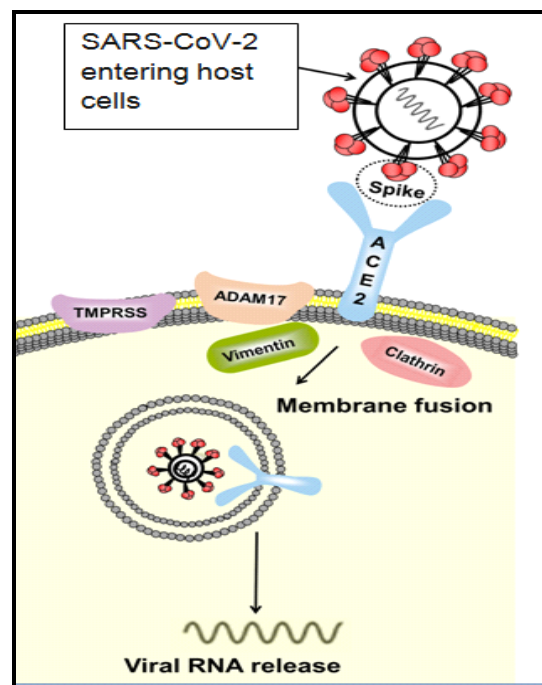


Figure 1. Diagrammatic Representation of Virus Attaching to Host Cell

ACE-2 was expressed in the oral cavity more prominently in epithelial cells of the tongue as

compared to other oral sites such as gingival and buccal mucosa.⁸ In clinical studies, it was found to be strongly expressed in taste buds of rats. Furthermore, angiotensin II produced in taste buds of mice demonstrated an essential role altering taste sensitivity. Since ACE2 is found to degrade the Ang II receptors, which might lead to possible accumulation of Ang II in taste buds during COVID-19 infection and this mechanism possibly explains the reason behind the reported dysgeusia among patients.

CNS INVASION⁶

The CNS invasion of the virus is shown in figure 2.

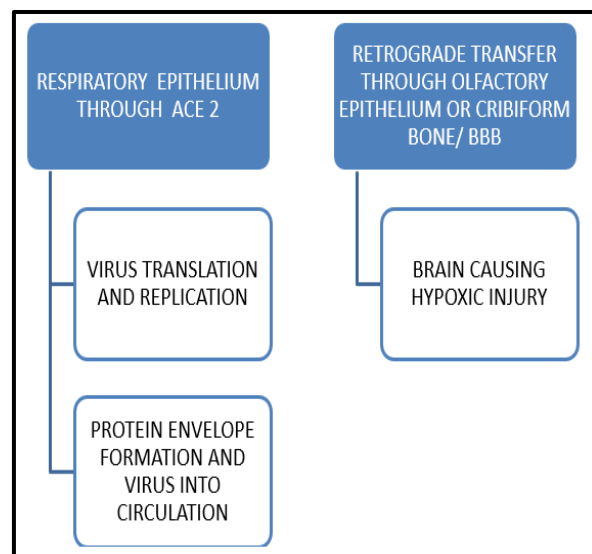


Figure 2. CNS Invasion of SARS-COV-2

MECHANISM OF SARS-CoV-2 IN ORAL CAVITY⁷

The mechanism of action of SARS-CoV-2 on the oral cavity is shown in figure 3.

ORAL MANIFESTATIONS OF SARS-CoV-2

Olfactory Dysfunction: According to Biadsee et (2020)⁸, 67% of patients report olfactory dysfunction during the disease. These olfactory impairments can be classified into two main categories: the first being conductive losses stemming from obstruction of nasal passages and the second: sensorinueral causes from damage to the olfactory nueropithelium which are most often attributed to post viral olfactory loss.

Ulceration in The Oral Cavity: According to a review by Behzad et al., oral manifestations of patients affected

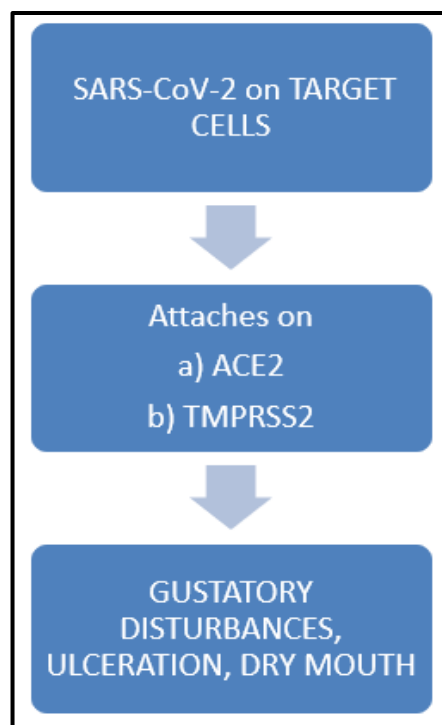


Figure 3. Mechanism of Action of SARS-CoV-2 in Oral Cavity

with COVID-19 included ulcer, erosion, bulla, vesicle, pustule, fissured or depapillated tongue, macule, papule, plaque, pigmentation, halitosis, whitish areas, hemorrhagic crust, necrosis, petechiae, swelling, erythema, and spontaneous bleeding. The most common sites of involvement in descending order were tongue (38%), labial mucosa (26%), palate (22%), gingiva (8%), buccal mucosa (5%), oropharynx (4%), and tonsil (1%). Suggested diagnoses of the lesions were aphthous stomatitis, herpetiform lesions, candidiasis, vasculitis, Kawasaki-like, EM like mucositis, drug eruption, necrotizing periodontal disease, bullosa-like, angular cheilitis, atypical Sweet syndrome, and Melkersson-Rosenthal syndrome. The oral lesions in approximately 68% of the patients were reported to be symptomatic (painful, burning sensation, or pruritus) and were nearly equally distributed among both genders (49% female, 51% male). The latent time between appearance of oral lesions was between 4 days before and up to 12 weeks after the onset of systemic symptoms among patients.⁹

Biadsee and colleagues demonstrated that 7% of the patients with RT-PCR positive test had plaque-like changes on the dorsum of tongue. Also, swelling of oral cavity including palatal, lingual, and gum) was reported by 8% of the patients. In addition, the appearance of oral lesions was simultaneously observed with a loss of taste

and smell in patients with more severe and disseminated oral lesions reported among older patients.⁸

Stress and immunosuppression associated with COVID-19 and drug eruption, vasculitis, or thrombotic vasculopathy secondary to COVID-19 were suggested as causes for development of ulcerative and erosive lesions and appearance of secondary herpetic gingivostomatitis. Oral lesions also included a painful, diffuse erythematous gingiva with necrosis of inter-papillary areas which suggested diagnosis of necrotizing periodontal disease as a result of bacterial co-infections. The lesions recovered after 5 days.⁹

Taste: Among patients, a true loss of taste is extremely rare, and is routinely preceded by the inability to perceive the odor of food due to olfactory dysfunction.¹⁰ Biadsee et al. reported that 25.8% patients with an impaired sense of smell and taste in the absence of other symptoms. The pooled eligible data for different taste disorders were 38% for dysgeusia, 35% for hypogeusia while ageusia had a prevalence of 24%. A loss of smell or taste as a result of COVID-19 seems to last slightly longer as compared to various other upper respiratory infections. The median reported duration of loss of smell or taste among patients suffering from COVID-19 was 8 days.

Dry Mouth: There is a strong correlation found between burning mouth and alteration of taste. Since saliva functions as a solvent of taste and regulates the conditions of taste receptors, a change in the salivary flow can be potentially linked to an altered taste alteration among patients. Taste disorders involve the damage of gustatory papillae and taste buds caused by reduced saliva secretion. Since human salivary glands express ACE2 and TMPRSS2, salivary gland infection with SARS-CoV-2 would affect saliva secretion, thereby altering the tasting ability.¹¹

The element zinc has been reported to increase the secretion of unstimulated and stimulated saliva in humans, and its deficiency is associated with COVID-19 as it may induce gustatory dysfunction through hyposalivation. The important functions of zinc not only include building the immune system and inflammatory response, but also involves the gustatory function at a level of taste buds and taste stimulus-transmitting nerves. It is also required for the subsequent regeneration and maintenance of taste cells and for zinc-metalloenzymes localized in taste buds. Taste

disorders are improved by administering zinc as zinc ionophore chloroquine which increases the cellular influx of zinc that inhibits SARS-CoV-2. A decreased zinc level is also favorable for the interaction of zinc-dependent metalloenzyme ACE2 with spike proteins of SARS-CoV-2 but an increased zinc level inhibits ACE2 expression.¹²

Periodontal Tissue: Among periodontal tissues, ACE2, TMPRSS2, and furin have been documented to play an important and have an established role in the viral cell invasion and are expressed in the epithelium of the gingival sulcus and periodontal pocket. Hence, the virus potentially infects these epithelia and leads to a potentially adverse effect on periodontal tissues. The major periodontopathic bacteria *Prevotella intermedia* has been frequently detected among COVID-19 patients. On subsequent examination, the intraoral cavity of patients revealed severe halitosis, generalized erythematous, edematous gingivae, and necrotic papillae (interdental) in both the maxillary and mandibular sextants on the labial side.¹³

Inflammation of Salivary Glands: Cases involving inflamed salivary glands have been reported among COVID-19 patients due to the expression of ACE2 in these glands. The virus can cause acute sialadenitis by binding to ACE2 receptors in the epithelia of the salivary glands and lead to lysing of the cells.¹¹ The inflammatory damages to the acinar cells are subsequently repaired by fibroblast proliferation and fibrous connective tissue formation, this fibrous repair and hyperplasia may give rise to salivary gland hyposecretion and ductal stenosis, as a result of which, the salivary flow is reduced.¹⁴

CONCLUSION

SARS-CoV-2 may manifest with various combinations of symptoms. Aphthous-like lesions, gustatory disturbance, candidiasis, xerostomia and oral lesions of Kawasaki-like disease are the most common oral manifestations of COVID-19 disease. Lack of oral hygiene, opportunistic infections, stress, underlying diseases (diabetes mellitus, immunosuppression), trauma (secondary to intubation), vascular compromise, and hyper-inflammatory response secondary to COVID-19 might be the most important predisposing factors for the development of oral lesions in COVID-19 patients.

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The Association between Vaccination and Autoimmunity

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Vaccines are one of the prime preventive measures against infectious diseases. Administration of vaccination may lead to significant autoimmune manifestations. There is a vast literature on autoimmune issues associated with vaccines including animal and in-vitro studies, case reports and case series. Contrary to this, epidemiological research work does not report this association. This review on the potential association between vaccines and the development of autoimmune diseases is based on currently available scientific literature. We conclude that vaccines have a very positive impact on human health. Further research is required to clarify the association between vaccines and autoimmune conditions and also the detailed mechanisms behind this.

KEYWORDS: Vaccines, Vaccination, Autoimmunity

INTRODUCTION

The demonstrated association between infection and autoimmunity in genetically predisposed individuals¹, has opened the debate in the scientific community about the possibility that vaccines may also induce autoimmune phenomena.² There are numerous reports of patients who have developed autoimmune diseases after certain vaccinations, which raises the suspicion of a causal relationship, but there are several epidemiological studies that have not confirmed this association, which has led to intense debate on this topic.³ The possibility that a vaccine is capable of inducing an autoimmune event must not be overlooked, although the magnitude of the potential risk is apparently low. There is currently still limited knowledge related to the etiology, genetic basis and other risk factors that are part of the mosaic of autoimmune diseases, so this is a field of intense research followed closely by health and regulatory entities in all countries.

There are various models of autoimmune diseases, induced in laboratory animals by immunization with antigens obtained from their own tissues formulated with adjuvants. A classic example is the experimental allergic encephalitis model, which is obtained in susceptible rat and mouse lines, by inoculating tissue extracts from the central nervous system, myelin basic protein, or peptides derived from it with Freund's Complete Adjuvant, resulting in characteristic neurological symptoms.⁴ Other models have been described to reproduce an autoimmune

disease in laboratory animals, following similar protocols.⁵ However, it has been described that inoculation of a peptide from the hepatitis B virus polymerase, which shares sequential similarities to rabbit MBP, by being inoculated with this, produced perivascular infiltration localized in the central nervous system, similar to that occurring with inoculation of full-length MBP or encephalitogenic peptides derived from it, further demonstrating a humoral and cellular immune response against MBP itself.⁶

Experimental models provide a basis for studying the mechanisms of a potential development of post-vaccine autoimmune disease. However, it should be considered that such models do not reproduce exactly what happens when a vaccine is given in humans, since they are based on immunization regimens under extreme conditions, using adjuvants such as Freund's, not approved for clinical use; in addition, genetically susceptible models are almost always used and immunized with purified organ or self-antigen homogenates, which does not occur in practice. There are numerous suspected cases of post-vaccination autoimmune diseases documented in the medical literature. Similarly, there are periodic databases and publications that record adverse events associated with vaccines that allow the causal relationship between vaccines and their adverse effects to be processed and statistically analyzed, including post-vaccination autoimmune events.⁷ The first case of



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suspected association of hepatitis B vaccines with signs of central nervous system demyelination in humans was recorded in 1991.⁸ Then, in France, 35 cases of demyelinating diseases were described, occurring within eight weeks after a similar vaccination was given, with half of the cases being confirmed as multiple sclerosis.⁹ The accumulation of spontaneous multiple sclerosis cases led the French Minister of Public Health to temporarily prohibit the vaccination program of schoolchildren with the hepatitis B vaccine initiated in 1995, which coupled with the absence of epidemiological data demonstrating otherwise, created much debate and confusion.¹⁰ Epidemiological studies and other analyses were subsequently performed that could not confirm this causal relationship.^{11,12}

Girard has questioned the methods used and the conclusions issued after the controlled studies, highlighting that not all cases of autoimmunity associated with this vaccine were collected, and the inappropriateness of the statistical methods used.¹³ However, Bogdanos et al. reported that several patients vaccinated against hepatitis B developed antibodies against myelin oligodendrocyte protein mimetic peptides; however, no clinical consequences of this cross-reactivity were detected and the antibodies decreased their titer in the subsequent months. No anti-MBP peptide antibodies¹⁴ were detected in this same study. This supports the criterion that an autoimmune reaction does not always have a clinical translation, which further complicates interpretation of the results. The actual danger of hepatitis B vaccination is still debated, and it is generally accepted that if a true causal relationship exists in practice, the benefits reported for this vaccine outweigh the potential risk. The existence of autoimmune phenomena associated with natural hepatitis A infection is known, but in relation to hepatitis A vaccines, to date, one case of a possible connection to autoimmune hepatitis has been reported,¹⁵ so this vaccine is considered one of the safest, after millions of doses given worldwide.

Guillain-Barré syndrome also called demyelinating polyradiculoneuritis, is closely related to a previous infection, with evidence of cross-immune reaction between viral antigens and myelinic antigens and constituting the most common autoimmune condition that has been related to influenza vaccines.¹⁶ The relationship of GBS to influenza A/New Jersey vaccine was suggested following a vaccination campaign conducted in the United States

between 1976 and 1977, during which the number of cases of this condition increased in the first weeks after vaccination, particularly in the fifth week, with the incidence decreasing after the sixth week, leading to a temporary suspension of the vaccination program.¹⁷

However, retrospective research developed after campaigns conducted in 1992–1993 and 1993–1994 revealed that the incidence within six weeks was significant although much lower than in the campaign of the 1970s.¹⁸ Another found a significantly increased risk of developing GBS following influenza vaccination, with differences between vaccine producers and the viral strains used.¹⁹ Meanwhile, it has been shown that the risk of GBS recurrence following an initial episode and re-immunization with influenza vaccine is minimal. Influenza vaccine may also result in Henoch-Schönlein purpura, microscopic polyangiitis, reactive arthritis, giant cell vasculitis, polymyalgia rheumatica, cryoglobulinemia, polyarthralgia, fatigue, meningoencephalitis/encephalitis, optic neuritis, transverse myelitis, brachial neuritis, Guillain-Barré syndrome, Bell's palsy, lymphocytopenia, thrombocytopenia, autoimmune hemolytic anemia, acute myocarditis, acute pericarditis, type 1 diabetes mellitus, nephrotic syndrome, uveitis, myositis, erythema multiforme.

It has been suggested that immunization with H. influenzae type b vaccine after the age of two months may be related to type 1 diabetes in humans and that the potential risk of the vaccine may exceed the benefit it provides.²⁰ However, this association has not been confirmed in controlled studies.⁽²¹⁾ Hepatitis B vaccine might result in rheumatoid arthritis, reactive arthritis, SLE exacerbation, Sjogren's syndrome, vasculitis, cryoglobulinemia, polyarthralgia, polyarteritis nodosa, myalgia, fatigue, erythema nodosum, erythema multiforme, cutaneous lupus erythematosus, localized scleroderma, lichen planus, encephalitis, acute aseptic meningitis, transverse myelitis, optic neuritis, neuropathy of lumbar and brachial plexuses, Guillain-Barré syndrome, Bell's palsy, acute cerebellar ataxia, myasthenia gravis, multiple sclerosis, thrombocytopenia, immune hemolytic anemia, aplastic anemia, nephrotic syndrome, uveitis, alopecia, acute pericarditis and Graves' disease. The re-emergence of yellow fever has led to mass vaccination in countries such as Brazil, Australia, Spain, among others, with attenuated vaccines such

as 17D and 17DD, which have been very successful in their protective capacity; however, the occurrence of very sporadic conditions called viscerotropic and neurotropic diseases, have led to discussions about its safety.²² The mechanism of these severe adverse effects produced by these vaccines²³ has not yet been determined, although it appears that people over 60 years of age, and those with some predisposition or immunological compromise, exhibit an increased risk of these adverse events, so it is proposed to evaluate the risk/benefit of vaccination²⁴ in these populations. These vaccines are generally considered safe and highly effective against this dangerous disease. Measles Mumps Rubella vaccine can cause arthritis and acute arthralgia, chronic arthritis, myositis, encephalitis, aseptic meningitis, myelitis, optic neuritis, Guillain-Barré syndrome, thrombocytopenia/acute thrombocytopenic purpura, hemolytic uremic syndrome, hemolytic anemia. Varicella vaccine is known to be associated with arthritis or arthralgia, vasculitis, encephalitis, aseptic meningitis, myelitis, optic neuritis, Guillain-Barré syndrome, transient cerebellar ataxia, optic neuritis, transverse myelitis, Bell's palsy, thrombocytopenia, aplastic anemia, erythema multiforme. Poliomyelitis vaccine may induce acute arthritis, encephalitis, Guillain-Barré syndrome and autoimmune hemolytic anemia. Smallpox vaccine may cause post-vaccine encephalopathy, encephalomyelitis, erythema multiforme, myopericarditis, dilated cardiomyopathy. Diphtheria/tetanus toxoid is known to be associated with demyelinating diseases of the central nervous system and Guillain-Barré syndrome. BCG vaccine can cause Arthritis and Reiter's disease.

A latent concern of the health and regulatory authorities is the possibility that a vaccine may aggravate a pre-existing autoimmune disease. In this regard, several controlled studies, particularly in patients with multiple sclerosis, rheumatoid arthritis and SLE, using hepatitis B, influenza, pneumococcal and tetanus toxoid vaccines have not revealed evidence of worsening of the disease post-vaccination,¹⁰ so there are no objective criteria to date that a patient-carrier of autoimmune disease must not be vaccinated. The development of an autoimmune process rests on the influence of genetic factors associated with external factors that induce or facilitate the loss of immunotolerance with the development of immune responses against its own structures. The genetic factor determines that not all individuals have the same predisposition to develop an autoimmune disease, among the most commonly

involved genes are those that code for Human Leucocyte Antigens. There are reports of association of certain HLA haplotypes with autoimmune diseases, with HLA-B27 being the haplotype most associated with diseases such as ankylosing spondylitis.²⁵ Other genes recently associated with autoimmune diseases are the autoimmune regulator genes, which participates in the presentation of self-antigens during the central tolerance process in the thymus, for the deletion of autoreactive T-cells, the defect of which may lead to the development of multi-systemic autoimmune diseases.²⁶ Associations with polymorphisms have also been found in the gene encoding the cytolytic T lymphocyte associated antigen, a negative regulator in T-cell activation, and in the TIM (T-cell immunoglobulin and mucin-domain-containing) family of proteins.²⁷ Molecular mimicry in microbial antigens may constitute a potential hazard for the development of post-vaccine autoimmunity,^{1,6} especially in the presence of a vaccine adjuvant. Adjuvants optimize the immune response against the co-administered antigen, but also contribute to vaccine toxicity,²⁸ so there is a hypothesis that certain autoreactive lymphocyte clones, which, under physiological conditions, do not recognize self-antigens due to being under the peripheral tolerance pressure, could well increase their ability to recognize and activate through the influence of adjuvant activity and develop an autoreactive response, especially in individuals with a favorable genetic background.²⁹ Fortunately, the tolerance mechanisms are very effective in limiting the deleterious effect that molecular mimicry could cause between microorganisms and their own structures. Another mechanism that may act on post-vaccine autoimmunity is the formation of immune complexes, causing vasculitis or exacerbation of latent autoimmune processes.¹⁰

Lastly, it should be noted that within the dynamics of the immune response, usually responses against their own structures develop in a subclinical manner whose etiopathogenetic role is not yet known. Although there is theoretically the possibility of induction of post-vaccination autoimmune disease and the existence of documented suspicions of associations between certain vaccines and autoimmune conditions, epidemiological studies have mostly concluded that there is no such association or is of very low incidence. However, the epidemiological research required in vaccines currently has some issues, such as the lack of knowledge of the genetic profile of each vaccinated individual, since all genes

involved in autoimmunity have not yet been accurately defined. Another difficulty in the interpretation of population-based studies is that the timing of developing an autoimmune response is unpredictable. There is also a need to establish ways to improve the recording of adverse events in the pharmacovigilance studies, since these are performed through passive surveillance in which the patient spontaneously describes the event, which implies the problem that many people do not report and, furthermore, it is more difficult to establish a possible causal relationship with an event that occurs later as time passes after vaccination. All of this implies that refining analysis methods and having new elements in the pathogenesis of autoimmune diseases are necessary in order to establish the correct estimates.

CONCLUSION

Due to the great benefit to humanity achieved with vaccines, there is no justification for stopping or decreasing their administration. However, the potential risk of post-vaccine autoimmunity cannot be ignored and, although a clear causal relationship has not been established in practice, due to the ethical and medical-legal implications, it is a responsibility of medical field to continue refining evaluation methods from base level to pharmacovigilance studies and try to avoid potential adverse effects as much as possible, with greater rigor in the design and evaluation of vaccine candidates under development.

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Whitening of a Non-Vital Tooth with Walking Bleach Technique: A Case Series

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A significant aspect of cosmetic dentistry is the treatment of tooth discoloration. Discoloration of non-vital anterior teeth can cause significant esthetic concern and requires efficient treatment. Discoloration of teeth can be extrinsic or intrinsic or a combination of both based on etiology, appearance, localization, and severity. Walking bleach involves the use of chemical substances like sodium perborate or hydrogen peroxide which in contact with the tooth release oxidizing agents that diffuse through the enamel and dentin and oxidize the pigments responsible for discoloration. This article aims at presenting a case series on the walking bleach method performed on discolored endodontically treated teeth associated with superior esthetic outcomes.

KEYWORDS: Hydrogen Peroxide, Teeth, Endodontics

INTRODUCTION

Increased cases of tooth whitening have been noted in dental practice over the last decade, with a greater preference for minimally invasive procedures. Several methods have been developed with the goal of treating non-vital tooth discoloration. Full veneer crowns are traditionally preferred to restore aesthetics in endodontically treated anterior teeth. In case with a sound tooth structure and mild to moderate discoloration, bleaching is a favourable option. It is also non-invasive, less time-consuming and cost-effective.¹⁻⁴

Walking bleach technique employs the use of chemicals that release active oxygen i.e. hydrogen peroxide (H₂O₂) or sodium perborate (SP). Very often combination of SP and water or H₂O₂ are being used in the “walking bleach” technique.⁵⁻⁶ The effect of bleaching depends on the factors such as firstly the concentration of the bleaching agent, second the ability of the agent to enter the chromophore molecules and lastly the length and amount of time the agent is in contact with chromophore molecules.⁷

Intrinsic discoloration may be caused by systemic or local causes. The systemic explanations include metabolic fluorosis linked to drugs (tetracycline), and hereditary (hyperbilirubinemia, amelogenesis imperfecta, and dentinogenesis imperfecta),⁸ whereas the local reasons include necrosis of pulp, intrapulpal

hemorrhage, remnants of pulp tissue after endodontic therapy, endodontic root canal materials, coronal filling materials, root resorption, and aging.⁹ The present case series reports successful bleaching accomplished in the discolored nonvital anterior endodontically treated tooth. Two different approaches of walking bleach technique was performed.

CASE 1

A 24-year-old young female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of discolored upper front tooth and wanted to get whitening of the discolored tooth. Patient had a history of trauma with respect to upper front teeth eight years back. On examination, maxillary left central incisor tooth was discolored and structurally intact and firm (figure 1). An intraoral radiograph showed widening of periodontal ligament space and discontinuity in lamina dura and mild radiolucency in periapical region with 21 (figure 2). Patient was explained about the root canal therapy followed by intracoronal bleaching for the tooth and informed consent was taken. B2 shade was determined using VITA shade guide and preoperative photographs were taken. Root canal therapy was performed under the proper isolation. The preparation in the pulp chamber for bleaching was done by removing 2 mm of gutta-percha near orifice (figure 3)



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Figure 1. Preoperative photograph



Figure 2. Preoperative radiograph

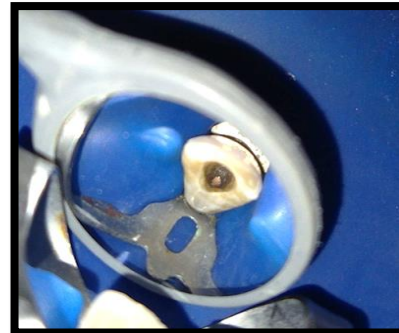


Figure 3. Intracoronal chamber



Figure 4. GIC placed at level of CEJ



Figure 5. Follow up after one week



Figure 6. Post-operative photograph

and 1 to 2 mm glass ionomer cement (GIC) (Ivoclar Vivadent) was placed over it to create a mechanical barrier between the root canal at the level of cemento enamel junction (figure 4). Bleaching agent was placed inside pulp chamber using applicator tip then cavity was sealed by using zinc phosphate (ShofuHy-Bond Zinc Phosphate Cement) as temporary restoration. Bleaching was carried out using a paste of sodium perborate prepared by mixing with distilled water. In this case, the same procedure was repeated every 1 week in two-time interval (figure 5). After two weeks, the anticipated results were achieved with better cosmetic appearance, even the shade got lighter to A1 (figure 6). Following this, the tooth was then permanently restored using composite resin (3M EspeFiltek Z250 Xt).

CASE 2

A 19 years old young adult was referred to the Department of Conservative Dentistry and Endodontics for treatment of discolored maxillary right

central incisor teeth (figure 7). History of dental trauma in the same region dated back to 6 years. The preoperative radiograph showed the extent of fracture to the pulp chamber with periapical radiolucency. Patient was explained in detail about the root canal therapy and intracoronal bleaching for the same tooth. Informed consent was taken prior to commencement of the root canal treatment done in relation to 11 and 12. Preoperatively, VITA Classical shade guide was used to determine and match the tooth color under normal daylight. A 3.5 shade was determined using VITA shade guide. Gutta-percha was removed just below the cemento enamel junction. The glass ionomer cement (GIC) (Ivoclar Vivadent) barrier of 2 mm thickness was applied (figure 8). Bleaching was carried out using a paste of sodium perborate prepared by mixing with 10% carbamide peroxide. Using applicator tip, Bleaching agent was placed inside pulp chamber (figure 9). The tooth was coronally then sealed with the help of zinc phosphate (ShofuHy-Bond Zinc Phosphate Cement). The tooth showed significant changes in shade after 7



Figure 7. Preoperative photograph



Figure 8. Radiograph after placing GIC barrier



Figure 9. After placing bleaching agent

days. The shade changed to A₂ from A_{3.5} (figure 10). The tooth was then permanently restored using composite resin (3M EspeFiltek Z250 Xt).

DISCUSSION

Intrinsic discoloration occurs due to entrapment of chromogenic content within enamel or dentin, either during tooth formation or after eruption, whereas extrinsic discolorations occurs on the surface.⁷ Intrinsic stains are classified as pre-eruptive and post-eruptive stains.⁹ Pre-eruptive discoloration may result from exposure to elevated fluoride levels, tetracycline administration, hereditary developmental anomalies, and damage to the developing tooth. Aging, pulp necrosis, and iatrogenesis are the primary sources of intrinsic discoloration following the tooth eruption. Extrinsic stains originate from chocolate, tea, red wine, carrots, grapes, and cigarettes. A thorough and definitive understanding of the etiology of teeth discoloration is crucial for arriving at a correct diagnosis and formulating appropriate treatment plan.¹⁰

Numerous options are available for the treatment of discolored endodontically treated anterior teeth: full veneers, laminates, crowns, and non-invasive procedure such as bleaching.¹¹ Traditionally, laminate, veneer or a complete porcelain crown are treatment options in these situations but they involve removal of substantial amount of the tooth structure.^{12,13}

In the mid-19th century, bleaching of discolored non vital teeth using lime chloride was first reported. At first, the bleaching effect of H₂O₂ on the tooth was discovered in 1884 and before this various bleaching

agent like aluminum chloride and oxalic acid were identified.^{14,15}



Figure 10. Post-operative photograph

For the very first time, Spasser described Walking bleach method. This method uses sodium perborate (SP) mixed with distilled water.¹⁶ Sodium perborate serves as an oxidizing agent containing 95% perborate that exists in the form of mono, tri (NaBO₂ · H₂O₂ · 3H₂O) or tetra hydrate.¹⁷ Sodium perborate when combined with water releases H₂O₂.¹⁶ Nutting and Poe later modified this method by replacing H₂O with 30% H₂O₂ to improve the effect.¹⁸ The use of a bleaching agent with a high H₂O₂ concentration in combination with heating tends to encourage resorption of the cervical root.^{19,20} The leakage of bleaching agent through dentinal tubules initiates an inflammatory reaction.²¹ The SP releases active oxygen radicals inside the pulp chamber, which diffuses into the dentinal tubules.²² The iron sulfide and other pigments present in the dentinal tubules get oxidized and bleached, and

also the free radicals induce oxidative effects on lipids, proteins and nucleic acids.^{23,24}

Resorption of the cervical root is a major concern while performing nonvital tooth bleaching. Studies have demonstrated that the use of SP and water mixture have a low potential to induce cervical resorption. To avoid leaching of bleaching agent, glass ionomer cement was placed as a sealant barrier.^{20,25} This also prevents the diffusion of hydrogen peroxide in the surrounding extra-radicular environment.²⁶ When a combination of sodium perborate-tetrahydrate and water is used, the amount of hydrogen peroxide diffusion is significantly less compared with the use of 30% hydrogen peroxide combined with different sodium perborates.²⁷

Carbamide peroxide ($\text{CH}_4\text{N}_2\text{O}\cdot\text{H}_2\text{O}_2$) is an organic compound comprising of H_2O_2 and urea products. 10% carbamide peroxide releases 3.5% hydrogen on decomposition.^{28,29} Evidence is also available from the in vitro studies which mention that SP in water, SP in H_2O_2 (both 3% and 30%), and 10% carbamide peroxide are effective agents for the internal bleaching of nonvital teeth.³⁰

In this case series, the walking bleach method was performed by applying a thick paste of sodium perborate mixed with distilled water and alternatively with 10% carbamide peroxide on the desired site in the pulp chamber for a period of 7 days and the patient was recalled periodically for evaluation. The whole procedure was repeated till the desired result was obtained.

CONCLUSION

The present case series highlights the efficiency of the nonvital bleaching method where, sodium perborate is used with distilled water and alternatively with 10% carbamide peroxide to attain successful and predictable cosmetic results. No signs of relapse of discoloration or cervical root resorption were seen at follow up in both the cases. Henceforth, it can be summarized that walking bleach method can be considered as a potential treatment of choice for discolored nonvital endodontically treated teeth.

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Knowledge, Attitude and Practice towards COVID-19 among Dental Practitioners in Bhutan

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INTRODUCTION: Corona virus disease was first reported in Wuhan city of China in 2019. The disease is caused by a highly infectious virus which can be transmitted from human to human through physical contact, droplets, or touching surfaces contaminated with the virus.

AIM: The study aims to get an assessment of knowledge, attitude and practices towards COVID-19 disease among the dental practitioners in Bhutan.

MATERIAL AND METHODS: An online cross-sectional study was conducted among dental practitioners working in different hospitals across the country. All dental professionals who provided their email address were included in the study. Data were collected using a structured questionnaire shared through email. A total of 157 dental professionals were invited through e-mail to participate in the study.

RESULTS: A total of 125 dental professionals participated in the study (response rate 79.6%). Over half of the participants (51.2%) were between the age group 20-30 years. Despite almost everyone (98.4%) knowing the causative agent and management of COVID-19 positive patients, only around a half of the participants (48%) had a good level of knowledge on COVID-19.

CONCLUSION: The study found that less than half of the participants have a good level of knowledge on COVID-19 while a majority of them feel that there is discrimination against COVID-19 positive patients and health professionals working for COVID-19 patients. The study highlights the need to conduct sensitization, trainings or CME on COVID-19 periodically to keep all health professionals updated with latest advancements to help maintain safety in clinical practice.

KEYWORDS: Bhutan, COVID-19, Dental practitioners, Knowledge, Practice

INTRODUCTION

Corona virus disease was first reported in Wuhan city of China in 2019.¹ The virus came into limelight when atypical cases of patients suffering from pneumonia like illness was reported in Wuhan.² One such patient who suffered pneumonia was admitted to one of the hospitals who was later confirmed to be affected by corona virus, specifically β -coronavirus 2019-nCov.^{3,4} The virus was identified and named as SARS-Cov-2 on 11th February 2020 and the disease as Corona Virus Disease (COVID-19) by the World Health Organization (WHO).³ A month later, on 11th March 2020 it was declared as a pandemic by WHO.⁵

The most common symptoms of the disease are high fever, dry cough, sneezing, fatigue, loss of smell, difficulty in breathing, body aches and chest pain among others. The virus can be transmitted to humans from animals where it mutates and can be transmitted from humans to humans through physical contact, droplets, or touching surfaces contaminated with the virus.^{6,7} Its transmission is rapid and these modes have been established.⁶ Droplets can travel up to 6 feet and the virus remains active and contagious, suspended in the air for up to 4 hours.⁷ These droplets can settle on the surfaces which in turn can infect people who handle them. A person gets infected if they touch the

surfaces contaminated by the virus and then touch eyes, nose, mouth or any other mucous membranes.⁷ Therefore, washing hands frequently with soap and water or alcohol based hand rubs have been recommended to prevent infection by health experts including the WHO.⁸

In Bhutan first positive case of COVID-19 was detected on 5th March, 2020. The country experienced two national lockdowns; first lockdown from 11th August 2020 which lasted for 21 days and second lockdown from 20th December 2020 till 31st January 2021 for 43 days in a stretch due to sporadic community transmission. The lockdowns helped curb the community transmission which was controlled very effectively. As of 1st March, 2021 the country recorded a total of 867 confirmed cases with 865 being declared recovered and one death taking the recovery rate to 99.8%.⁹

It is important for health professionals to keep themselves abreast with the latest updates on COVID-19 in order to prevent and contain the disease. Assessment of knowledge, attitude and practices (KAP) on COVID-19 among dental practitioners is important due to nature of work and close proximity of the



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working environment. Therefore, such studies are being conducted to obtain accurate information about what is known, believed or practiced in a population or community to prevent and fight the disease.¹⁰⁻¹² It is important to get accurate and timely information about this infectious disease so that people do not panic during the pandemic and are well prepared to overcome it. Sharing confusing or wrong information during pandemic can lead to unnecessary panic and distress.¹² Therefore, KAP is crucial for the understanding of peoples' level of knowledge and attitudes and practices towards COVID-19.¹³ This study aims to describe knowledge, attitude and practices regarding COVID-19 among the dental practitioners in Bhutan.

MATERIAL AND METHOD

A cross-sectional online survey was conducted in February 2021 among dental practitioners working in different hospitals across the country to assess the knowledge, attitude and practices on COVID-19. Data were collected using a structured questionnaire shared through email. There were a total of 191 dental practitioners in the country during the conduct of this study. Dental professionals not willing to share their email address and those without email address were excluded from the study. A total of 157 (82.2%) dental professionals working across the country provided their email address and were invited through e-mail to participate in the study. Informed consent form was included at the beginning of the online survey and those responding to questionnaire were assumed to have consented for the study. Data management was done using Microsoft Excel and analyzed using SPSS. The findings are presented as frequency and percent. Mean and standard deviations also have been presented wherever applicable. Knowledge is categorized as 'good', 'moderate' and 'poor' depending on the total score of the participant using Benjamin Bloom criteria. Ethical clearance was granted by the Research Ethics Board of Health (REBH), Ministry of Health, Bhutan (Approval No. REBH/Approval/2020/x06).

RESULTS

A total of 125 dental professionals participated in the study (response rate 79.6%). Over half of the participants (51.2%) were between the age group 20-30 years. Around a half of the participants (49.6%) did not attend sensitization meeting/ CME on COVID-19 and over a half (52.8%) of them reported that COVID-19 financially affected them. Only around one-fifth

(22.4%) of the participants followed Ministry of Health/Prime Minister's Office for updates on COVID-19 (table 1).

| VARIABLES | CATEGORY | FREQUENCY | PERCENT |
|--|--------------------|-----------|---------|
| Age | 20-30 | 64 | 51.2 |
| | 31-40 | 43 | 34.4 |
| | 41- 50 | 14 | 11.2 |
| | 51 and above | 4 | 3.2 |
| Sex | Male | 62 | 49.6 |
| | Female | 63 | 50.4 |
| | | | |
| Designation | Dental Specialist | 6 | 4.8 |
| | Dental Surgeon | 38 | 30.4 |
| | Dental Hygienist | 58 | 46.4 |
| | Dental Technician | 23 | 18.4 |
| Clinical Work Experience | Less than 1 year | 3 | 2.4 |
| | 1 - 5 years | 54 | 43.2 |
| | 6 - 10 years | 29 | 23.2 |
| | 11 -15 years | 18 | 14.4 |
| | 16 - 20 years | 6 | 4.8 |
| | More than 20 years | 15 | 12 |
| Attended COVID-19 sensitization meeting/ CME | Yes | 63 | 50.4 |
| | No | 62 | 49.6 |
| Source of update on COVID-19 | Newspapers | 0 | 0 |
| | Television | 3 | 2.4 |
| | MOH/PMO | 28 | 22.4 |
| | Social media | 12 | 9.6 |
| | All of above | 82 | 65.6 |
| Did COVID-19 financially affect you? | Yes | 66 | 52.8 |
| | No | 59 | 47.2 |
| Did COVID-19 psychologically affect you? | Yes | 88 | 70.4 |
| | No | 37 | 29.6 |

Table 1. Sociodemographic Characteristics (n=125) *MOH/PMO: Ministry of Health/Prime Minister's Office

Correct responses to knowledge questions have been presented in table 2. Almost everyone (98.4%) the causative agent of COVID-19 and management of COVID-19 positive patients. However, only around one fourth (26.4%) had an idea about the clinical

| QUESTIONS | FREQUENCY | PERCENT |
|---|-----------|---------|
| What is causative agent of COVID-19? | 123 | 98.4 |
| The clinical symptoms of COVID-19 are | 33 | 26.4 |
| The mode of transmission of COVID-19 | 108 | 86.4 |
| COVID-19 is riskier to people who are | 124 | 99.2 |
| Which age group is affected the most from COVID-19? | 89 | 71.2 |
| How many hours can COVID-19 can survive outside the body? | 44 | 35.2 |
| The new strain of COVID-19 is B117 | 104 | 83.2 |
| The new strain of COVID-19 (B117) is 70% less infectious than of earlier strain | 101 | 80.8 |
| At present, there is no effective cure for COVID-19, but early symptomatic and supportive treatment can help most patients recover from the infection | 123 | 98.4 |
| We already have vaccine to prevent COVID-19 | 71 | 56.8 |

Table 2. Correct responses to knowledge questions(n=125)

symptoms and around one-third (35.2%) were aware of the life span of virus outside the body. Around 10% of the participants had a poor level of knowledge and less than a half of them (48%) had a good level of knowledge on COVID-19 (table3).

| LEVEL OF KNOWLEDGE | FREQUENCY | PERCENT |
|-------------------------------|-----------|---------|
| Poor (0-5 scores) | 12 | 9.6 |
| Moderate (6-7 scores) | 53 | 42.4 |
| Good (8 and above) | 60 | 48.0 |
| Mean:7.32, SD:1.28, Median: 7 | | |

Table 3. Level of Knowledge (n=125)

Attitude of participants towards COVID-19 is presented in table 4. A majority of the participants (89.6%) reported that they are scared of human to human transmission of COVID-19 and discrimination against COVID-19 positive patients and health professionals working for COVID-19 patients (86.4%). All the participants agreed that avoiding crowded places would help to prevent COVID-19 infection. However less than half (48%) reported that COVID-19 will be successfully controlled in dental clinic or laboratory.

Practices of dental professionals to prevent COVID-19 is presented in table 5. Almost everyone (97.6%) followed cough etiquettes and a majority (92.8%) of the participants' practices hand hygiene. However, only around two-third (69.6%) of dental professionals used

PPE during dental procedures and only around 60% of the participants disseminated information on COVID-19 prevention to patients visiting them.

DISCUSSION

The study found that less than half of the participants had a good level of knowledge on COVID-19 disease. This corresponds to findings reported by studies conducted in other countries which have reported that dental professionals had insufficient knowledge on COVID-19 disease and disinfection processes.^{14,15} Contrary to this, a global study among dental professionals found that dentists had a good level knowledge to deal with COVID-19 disease.¹⁶ This study found that a majority of the dental professionals feel that there is discrimination against COVID-19 positive patients and health professionals working for COVID-19 patients. The working distance for dental personnel is very less with long contact duration which puts them at a higher risk of contracting COVID-19.¹¹ Similar findings were reported among medical and dental professionals in Nepal.¹⁷ The COVID-19 pandemic has shown drastic effects on individuals' social lives, since all sorts of gatherings, social events and even usual hospital cares are closed to reduce the transmission. It has also affected people financially and psychologically. Various preventive measures are put in place including occasional lockdowns to disrupt the transmission chains.¹⁸

Although the dental professionals had intentions to practice appropriately, some did not have adequate knowledge to implement in practice against COVID 19 disease which was similar to the study by Acharya et al. where 80% of the participants did not have good

| QUESTIONS | AGREE | | DISAGREE | | UNCERTAIN | |
|---|-------|-------|----------|------|-----------|------|
| | n | % | n | % | n | % |
| Do you agree that COVID-19 is contagious | 122 | 97.6 | 1 | 0.8 | 2 | 1.6 |
| It is not necessary for younger dental professionals to take measures to prevent COVID-19 infection | 14 | 11.2 | 110 | 88.0 | 1 | 0.8 |
| Do you agree that COVID-19 infection will be controlled successfully in Dental clinic or laboratory | 60 | 48.0 | 54 | 43.2 | 11 | 8.8 |
| Contacting wild animals would result to COVID-19 infection | 30 | 24.0 | 72 | 57.6 | 23 | 18.4 |
| We should avoid crowded places to prevent COVID-19 infection | 125 | 100 | 0 | 0.0 | 0 | 0.0 |
| Dental professionals who have contact with COVID-19 patients should be immediately isolated in a proper place for 21 days observation | 116 | 92.8 | 8 | 6.4 | 1 | 0.8 |
| Do you agree that the virus transmits from animals to humans and vice versa? | 69 | 55.2 | 35 | 28.0 | 21 | 16.8 |
| Are you scared by human-to-human transmission of COVID-19? | 112 | 89.6 | 10 | 8.0 | 3 | 2.4 |
| It is important to create awareness about the COVID-19 in family | 125 | 100.0 | 0 | 0.0 | 0 | 0.0 |
| COVID-19 is generating discrimination against specific groups of people like COVID-19 positive persons, persons suspected with COVID-19 and Frontline workers | 108 | 86.4 | 13 | 10.4 | 4 | 3.2 |

Table 4. Attitude(n=125)

knowledge.¹⁷ Our study found that around 10% of participants had a poor level of knowledge on COVID-19. This is in consistence to the findings reported by many other studies on COVID-19.^{14,15,17} This could be because many participants did not attend the training on COVID-19 disease and/or do not follow media and other COVID-19 related developments. Thus, there is a

need to implement activities such as online classes, workshops and trainings to upgrade their knowledge.

Latest guidelines and protocols of Ministry of Health should be made available to all health professionals to stay safe and protect others from becoming infected (14, 18). Not being able to include dental professionals

| QUESTIONS | YES | | NO | | SOMETIMES | |
|--|-----|------|----|------|-----------|------|
| | n | % | n | % | n | % |
| Do you wear personal protective equipment (PPE) to prevent COVID-19 infection during the dental procedures | 97 | 77.6 | 8 | 6.4 | 20 | 16.0 |
| Do you practice 5 moments of hand hygiene to prevent COVID-19 infection | 116 | 92.8 | 1 | 0.8 | 8 | 6.4 |
| Do you wear a face mask when leaving home/ duty? | 120 | 96.0 | 3 | 2.4 | 2 | 1.6 |
| Are you disseminating information on preventive measure against COVID-19 to the patients visiting you? | 93 | 74.4 | 5 | 4.0 | 27 | 21.6 |
| Do you follow proper cough etiquettes when you cough or sneeze in clinic, home, market or in crowd | 122 | 97.6 | 1 | 0.8 | 2 | 1.6 |
| Does all dental healthcare providers in your healthcare facility wear personal protective equipment (PPE) to prevent COVID-19 infection during the dental procedures | 87 | 69.6 | 15 | 12.0 | 23 | 18.4 |
| Does all dental healthcare providers in your healthcare facility practice 5 moments of hand hygiene to prevent COVID -19 infection | 92 | 73.6 | 9 | 7.2 | 24 | 19.2 |
| Does all dental healthcare providers in your healthcare facility wear a face mask when leaving home/ duty | 120 | 96.0 | 1 | 0.8 | 4 | 3.2 |
| Does all dental healthcare providers in your healthcare facility follow proper cough etiquettes when you cough or sneeze in clinic, home, market or in crowd | 103 | 82.4 | 4 | 3.2 | 18 | 14.4 |
| Are all dental healthcare providers in your healthcare facility disseminating information on preventive measure against COVID-19 to the patients visiting them | 80 | 64.0 | 7 | 5.6 | 38 | 30.4 |

Table 5. Practice (n=125)

without email address and non-response rate of around 20% were limitations of the study.

CONCLUSION

The study found that less than half of the participants had a good level of knowledge on COVID-19 while the majority of the participants felt there is discrimination against COVID-19 positive patients and health professionals working for COVID-19 patients. Only around two-third (69.6%) of the participants used PPE during dental procedures and 60% of the participants disseminated information on COVID-19 prevention to patients visiting them. The study highlights the need to conduct sensitization, trainings or CME on COVID-19 periodically to keep all health professionals updated with latest advancements and maintain safety in clinical practice.

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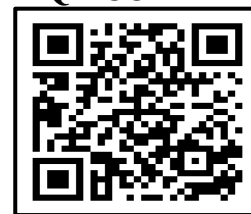
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Perceptions, Fast Food Consumption and Eating Habits Among Students Belonging to the Allied Health Sciences

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INTRODUCTION: The present generation is the most frequently targeted consumer for the fast food marketers and this can lead to various health related disorders in them.

AIM: To assess the perceptions, fast food consumption and eating habits among students belonging to the allied health sciences in various corners of India

MATERIALS AND METHOD: The study was an online, questionnaire based, cross-sectional study. The questionnaire was in English language, was pre-tested on 50 students and validated accordingly. The questionnaire was based on a 5-point Likert-type scale [(1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) Strongly agree]; had 19 questions and required approximately four minutes for completion. Data was analysed using SPSS version 21.0 and the student's t-test and multiple logistic regression was applied keeping the p value as 0.05.

RESULTS: The study comprised of 1020 complete responses; out of which males formed a majority (52.3%) and most students belonged to the 2nd year of their study (49.1). High mean \pm SD scores pertaining to perception were obtained in four questions. While assessing the eating habits, high mean \pm SD scores were obtained in three questions. Multiple logistic regression based on gender revealed that females has a significant difference on both perception (0.01) and consumption (p=0.03) habits in relation to fast food as compared to males, while the year of study was significantly associated with the food consumption habits (p=0.01) of the students.

CONCLUSION: Universities and institutions need to educate and motivate students on the importance of healthy eating to reduce the burden of disease among such students.

KEYWORDS: Fast Food, Consumption, Habits

INTRODUCTION

As a student enters a university/institution, there are certain changes in his/her living arrangement (which includes living in hostels, PG homes, etc) that results in a change in various factors, including their food choices and with their new found "freedom", they tend to prefer eating "fast foods".^{1,2}

The term, "fast food" typically refers to food preparations that are prepared quickly, mostly purchased through self-service which is made from pre-cooked ingredients, and is served in a packaged form for the customer to take-away.³ The present generation is the most frequently targeted consumer for the fast food marketers and are flocked by students and children frequently. Infact, most students prefer eating junk food as compared to home cooked meals.⁴

As these students are given a monthly allowance, the overall competition among various food franchises to lower their prices by providing special offers and discounts makes it appealing and affordable to these students.⁵ Due to the increased costs of living, and preference to dedicate their after college hours towards social interactions, sports and studying, students save time by ordering fast food. However, the intake of fast food among these students also contributes to various lifestyle related diseases such as eating behaviours, rising obesity rates, insulin

resistance & development of type 2 diabetes, hypertension and dyslipidemia.⁵

Due to the hidden dangers of fast food consumption to one's health, the present study was designed to explore and document the perceptions, fast food consumption and eating habits among students belonging to the allied health sciences and use the data to further chalk out intervention programs, if required.

MATERIALS AND METHODS

The present study was designed as descriptive cross-sectional study which was conducted online from 10th October, 2019 to 10th January, 2020 after taking prior approval from the Institutional Review Board. The questionnaire was adopted from Abraham S et al.⁶ and later modified as per the present needs of the study. The questionnaire was in English language, was pre-tested on 50 students and validated accordingly as a part of the pilot study (Cronbach's $\alpha=0.87$). The questionnaire was based on a 5-point Likert-type scale. The scale options were (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) Strongly agree. The questionnaire has a total of 19 questions and required approximately four minutes for completion.

Data was collected through convenience sampling and the questionnaire was distributed as a link on various



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social media sites and WhatsApp. Upon clicking the link, the participant was informed about the study objectives and instructed that the study meant is for college students belonging to the allied health sciences (Nursing, Physiotherapy, Homeopathy, Yoga, Unani and Siddha) based in India only and consent was obtained before initiating the survey. Participation in the study was purely voluntary and no personal details were collected from the participants. On the basis of the results obtained during the pilot study, the minimum sample required for the study was calculated as 349. All the participants were students aged 17 years or older.

Data was analysed using SPSS version 21.0 and the student's t-test and multiple logistic regression was applied keeping the p value as 0.05.

RESULTS

Table 1 depicts the demographic details of the study population. There were a total of 1020 complete responses obtained, out of which males formed a majority (52.3%). Most students belonged to the 2nd year of their study (49.1) and the least belonged to the 3rd year of study (18.6%).

| VARIABLE | n,% |
|--------------------------------|-----------|
| Males | 534(52.3) |
| Females | 486(47.7) |
| Year of study | |
| 1 st Year | 329(32.3) |
| 2 nd Year | 501(49.1) |
| 3 rd year and above | 190(18.6) |

Table 1. Demographic details of the study population

Perceptions regarding fast food consumption among the study population is depicted in table 2. High mean \pm SD scores (above 3.5) were obtained in the questions "Fast food consumption can lead to obesity" (3.9 \pm 1.33), "Home cooked meals provide me with a balanced diet" (3.5 \pm 0.17), "Home-made meals are healthier than fast food meals." (4.2 \pm 0.43), "It is easier to make fast food as compared to home-cooked meals" (4.5 \pm 0.33, p=0.01*) and "Fast food does not affect my mental physical and spiritual well-being" (3.9 \pm 0.55). Significant differences were also obtained in the questions "Diabetes and hypertension is a consequence of our eating habits." (2.6 \pm 2.33, p=0.05) and "I am concerned

about my calorie intake while eating at fast food joints" (1.9 \pm 1.99, p=0.01).

High mean \pm SD scores (above 3.5) regarding food consumption were obtained in the questions "Busy days lead to increased consumption of fast food" (3.9 \pm 0.52, p=0.04), "I usually order/have a sweetened beverage along with fast food" (4.1 \pm 0.32), and "I tend to order fast food when I am stressed" (3.8 \pm 0.43). Significant differences were also obtained when the students responded to the question "I share my fast food with friends" (2.7 \pm 0.78, p=0.04) and is depicted in table 3.

The results based on the multiple logistic regression are depicted in table 4. Analysis based on gender revealed that females have a significant difference on both perception (0.01) and consumption (p=0.03) habits in relation to fast food as compared to males, while the year of study was significantly associated with the food consumption habits (p=0.01) of the students.

DISCUSSION

Based on the results of the present study, it was observed that students perceived fast food as a viable option as compared to home cooked meals and their habits included increased fast-food consumption, especially on busy and stressful days. The present study had more respondents belonging to the second year of their course and this can be attributed to the fact that as the course progresses, students get busy with their academic work preparing for their final examinations and hence, show lesser participation in such studies.

It was revealed that females were more concerned and conscious regarding fast food consumption in comparison to their male counterparts and these findings are in agreement to studies conducted by Mahajan SA et al. (2020)⁷ and Bipasha MS et al. (2013).⁸

Beverage intake along with fast food was reported by approximately 83% of the respondents (4.1 \pm 0.32) and the results were in agreement to various authors who documented unhealthy eating patterns along with a high level of beverage (soft drinks) consumption.^{9,10} In addition, Deliens T et al. (2015) reported a massive consumption of 423.6 \pm 445.2 ml of soft and energy drinks among Belgian university students.¹¹

The responses of the students in the present study

| | MEAN | SD | P VALUE |
|--|------|------|---------|
| Fast food consumption can lead to obesity | 3.9 | 1.33 | NS |
| I am happy eating home made food | 2.3 | 1.6 | NS |
| Home cooked meals provide me with a balanced diet | 3.5 | 0.17 | NS |
| Home-made meals are healthier than fast food meals. | 4.2 | 0.43 | NS |
| Diabetes and hypertension is a consequence of our eating habits. | 2.6 | 2.33 | 0.05* |
| I am concerned about my calorie intake while eating at fast food joints. | 1.9 | 1.99 | 0.03* |
| It is easier to make fast food as compared to home-cooked meals | 4.5 | 0.33 | 0.01* |
| I find fast food more appealing as compared to home cooked meals. | 3.2 | 0.76 | NS |
| Eating fast food has the same caloric value as eating at home. | 3.3 | 0.63 | NS |
| Fast food does not affect my mental physical and spiritual well being | 3.9 | 0.55 | NS |

Table 2. Perceptions regarding fast food consumption among the study population (NS: Non-Significant)

stating that they were conscious of the calories they consume while eating at fast food restaurants (1.9 ± 1.99) as well as agreeing to the fact that fast food consumption can lead to obesity (3.9 ± 1.33) is in agreement to the results of the various authors where students reported that increased calorie consumption can lead to weight gain in individuals consuming fast food.^{12,13} A total of 3.2 ± 0.76 students found fast food more appealing as compared to home cooked meals, and this statement is in disagreement to Shah T et al. (2014) where participants did not find fast food to be more appealing.¹⁴

The limitations of the study could potentially include under and over-reporting of the questions by the respondents and to decrease the same, the researchers did not collect any personal data from the students, due to which, the results of the present study can be generalized.

CONCLUSION

It is recommended that universities and institutions need to educate and motivate students on the importance of healthy eating so that the burden of obesity and health related disorders among university going students can be reduced.

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| | MEAN | SD | p VALUE |
|--|------|------|---------|
| I frequently order fast food while with friends | 3.2 | 0.71 | NS |
| I order fast food more than twice in a week | 2.9 | 1.1 | NS |
| Busy days lead to increased consumption of fast food | 3.9 | 0.52 | 0.04* |
| I usually order/have a sweetened beverage along with fast food | 4.1 | 0.32 | NS |
| I order healthier, vegetable based fast food (like salads etc) | 1.3 | 0.21 | NS |
| I order extra cheese with my order | 3.3 | 0.43 | |
| I chew my fast food properly. | 1.1 | 2.5 | NS |
| I share my fast food with friends | 2.7 | 0.78 | 0.02* |
| I tend to order fast food when I am stressed | 3.8 | 0.43 | NS |

Table 3. Food consumption habits among the study population (NS: Non-Significant)

| | PERCEPTIONS REGARDING FAST FOOD | FOOD CONSUMPTION HABITS |
|---------------|---------------------------------|-------------------------|
| Gender | 0.01* | 0.03* |
| Year of study | NS | 0.01* |

Table 4. Multiple Logistic Regression based on gender and year of study. (NS: Non-Significant)

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