Original Article

Prevalence of Oral Health Issues and Its Associated Risk Factors Among Post-COVID Patients in Kannur, Kerala: A Cross-Sectional Study

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Abstract

Background: The novel coronavirus has affected over 6.9 million people in over 200 nations in the world. As of May 2022, according to World Health Organization, India reported 43,107,689 confirmed cases of coronavirus disease (COVID-19). An Egyptian study reported 67.2% with oral manifestations where dry mouth was 39.7%, gustatory dysfunction as 34.5% loss of salt sensation, 29.3% loss of sweet sensation, and 25.9% altered food taste. The objective of this study was to estimate prevalence of oral health issues and associated factors among persons who had been diagnosed COVID positive in Kerala.

Methods: In the cross-sectional study conducted among 63 post-COVID patients in Kannur district in Kerala, data was collected through online survey with semi-structured questionnaires.

Results: Mean age of study participants was 43.96 ± 16.78 years. About three-fourth, 74.6% (95% confidence interval: 63.9, 85.3), of study participants suffered oral health issues. Most common oral health issues reported were dry mouth 37 (58.7%), altered taste sensation in 35 (55.6%), and teeth sensitivity among 32 (50.8%). Ayurvedic medications for COVID-19 (*P* value: .014), oral hygiene habits (*P* value: .001), irregular dental consultation (*P* value: .04), and treatment (*P* value: .033) were factors significantly associated with oral health issues.

Conclusion: Our study reveals that post-COVID patients are a group which require better oral care and hence early diagnosis is encouraged to recognize and treat oral manifestations in them.

Keywords

COVID-19, dry mouth, altered taste, teeth sensitivity

Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus has caused major upheaval and has also challenged health-care settings.[1] To date, there have been 48,01,203 confirmed cases in Kerala.[2]

The typical clinical symptoms of COVID-19 patients were fever, cough, shortness of breath, and myalgia or weakness with abnormal chest computed tomography scan.[3–4] Xerostomia and loss of taste have also been reported among patients with COVID-19 and may be associated with salivary gland dysfunction.[5]

Other manifestations in the oral cavity due to COVID-19 were taste disorders, nonspecific oral ulcerations, desquamative gingivitis, petechiae, and coinfections like candidiasis. Several studies reported high prevalence of gustatory dysfunction, sialadenitis, and inflammatory reactions in salivary glands, tongue, and fungal infections typically mucormycosis. Opportunistic fungal infections, ulcerations, and herpes simplex virus-1 infection due to therapeutic interventions in post-COVID patients have also been reported.

There is a paucity of studies in Kerala on the prevalence of oral health issues and its associated factors. Such patients require immediate dental care with a multidisciplinary approach. Therefore, this study was conducted with the

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objective of determining the prevalence of oral health issues and its associated risk factors among post-COVID patients in Kannur, Kerala.

Material and Methods

This cross sectional study was conducted among post-COVID patients. Based on the study "Oral manifestations of COVID-19" by Dina M El Kady,[6] the prevalence obtained was 67.2% and this was used to calculate the sample size, $n = \{z^2_{1-\alpha/2}pq\}/d^2$, with 95% of confidence interval (CI) and 20% of allowable error were $q = (100 - P)$, d = (20% of *P*), and the minimum sample size was calculated to be 48. Previous studies carried out by the investigator (unpublished) in Kannur had a high prevalence for oral health issues like fungal lesions, caries, periodontal problems, white patches, oral mucosal problems, and abnormal features, therefore Kannur was chosen as the target district of this study. The study was carried out during October and November 2021. The list of about 150 adults diagnosed with COVID-19 in the 2 randomly selected taluks of Kannur, namely Taliparamba and Kannur in the past 6 months, was obtained from the respective primary heath cares and was included in the study. Every alternate person in the list was invited to participate in the study through a telephone call. The study was carried out during October and November 2021. After getting consent through a phone call, informed consent was obtained through Google forms in Malayalam. Out of total 75 persons, about 8 could not reach due to hospitalization and 4 refused consent. The independent variables collected included sociodemographic, COVID-related, oral hygiene, personal habits, and food habits such as snacking, consumption of sweetened food and beverage, junk food and, comorbidities. The dependent variable was the presence of any oral symptom such as oral pain, teeth sensitivity, teeth mobility, fungal infection, difficulty in opening mouth, mouth ulcers, halitosis, abnormal features, white patches, eruptions, dry mouth, gum inflammation, and altered taste sensation. All the symptoms were self-reported in the Google form.

Collected data was then coded and entered in Microsoft Excel in Windows 10 and analyzed using the Statistical Package for Social Sciences (SPSS) version 21, categorical data was expressed in percentage, and continuous data was expressed in mean and standard deviation. Chi-square test was done to check the association between categorical variables. The multivariate regression model was built with the variables occupation, oral status, comorbidity, and brushing habit. The data collection was initiated after getting approval from the Review Board and Ethical Committee of Amrita School of Medicine vide ECASM-AIMS-2021-397.

Results

The mean age of the participants was 43.96 ± 16.78. More than half of the participants 36 (57.1%) were women (Table 1). In our study, about 17 (27%) participants had comorbidities. Among them, for each comorbidity when taken separately, about a quarter 15 (23.8%) suffered from hypertension, 11 (17.5%) experienced mental stress, 6 (9.5%) had diabetes, 2 (3.2%) arthritis, and 1 (1.6 %) suffered from gastrointestinal tract (GIT) problems. None had habit of chewing areca nut and tobacco products (see Table 1).

About three-fourth, 74.6% (95% CI: 85.3, 63.9) of the study participants reported suffering from oral health issues. The leading oral health issues were dry mouth, altered taste sensation, tooth sensitivity, and gum inflammation reported

Table 1. Profile of the Study Participants.

Sociodemographic Characteristics		Frequency (N = 63)	Percentage (100)
Age	Less than 45	35	55.6
	Greater than or equal to 45	28	44.4
Sex	Male	27	42.9
	Female	36	57.1
Occupation	Professional	17	27
	Skilled	12	19
	Unskilled	4	6.3
	Unemployed	12	19
	Others	18	28.6
Educational qualification	No formal education	3	4.8
	Primary education	1	1.6
	High school	3	4.8
	Higher secondary or predegree	4	6.3
	Bachelor's degree	33	52.4
	Master's degree	18	28.6
	Doctorate or higher	1	1.6
COVID-19 related			
Infected within	Less than 2 months	12	19
	Greater than or equal to 2 months	51	82.6

(Table 1 continued)

(Table 1 continued)

Sociodemographic Characteristics			Frequency (N = 63)	Percentage (100)
Symptoms	Fever/Headache/Sore throat	Yes	61	96.8
		No	2	3.2
	Breathing difficulty	Yes	8	12.7
		No	55	87.3
	Diarrhea	Yes	7	11.1
		No	56	88.9
	Other difficulties	Yes	8	12.7
		No	55	87.3
Complications with COVID-19	Yes		5	7
	No		58	92.1
Hospitalization	Yes		5	7.9
	No		58	92.1
Medicines whether taken	Yes		53	84.1
	No		10	15.9
Types of medications taken	Allopathic		21	33.3
	Ayurveda		17	27
	Homeopathic		2	3.2
	Others		23	36.5
Oral care				
Oral status	Poor		9	14.3
	Fair		28	44.4
	Good		20	31.7
	Excellent		6	9.5
Brushing habit twice daily	Yes		37	58.7
	No		26	41.3
Bleeding on brushing	Yes		21	33.3
	No		42	66.7
Dental visits/consultation	Yes		10	15.9
	No		53	84.1
Dental treatments	Yes		11	17.5
	No		52	82.5
Personal habits				
Snacking between meals	Yes		53	84.1
	No		10	15.9
Consumption of sweetened foods and beverages	Yes		46	73
	No		17	27
Consumption of junk foods	Yes		35	55.6
	No		28	44.4
Consumption of tea or coffee	Yes		61	96.8
	No		2	3.2
Smoking	Yes		5	7.9
	No		58	92.1
Alcohol consumption	Yes		11	17.5
	No		52	82.5

by 37 (58.7%), 35 (55.6%), 32 (50.8%), and 19 (30.2%), respectively. Other oral issues were oral pain, teeth mobility, fungal infection, mouth opening difficulties, ulcers, halitosis, abnormal features, white patches, eruptions, and burning sensation in mouth (see Figure 1).

In univariate analysis, sociodemographic variables such as age, sex, occupation, and educational qualifications had no association with oral problems. Those who had taken medicines for COVID-19 had a significantly higher proportion of oral problems at 83% (0.002) compared to 17% in the group without medicines. Among them, all those who have consumed ayurvedic medications had oral problems. The perception of poor oral health status was significantly associated with a higher percentage of oral health problems (91.9%). Those who did not brush twice daily had higher percentage of oral health problems (96.2%) (0.001) and those who made dental visits and those who sought dental treatments also had significantly higher oral health problems. Those who had comorbidities had significantly higher percentage of oral problems at 94.1% (0.048). Those who drank tea/coffee had

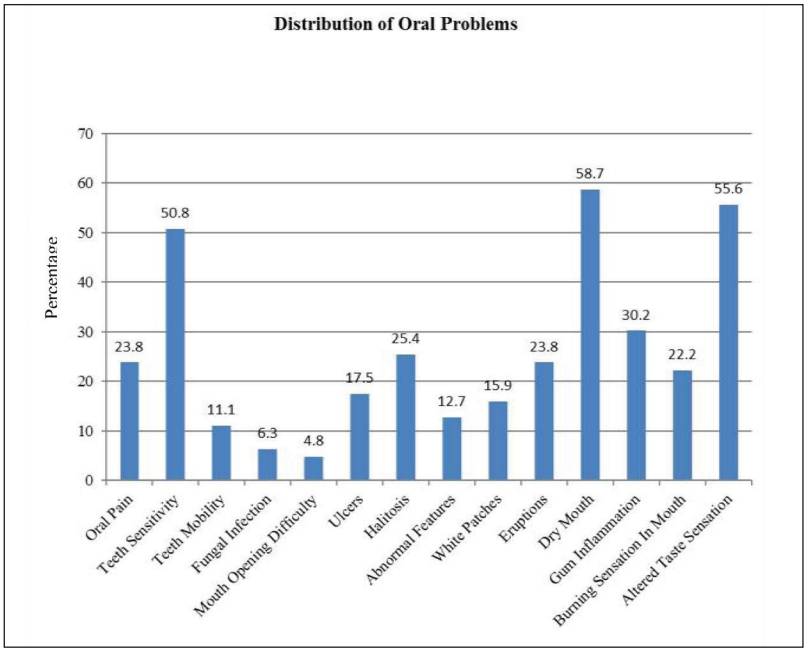

Figure 1. Types of Oral Health Problems Reported.

Table 2. Multivariable Logistic Regression of Post-COVID-19 Oral Health Problems Among Study Population.

Variable	Crude OR	*P* Value	AoR	*P* Value
Occupation				
Unemployed	4.583 (0.543, 38.718)	.162	1.583 (0.133, 18.813)	0.716
Employed	1		1	
Oral Status				
Poor	11.33 (2.77, 46.36)	.001	6.341 (1.20, 33.5)	0.030
Good	1		1	
Comorbidity				
Yes	7.74 (0.937, 64.00)	.058	5.29 (0.513, 54.71)	0.162
No	1		1	
Brushing Habit				
No	17.04 (2.07, 139.72)	.008	18.24 (1.97, 168.27)	0.010
Yes	1		1	

a significantly higher proportion of oral health problems at 77% (0.061).

A multivariable logistic regression showed that those who perceived their oral health to be poor had 6.34 (95% CI: 1.2,33.5) times higher chances of reporting oral health problems and those with a poor brushing habit were 18.24 (95% CI: 1.97, 168.27) times more prone to oral health problems (Table 2).

Discussion

The leading oral health issues in this study were dry mouth, altered taste sensation, tooth sensitivity, and gum inflammation. The major reasons for these may be snacking in between, frequent intake of beverages, and sweetened food items. Dental care and utilization also appears to be poor which may aggravate dental problems.

In a study conducted among 123 individuals in Italy after oral examination, ulcerative lesions were the most common form of injury.[7] Prevalence of oral lesions was much more when compared to the results of our study. Dysfunction of taste was noticed with a percentage higher than 80% whereas in our study it was only 55.6% which can be because of less percentage of participants having complications of COVID-19 and lower proportion of use of tobacco smoking and alcohol in this study population.

Candidiasis was the most prevalent opportunistic infection reported in studies from Brazil and India,[8,9] while in another study in Brazil, oral ulceration was found to be about 17.2%, mouth and lip spots 13.8%, and their prevalence was higher than other oral changes in COVID-19 patients.[10] In a study in France, irregular and asymptomatic ulcers[11] typical of other viral exanthematous illnesses were reported. Tongue redness has also been reported in Brazil to the extent of 5.2%.[12] A study in Japan revealed 32.8% of the patients had no symptoms related to the oral cavity or salivary glands and were estimated as asymptomatic patients.[13,14]

Around 17 (27%) participants in our study suffered from other disease conditions. The participants reported of hypertension, mental stress, diabetes, arthritis, and GIT problems. About 16 (94.1%) have taken medications for other disease conditions and 16 (94.1%) suffered from oral problems. While in a study conducted by Juliana Amorim Dos Santos in Brazil, the participants reported coronary disease and systemic hypertension. In the multivariate analysis, those who perceived their oral health to be poor had 6.34 (95% CI: 1.2, 33.5) times higher chances of reporting oral health problems and those with a poor brushing habit had 18.24 (95% CI: 1.97, 168.27) times higher probability of oral health problems.

As the study was conducted in an online platform, digital literacy was a limitation. Self-reports were used which could overestimate the problem of oral health issues among persons with COVID-19. An Egyptian study reported that detailed patient's history is required to confirm COVID impact on oral cavity and salivary glands.[6] As per our study results, we can say that early identification of oral symptoms could help to diagnose high-risk groups, prevent complications, and promote overall oral health of study participants. A study done in Brazil reports that since COVID-19 is a novel infectious disease with insufficient data on pathogenesis and clinical features, a long-term follow-up with a multidisciplinary approach is highly recommended for all COVID-19 recovered patients particularly for the unemployed, and those with comorbidities.[8] The reason may be as unemployed and those with comorbidities are especially vulnerable and at increased exposure to infection.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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