INTRODUCTION

A complete denture is prosthesis to replace the lost teeth and restore esthetics and function. When we do construct a complete denture it is important to determine the correlation of the maxillary anterior teeth. As age changes occur in individuals, the use of complete dentures varies. The medical conditions in complete denture wearers can be hypertension, diabetes, or any other systemic disease. The faultiness of dentures or improper handling of dentures increases the risk of infection. Oral hygiene is important to be maintained in people using dentures. COVID-19 is the new strain that is introduced in 2020. It is more prone to individuals who have decreased immunity that is especially in the elderly population. Since mostly old age people prefer complete dentures, it leads to more risk on them. COVID-19 is transmitted by droplets. So, proper infection control is required to prevent cross-infection. When hygiene control is not properly maintained it can lead to infection occurrence.

Denture wearers are at high risk due to the possibility of aerosols. Through saliva which is the main aerosol of denture wearers, it can get transmitted easily. When droplets are inhaled or if they come in contact with skin and mucous membranes and get lodged, they contaminate hands. Proper maintenance of denture is needed to prevent the risk of COVID-19. Mouthwash which consists of chlorhexidine can be used as a cleansing agent to provide hygiene to the denture. Denture shape is maintained by soaking in water. They can be added with some cleansing tablets which will protect them from COVID-19 after alcohol rinse. Proper hygiene is required to prevent infection of COVID-19. Since COVID-19 can be transmitted through droplets and air it is safe to keep dentures in a closed box. To prevent contamination, before and after wearing denture it is wiser to use a hand sanitizer, this contains alcohol so that it can destroy the pathogen.

SARS-COV is similar to corona. It was also transmitted through aerosol like saliva. It was also transmitted through.
bloodborne and contaminated the dental water unit line also. The lacuna found in this study was it was not able to stop the spread of infection even after protocols were undertaken. This virus also affects the lungs\textsuperscript{10}. Now similarly SARS-CoV-2 is also transmitted in the same manner and affects the respiratory organ\textsuperscript{11}. The effect of aging in the elderly population is they have diminished production of T cells and B cells from thymus and bone marrow. So they are not able to produce an immune response as rapidly and efficient as the younger generation\textsuperscript{12-17}. Aim of this study is to understand how infection control can protect us from COVID-19 which previous studies failed to deliver. It also helps us how to protect the old people from the spreading infection, who also additionally suffer from decreased immunity, which is a risk factor for COVID \textsuperscript{18,19}. COVID-19 also is transmitted through droplets which make us be even more careful in protecting ourselves. They are transmitted through the air so they can easily infect the dentures which patients use and are required to keep it in a closed box so that they are not contaminated. This survey is conducted to know the awareness level among older people regarding COVID-19. This tests their knowledge of infection control of COVID-19 and the hygiene measures they follow to disinfect the dentures.

**MATERIALS AND METHODS**

80 denture wearers were selected randomly for the study. Approval for the study was obtained from the Institutional Review Board (SRB/SDC/BDS/002/02). The questionnaire was prepared and disseminated using Google forms online response collection software. The questionnaire was validated by 5 prosthodontist lecturers. IBM SPSS version 20.0 software was used for data analysis.

**STATISTICAL ANALYSIS**

The dependent variable is infection control from COVID-19. The independent variables are age and sex. The statistical test used was the Chi-square test.

**RESULTS AND DISCUSSION**

**Figure 1:** Awareness of COVID-19 travelling through droplets. This Figure shows that 53.75% were aware of it and 25% were not aware while 21.25% were not sure if COVID-19 infection can spread through droplets.

**Figure 2:** People who use mouthwash. 40% use mouthwash regularly while 31.25% use it occasionally. 28.75% don’t use mouthwash. This shows the maintenance of oral hygiene among patients.

**Figure 3:** How often do they change the water. Nearly, 48.75%; that is half of the population change water every 12 hours while 12.5% change it every 6 hours. 38.75% of the population changes it every 8-10 hours.

**Figure 4:** How often do they remove the denture. Nearly 43.75% remove denture only at night while 12.5% remove it for every 4 hours once; 18.75% for every 6 hrs and 25% for every 8 hours. Each and every time while removing dentures it is essential to maintain hand hygiene to prevent contamination of dentures.
Table 1: This table shows the cumulative response to each question along with the Chi-square test value and P-value.

| Question                                      | Option     | Response by female | Response by male | Cumulative response | Chi-square test | P-value |
|-----------------------------------------------|------------|--------------------|------------------|---------------------|-----------------|---------|
| Are you aware that COVID-19 travels through  | Maybe      | 7                  | 10               | 21.3                | 0.140           | 0.932   |
| droplets                                      | Yes        | 20                 | 23               | 46.3                | 2.509           | 0.285   |
| Do you use mouthwash                          | No         | 9                  | 11               | 28.7                | 8.601           | 0.014   |
|                                               | Yes        | 12                 | 11               | 100                 | 12.5            | 0.875   |
| How often do you change water                 | 12hrs      | 14                 | 25               | 48.8                | 2.509           | 0.285   |
|                                               | 6hrs       | 2                  | 8                | 61.3                | 8.601           | 0.014   |
|                                               | 8-10hrs    | 20                 | 11               | 100                 | 12.5            | 0.875   |
| How often do you remove dentures              | 4hrs       | 5                  | 5                | 12.5                | 2.509           | 0.285   |
|                                               | 6hrs       | 8                  | 7                | 31.3                | 8.601           | 0.014   |
|                                               | 8hrs       | 9                  | 11               | 56.3                | 8.601           | 0.014   |
|                                               | Only at night | 14               | 21               | 100                 | 12.5            | 0.875   |
| Do you keep denture in closed box             | No         | 17                 | 14               | 38.8                | 1.980           | 0.159   |
|                                               | Yes        | 19                 | 30               | 100                 | 12.5            | 0.875   |
| Do you have medical conditions                | cardiac    | 1                  | 9                | 12.5                | 6.379           | 0.173   |
|                                               | diabetes   | 5                  | 7                | 27.5                | 6.379           | 0.173   |
|                                               | High BP    | 8                  | 9                | 48.8                | 6.379           | 0.173   |
|                                               | No issue   | 14                 | 13               | 82.5                | 6.379           | 0.173   |
|                                               | Resp       | 8                  | 6                | 100                 | 12.5            | 0.875   |

Figure 5: Do they keep dentures in a closed box. Nearly 61.25% keep it in a closed box to prevent infection through droplets while 30.75% do not keep it in a closed box.

Figure 6: People with medical conditions. Nearly, 17.50% have respiratory problems, 12.50% have cardiac problems, 15% have diabetes, 21.25% have hypertension and 33.75% have no complications. This is proving that most of the people have medical issues and they have to maintain proper hygiene control to protect themselves from COVID-19 as they already have low immunity and are at high risk of getting infected.

Figure 7: Awareness of people with medical conditions. Nearly 83.75% were aware that when they have medical conditions they are at high risk to COVID-19 while 16.25% are not aware of it.

Figure 8: Methods to improve immunity. Nearly 21.25% eat vitamin C food and improve immunity. 22.50% eat ginger-like food items to improve immunity while 17.5% have adequate sleep as a method. 38.75% of the population thinks that all the above methods are important to improve immunity and follow them all.
Table 1: (Continued)

| Question                                                                 | Option            | Response by female | Response by male | Cumulative response | Chi-square test | P-value |
|--------------------------------------------------------------------------|-------------------|--------------------|------------------|--------------------|-----------------|---------|
| Are you people aware that these medical conditions are highly susceptible to COVID-19 | No                | 4                  | 9                | 16.3               | 1.270           | 0.260   |
|                                                                          | Yes               | 32                 | 35               | 100                |                 |         |
| How do you improve immunity                                              | Adequate sleep    | 2                  | 12               | 17.5               |                 |         |
|                                                                          | Eat ginger, tamarind | 12                | 6                | 78.8               | 9.301           | 0.026   |
|                                                                          | Vitamin C         | 9                  | 8                | 100                |                 |         |
|                                                                          | All the above     | 13                 | 18               | 56.3               |                 |         |

Figure 9: This bar graph shows the association between the gender and people aware of COVID-19 that travels through droplets. The X-Axis shows the gender and Y-Axis shows the responses. The green bar shows people who are aware of it, red shows people who are ignorant of the fact, and blue shows that people are not sure about COVID-19 travelling through droplets. 28.75% of males were aware that COVID-19 travels through droplets. There was not a significant difference in awareness between males and females. Chi-square test value is 0.140, P-value 0.932 (>0.05) (no significant difference).

Figure 10: This graph shows the correlation between people who use mouthwash. The X-Axis shows gender and Y-Axis shows the responses. The green bar shows people who use mouthwash, red shows people who don’t use mouthwash, and blue shows people who use it occasionally. There is an equal amount of people who use mouthwash in both the female and male population of the study. P-value is 0.285, (>0.05), Chi-square test value is 2.509. This shows there no significant relationship between male and female responses regarding the use of mouthwash.

Figure 11: This graph shows the correlation between how often people change the water. The X-Axis shows gender and Y-Axis shows responses. The green bar shows people who change water for 8-10 hours, red for every 6 hrs, and blue for every 12 hrs. Most of the male population (31.25%) change water for once in 12 hrs, while the female population mostly changes the water (25%) for every 8-10 hours. P-value is 0.014 (<0.05), Chi-square test value is 8.601. This shows there is a significant relationship between male and female responses in regard to how often they change the water.

Figure 12: This graph shows the correlation between gender and how often they remove dentures. The X-Axis shows gender and Y-Axis shows responses. The orange bar shows where they remove it only at night, while the green bar shows they remove it for every 8 hrs, red bar for every 6 hrs, and blue bar for every 4 hrs. Most of them remove the dentures only at night which is 26.25% for males and 17.50% for females. P-value is 0.831 (>0.05), Chi-square test value is 0.875. There is no significance in male and female responses when correlated to how often they remove dentures.
Figure 13: This graph shows the correlation between gender and people who keep dentures in a closed box. The X-Axis shows gender and Y-Axis shows responses. The red bar shows that people store the dentures in a closed box to prevent contamination and the awareness is more in males with 37.50% when compared to females at 23.75%. P-value is 0.159 (>0.05), Chi-square test value is 1.980. This shows that there is no significant relation between the male and female responses in people who keep dentures in closed boxes.

Figure 14: This graph shows the correlation between gender and people who suffer from any medical conditions. The X-Axis shows the gender and Y-Axis shows the responses. The yellow bar shows the respiratory problems, orange bar no complications, blue bar cardiac problems, green bar hypertension, and red bar for diabetes. Cardiac problems were shown to be more prevalent in males (11.25%) when compared to females (1.25%). P-value is 0.173 (>0.05), Chi-square test value is 6.379. There is no significant relation between male and female responses regarding their medical conditions.

Responses were collected and analyzed. Nearly 50% were aware that COVID-19 traveled through droplets while some were doubtful and some were not aware of it (Figure 1). Nearly 40% use mouthwash regularly and 31.3% use it sometimes (Figure 2). Almost 50% change water in which they store dentures every 12 hours, in order to protect them from infection (Figure 3). 43.8% of the population removes dentures only at night time which can aid in the advantage of less hand contamination of the denture (Figure 4). To protect the denture nearly 61.3% of the population had kept it in a closed box.
from (Figure 5), only 33.8% were found to have no medical complications (Figure 6). But the elderly population of about 83.8% with medically compromised conditions was aware that high susceptibility to getting infected by COVID-19 (Figure 7). Almost all of them were aware that they have to improve their immunity and take different measures so that they can protect themselves from the COVID-19 pandemic (Figure 8). Denture hygiene maintenance is important to reduce the incidence of bacterial and fungal infections. Their maintenance like brushing and cleaning dentures can reduce the infection occurrence. In our study, about 40% use mouthwash and 50% change water once in 12 hours. In the previous study done by Delaney et al and Teng et al. nearly 52% maintained denture hygiene. As per the literature, the elderly population with medically compromised conditions, COVID-19 worsens the spread as they are more susceptible, henceforth maintaining the usage of dentures had a major role among denture wearers. In the present study, 83.8% of them knew the facts behind also in our survey, people with diabetes were 15%, cardiac 12.5%, hypertension 21.3%, respiratory-related diseases 17.5% and without any medical complications were 33.8%. The previous literature stated that 22% of diabetic patients had a poor survival rate in combating COVID-19. So diabetes becomes a major risk factor for COVID-19. Frequent removal of denture without hand hygiene can increase the risk of infection. Nearly 43.8% of the population removes it only at night which reduces the risk of transmission.

The cumulative response to each question along with the Chi-square test value and P-value is represented in Table 1. There was no significant association between the gender and the response of awareness of COVID-19 travelling through droplets (Figure 9), however, 28.75% of the male were aware that COVID-19 travels through droplets. In the next response knowing about the usage of mouthwash, there was no significant association between gender and the usage of mouthwash (Figure 10), i.e. equal amount of people used mouthwash in both the female and male population of the study. Comparing gender with how often they change the water for the denture, there was a statistically significant association between responses and how often they change the water, however, most of the male population (31.25%) change water for once in 12 hrs, while the female population change water (25%) for every 8-10 hours (Figure 11). Most of them remove the dentures only at night which is 26.25% for males and 17.50% for females; there was no significant association (Figure 12). Regarding the storage of dentures, the awareness is more among males with 37.50% when compared to females at 23.75% as most of the males kept in a closed box (Figure 13). Among the study population, the medically compromised conditions based on gender are represented (Figure 14). Based on medically compromised conditions, the level of awareness towards COVID-19, there was no significant association between responses and awareness of medical condition (Figure 15), however, Ignorance level was high in the male with 11.25%. Regarding the awareness of immunity among denture wearers, it was found that there was a significant association between responses and awareness of methods of immunity (Figure 16), among the different methods available to improve immunity, the male population (22.50%) were more aware of the different methods of improving immunity.

There was a reduction of infection of the denture by 13.8% by storing them overnight in water with cleansing tablets according to a previous study. Also, when oral hygiene like mouthwash is being used, it reduces the risk of pneumonia in ill patients. When mouthwash can reduce the risk of pneumonia it can simultaneously reduce the risk for COVID-19. Mouthwash can cause a 40% reduction in infection. In our study, nearly 40% use mouthwash regularly while 21% use it sometimes. Chlorhexidine mouth rinse is an adjunctive treatment for oral health. It also helps in the reduction of infection. When oral health is maintained no further occurrence of opportunistic infection occurs. The COVID-19 has emerged as an extremely virulent pandemic, causing disruption of the lives of thousands of individuals all over the world. According to a study by Jonathan Chadwick it has been suspected that the use of mouthwash can alter the lipid layer which is the outer membrane of the COVID-19 virus. It damages the lipid layer rendering them from virulence. The spike layer which is responsible for infection when altered can lead to a reduction of infection from the pathogen. Also, interdental brushing can reduce the control of infection and help in maintaining better oral hygiene.

When people are having oral inflammation it leads to infection of chronic obstructive pulmonary disease. This can lead to a loss of immunity. When there is loss of immunity it becomes the risk factor of COVID-19. Therefore when dentures were well cleaned and kept in overnight storage, the infection control is better according to previous literature. Hence, usage of mouthwash and daily change of water, cleanliness of denture, avoiding the frequent removal of the denture by hand can help in preventing the spread of infection. Hence oral hygiene is important as it reduces the risk of transmission of COVID-19.

**CONCLUSION**

Within the limitation of the study, the majority of denture wearers had awareness of denture cleansing and oral hygiene practices. As the elderly population is more prone to COVID-19, the patients should be motivated by the dentists about denture cleansing and the harmful effect of overnight wearing, such denture hygiene maintenance will aid patients in combating COVID-19. Therefore, dentists’ role in telecommunication with denture wearer patients, regarding denture maintenance can reduce the risk of infection.
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Conflict of Interest

The authors declare that they have no conflict of interest.

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