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A Comparative Study of Oral Thrush and Other Oral Complications among COVID 19 Positive Patients

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Abstract **Original Research Article**

Background: Oral disease is a worldwide problem that causes agony, tooth loss, deformity, and death. Even though acute pseudomembranous candidiasis, or thrush, is the most common oral candidiasis, other types exist and candida infection may present as white and erythematous sores. White lesions include acute pseudomembranous and chronic hyperplastic candidiasis; red lesions include acute and chronic erythematous candidiasis, angular cheilitis, median rhomboid glossitis, and linear gingival erythema. Candida albicans is a major health hazard. This species causes a variety of ailments, from vaginal infections that affect 75% of women at least once to severe hospital infections that cause morbidity and mortality. As a consequence of the COVID-19 epidemic, several patients have suffered ARDS, which threatens superinfections. According to WHO estimates, the total number of confirmed cases will approach 240 million by October 19, 2021, and the cumulative number of fatalities would exceed 4.8 million. SARS-CoV-2 causes lung illness and systemic consequences. Respiratory and heart issues killed several. Candida strains produce invasive fungal infections. In COVID-19, invasive yeast infections (IYIs) are common. Despite COVID-19's immune system failure, no abnormalities in the cellular and humoral immune cells essential to fight Candida have been found. Oral lesion, taste loss, and tooth loss have all been linked to COVID-19. ***Methods:*** This study was comparative study. This study comprised 25–90-year-olds diagnosed with moderate to severe COVID-19 and hospitalized in covid ICU at Comilla Medical College Hospital in Bangladesh. The assessment followed inclusion/exclusion criteria. Sample size was obtained using a calculator with a 0.05 standard error and 95% confidence. Chest imaging and RT-PCR confirmed COVID-19. Comparing 100 patients with oral thrush and associated oral issues. Data entry will utilize SPSS and Excel. SPSS 23 will be used for data analysis. Excel and JASP will be available for any complications. ***Result:*** Oral thrush is the most prevalent, 61 (64.2%). Second most prevalent is inflamed gum, 26 (27.4%). Teeth mobility is the 3rd most common complication among the COVID-19 patients, 11 (11.6%). Other complication such as dental pain, foul smell, burning sensation, aphthous ulcer, teeth sensibility; 8 (8.4%), 3 (3.2%), 2 (2.1%), 4 (4.2%) and 2 (2.1%), were also present, respectively. ***Conclusion:*** In severely sick COVID-19 patients, oral thrush, loose teeth, and inflamed gums were the most often reported problems. The extended prone posture and mechanical breathing equipment utilized in the ICU environment may have contributed to these oral problems. Therefore, it is highly recommended that a multidisciplinary approach be used for the monitoring and treatment of COVID-19, which implies that nurses and oral healthcare professionals should be included in the ICU teams.

Keywords: Oral thrush, Oral complications, Oral candidiasis, COVID-19.

INTRODUCTION

Oral disease is a significant economic burden, a global concern, and an urgent issue that may cause suffering, tooth loss, deformity, and death [1-3]. First discovered in 1838 by doctor Francois Veilleux, oral candidiasis is an infection of the mouth cavity caused by Candida albicans [4]. The syndrome is often caused by immunological suppression, which may be local or systemic, including extremes of age (newborns and the elderly), HIV/AIDS, and prolonged systemic steroid

and antibiotic usage [5]. Even though acute pseudomembranous candidiasis, generally known as thrush, is the most prevalent kind of oral candidiasis, it is crucial to realize that other varieties exist and that candidal infection may manifest as both white and erythematous lesions. Lesions that are white consist of acute pseudomembranous candidiasis and chronic hyperplastic candidiasis; lesions that are red consist of acute and chronic erythematous candidiasis, angular cheilitis, median rhomboid glossitis, and linear gingival erythema [6].

In recent years, Candida albicans has become a serious public health concern. The plethora of illnesses produced by this species range from vaginal infections, which afflict up to 75% of women at least once in their lifetime, to severe infections in hospitalized patients that result in significant morbidity and death [7]. Many patients have developed acute respiratory distress syndrome (ARDS) as a result of the current worldwide pandemic of COVID-19, posing a threat of superinfections [8]. According to data from the World Health Organization (WHO), the cumulative number of confirmed cases recorded globally by October 19, 2021 would exceed 240 million, and the cumulative number of deaths will exceed 4.8 million.Not only can the SARS-CoV-2 cause lung disease, but also a number of systemic complications. Numerous people died as a result of respiratory and cardiac problems [9].

SARS-CoV-2 targets an enzyme called angiotensin converting enzyme II (ACE II), which is primarily found on the surface of human epithelial cells, particularly type II alveolar epithelial cells. ACE II affects the anti-inflammatory, anti-proliferation, anti-fibrosis, anti-apoptosis, and vasodilator functions of alveolar epithelial cells [10]. SARS-CoV-2 may bind to ACE II receptors in oral tissues to produce oral problems, such as macroglossia, taste abnormalities, oral mucosa illness, etc [11]. As the gateway to the digestive system, the mouth cavity has a tight association with human nutrition intake and connects to the respiratory system to aid breathing. More attention should be devoted to oral problems during COVID-19 therapy. Similarly, some oral lesions, such as peripheral thrombosis, may potentially be an indicator of COVID-19 infection. Anticoagulant medication may be initiated in time to prevent more severe consequences caused by peripheral thromboembolism if oral lesions are carefully monitored [12].

Moreover, Candida strains are the primary cause of invasive fungal infections. In COVID-19, invasive yeast infections (IYIs) have grown to be a serious consequence. Despite the obvious immune system dysfunction in COVID- 19, no obvious abnormalities in the cellular and humoral immune cells needed to develop protection against Candida have yet to be identified [8]. Therefore, it is thought that prolonged immobility in ICU, central venous catheters and other lines, the administration of broad-spectrum antibiotics, prolonged use of corticosteroids may all contribute to IYIs. Only a small number of studies have examined the strength of the link between COVID-19 and candidiasis thus far [13]. Various oral complications has been associated with COVID-19; oral lesion, taste loss, teeth loss however, lesion is the most prevalent one.

Epidemiology of Oral Mucosal Lesion

Oral mucosal sores are another frequent consequence of COVID-19. Patients with oral mucosal lesions exhibit a wide range of oral diseases. The most prevalent continuous lesions were ulcers (55.38%), aphthous lesions (12.31%), and erosion (6.15%), followed by macula (6.15%), petechiae (4.61%), plaque (4.61%), and bullae (3.18%). Gingival abnormalities were the least prevalent. Peeling and necrotizing gingivitis accounted for 1.54 percent, whereas blisters and pustules accounted for 1.54 percent [14].

The tongue is the most prevalent location for oral mucosal lesions among patients (52.56%), followed by the palate and lip (16.67%), gingiva (7.69%), buccal mucosa (3.85) and connective tissue (2.56%) [14].

Clinical Manifestation

Oral mucosal lesions induced by SARS-CoV-2 exhibit a range of clinical symptoms, and the tongue, palate, lip, gingiva, and buccal mucous membranes of patients are affected in varied quantities, color, and appearance. In addition to irregular ulcers, tiny blisters, petechiae, erythematous plaques, and desquamative gingivitis, specific symptoms include petechiae. Additionally, these oral mucosal lesions may be co-infected with other viruses, and the majority of patients are caused by more than one virus [9, 15]. Patients with oral mucosal lesions often have additional skin lesions. Currently, the features of oral mucosal lesions caused by COVID-19 are comparable to those of non-COVID-19 patients; thus, epidemiological history should be included into the diagnosis [16].

Whether oral mucosal lesions are directly caused by SARS-CoV-2 or are subsequent symptoms is now a matter of debate. On the tongue mucosa and salivary glands, ACE2 receptor-containing cells are dispersed; these cells may serve as viral hosts, causing inflammatory responses in oral organs and tissues [17, 18]. Recently, Xu *et al.*, 2020 revealed the sensitivity of SARS-CoV-2 to tongue mucosa and salivary glands, suggesting that oral mucosa may be one of the virus's targets in people [19]. Thus, oral mucosal lesions may be a direct result of COVID-19 infection [20].

Nevertheless, other experts think that the oral symptoms are the result of opportunistic or secondary infections resulting from lowered immunity after COVID-19 therapy following coronavirus infection. According to a high number of recorded medical

records, several individuals exhibit co-infection and subsequent symptoms. During therapy, the immunological system of patients is changed, and many COVID-19 infections are deadly owing to bacterial and fungal co-infection [21, 22]. Oral mucosal lesions may be caused by a number of non-viral sources in addition to a number of viral reasons.

Given the potential role of Candida or thrush and other oral complications in the prognosis and outcome of viral infections, including COVID-19, it is essential for general dental professionals to be familiar with oral and general candidiasis as markers of immunosuppression, particularly since they are often the first to diagnose the oral condition.

METHODS AND MATERIAL

Study Design

This study is a comparative studyadopting anopen-label, study design conducted in Tertiary Medical College Hospital in Bangladesh. This research included adults aged 25–90 years diagnosed with moderate to severe COVID-19 according to the management guideline for COVID-19 in Bangladesh and admitted in ICU at Cumilla Medical College Hospital in Bangladesh. The evaluation was conducted in accordance with the inclusion and exclusion criteria.

Procedure

Using a sample size calculator application with a standard error of 0.05 and a confidence level of 95%, the sample size was determined. Chest radiography and a positive real-time reverse transcription-polymerase chain reaction (RT-PCR) confirmed the diagnosis of COVID-19. Patients (n = 100) with oral thrush and those with additional oral problems were compared.

A written informed consent was acquired from the patients or their legal guardians after detailing the purpose and benefit of this research.

Inclusion Criteria

- Age from 25-90 years.
- Confirmed COVID 19 infection using RT-PCR.
- ICU admitted patient.
- Have oral complication.
- Both male and female.

Exclusion Criteria

- Diagnosed with malignancy.
- Not willing to consent.

Outcome

This study was conducted from the patients' admission to the hospital until discharge or death. The prevalence of patient with oral thrush and other complication among COVID-19 patients were the outcomes evaluated in this study.

Statistical Analysis

For data input, SPSS and Microsoft Excel software will be used. Moreover, for data analysis, SPSS version 23 will be used as principal software. As well as Microsoft excel and JASP will be kept stand by for any kinds of complication.

The collected data were analyzed using IBM SPSS and Microsoft Excel software. All data was recorded systematically in preformed data collection form (questionnaire) and quantitative data was expressed as mean and standard deviation and qualitative data was expressed as frequency distribution and percentage. Data was presented on a categorical scale compared between the groups using Chi-square (X2) or Fisher's Exact Probability test, while the data presented on a quantitative scale was compared between the groups using Student's 't' test or ANOVA. For all analytical tests, a probability (p) value of < 0.05 ($p<0.05$) was considered statistically significant and $p<0.01$ was considered highly significant but $p>0.05$ was taken as non-significant with 95% confidence limit was taken. The summarized data are interpreted accordingly and is then presented in the form of tables.

RESULTS

Table 1 shows the prevalence of age group and gender. Age group between 65-74 with COVID-19 is prevalent in the study, 31%, and 55-64 years of age are the second most prevalent, 19%. Male patients are found more than the female patients, 72% and 23%, respectively.

Table 1: Prevalence of age group and gender

Variables	N=95	Percentage (%)
Age		
25-34	10	10.5
35-44	5	5.3
45-54	15	15.8
55-64	19	20.0
65-74	31	32.6
75-84	9	9.5
85<	6	6.3
Gender		
Male	72	75.8
Female	23	24.2

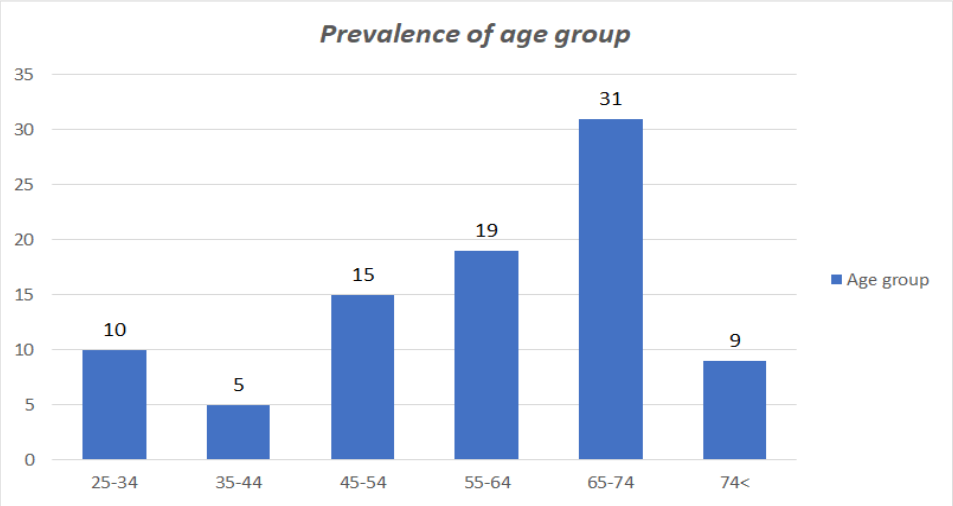

Figure 1: Prevalence of age group

Table 2 shows no of patient with oral thrush among various age group. Oral thrush is prevalent among the age group of 65-74, 25.3%. Age group of 55-64 and 45-54 also have patient with oral thrush, 15.7% and 11.5%. Rest is explained in the table below. There is no significant association between age group and oral thrush, 0=0.070.

Table 2: Oral thrush among the various age group

Age	Oral thrush n (%)	P value
25-34	4 (4.2)	
35-44	3 (3.2)	
45-54	11 (11.5)	
55-64	15 (15.7)	0.070
65-74	19 (25.3)	
75-84	5 (6.7)	
85<	4 (5.3)	

Table 3 shows the prevalence of the complications among the covid-19 patients. Oral thrush is the most prevalent, 61 (64.2%). Second most prevalent is inflamed gum, 26 (27.4%). Teeth mobility is the 3rd most common complication among the COVID-19 patients, 11 (11.6%). Other complication such as dental pain, foul smell, burning sensation, aphthous wean, teeth sensibility; 8 (8.4%), 3 (3.2%), 2 (2.1%), 4 (4.2%) and 2 (2.1%), were also present, respectively.

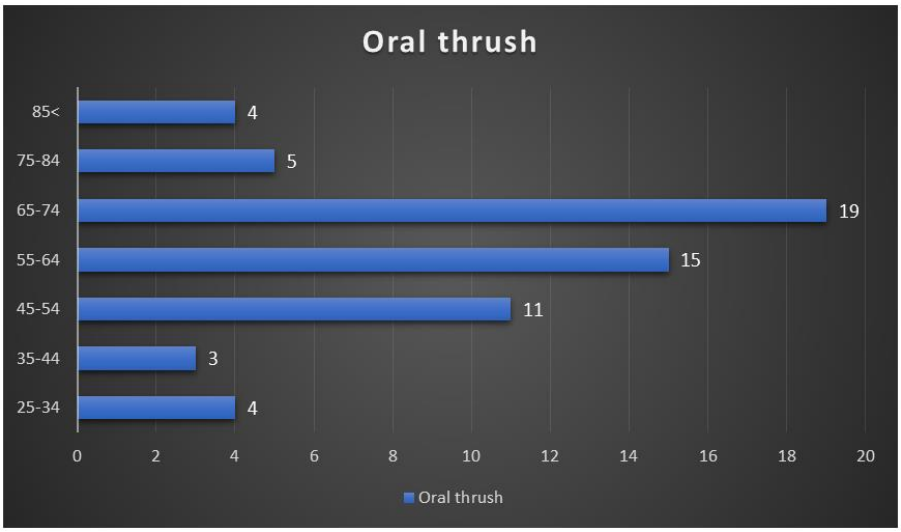

Figure 2: Oral thrush complication

Table 3: Prevalence of oral complications

Variables	n	Percentage (%)
Inflame gum	26	27.4
Foul smell	3	3.2
Oral thrush	61	64.2
Dental pain	8	8.4
Burning sensation	2	2.1
Aphthous wean	4	4.2
Teeth mobility	11	11.6
Teeth sensibility	2	2.1

DISCUSSION

Given that the case definition of COVID-19 must be as sensitive as feasible, the accumulating information on COVID-19-related oral manifestations sparked a large discussion over the pathophysiological course and epidemiological importance of these mucocutaneous symptoms [23].

The current case criteria for COVID-19 rely only on the complication that are characteristic of other oral disorders.As pointed out by Riad *et al.,* in 2020, the lack of reference time point consistency across COVID-19 case- reports and case-series has hampered attempts for accurate estimate of the onset of COVID-19-related oral symptoms and their epidemiologic importance [24]. Current study presented that most of the COVID positive patients have higher incidents on oral thrush which is due to oral candida. Candida strains are the primary cause of invasive fungal infections. In COVID-19, invasive yeast infections (IYIs) have grown to be a serious consequence. Therefore, it is thought that prolonged ICU stays, central venous catheters, and the administration of broad-spectrum antibiotics may all contribute to IYIs. Similarly, Amorim dos Santos *et al.*, 2020 [25]; Brasilia (Brazil) discovered persistent white plaque on the tongue dorsum on his patients. Baraboutis *et al.,* 2020; Athens (Greece) also found unexpected "oral candidiasis." One of them resembled esophageal candidiasis [26].

The primary objective of our study is to find the prevalence of oral thrush and other complication among the COVID positive patients. 64.2% were found with oral thrush which is similar to the one found in Baraboutisstudy [26]. All the patients were above 25 years where patient with the age of 65-7 have the highest incidence of oral thrush.

CONCLUSION

In severely sick COVID-19 patients, oral thrush, dental movement, and inflamed gums were the most often reported problems. The extended prone posture and mechanical breathing equipment utilized in the ICU environment may have contributed to these oral problems. Therefore, it is highly recommended that a multidisciplinary approach be used for the monitoring and treatment of COVID-19, which implies that nurses and oral healthcare professionals should be included in the ICU teams.

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