A study to evaluate taste perception changes of hospital discharged COVID-19 patients - A cross sectional study

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Abstract:

Context*:* In the wake of the coronavirus outbreak that began in China in December 2019,there has been a surge in research into the various aspects of this disease. Even three years after the

first outbreak the disease's pathogenesis and manifestations continue to remain elusive. While many scholars believed that the coronavirus virus pandemic had ended, in reality, the disease continues to exist and the virus continues to thrive even in 2022. Though there has been some documentation regarding the systemic signs and symptoms there is a lack of adequate research on the long COVID manifestations in the oral cavity.**Aim**: This study aimed to assess the oral health status in hospital-discharged COVID-19 patients and determine the association between oral health and coronavirus disease outcomes for a prolonged duration, including the incidence of severity of COVID infection. **Study Design:** 200hospital-discharged COVID-19 patientswere selected by using a convenience sampling technique. **Materials and Methods***:*Participants who were evaluated for their taste changes. The methodology employed were included presence or absence of taste by using a taste kit and compared with post discharge duration, COVID severity criteria and age. **Results***:* In our study out of 200 participants, 180(90%) had normal taste sensations; however, 20(10%) did not experience any taste sensations. **Conclusions***:*In this study, some patients who survived COVID-19 infection exhibited taste impairment for at least six months. Thus, after the treatment of Covid-19, attention should be paid to the maintenance of good oral health status, including taste bud functions.

Keywords: Coronavirus, Dysgeusia, Long COVID

INTRODUCTION

"WE THINK WE ARE DONE WITH THE PANDEMIC, BUT THE PANDEMIC IS NOT DONE WITH US"

- Dr. Getanjali Pai, (MD, Infectious Specialist)

By the end of December 2019, after an outbreak of enigmatic SARS-CoV-2 as a new type of coronavirus, causing a wide range of illnesses from the common cold to more serious illnesses and in some circumstances, causes fatalities too.[1]WHO, who declared COVID-19 an international emergency in December 2019 and is now hopeful that the COVID-19 epidemic is nearing its end. Although manyexperts believed that the worst may be over, but it may be quite a while before we declare the end of the pandemic**.** On January 9, 2023, practically every nation in

the world had received confirmation of the coronavirus disease outbreak (COVID-19). About 669 million individuals had been infected by the virus, and 6.7 million had died as a result.

COVID-19 is believed to be a multiorgan syndrome with a wide range of manifestations.[2 3,4]The term "post-COVID syndrome" or “Long COVID” is used to indicate the existence of numerous systemic symptoms, even weeks or months later being infected with SARS-CoV-2, regardless of the viral status. Furthermore, the SARS-CoV does not spare the oral cavity causing loss of taste have been reportedcommonly in hospital-discharged patients.[5]Due to the potential for opportunistic infections and adverse reactions, taste alteration may be a symptom of systemic deterioration. Therefore there is widespread interest currently in the study of this oral manifestations due to COVID-19.[6]As healthcare providers, it is of paramount importance to ensure good oral and dental health as it is a mirror of oral health. Thus, this present study attempts to bridge this knowledge gap. This study has been undertaken to evaluate the taste changes in survivors of Covid19 infection.

MATERIALS AND METHODS

The current study was carried out at the School of Dental Sciences, Department of Oral Pathology and Microbiology, Krishna Institute Medical Sciences, Karad. A Cross-sectional analysis was used for the study.

Inclusion criteria

1. All patients who were COVID-19 positive in accordance with interim guidelines issued by the World Health Organization and were treated and discharged from the hospital.

2. Present no active symptoms of COVID-19

Exclusion criteria

1. Patient with a recent history of any antimicrobial drugs.
2. Pregnant women
3. Patient with a history of COVID vaccine.

200 Subjects reporting to the Krishna Institute of Medical Sciences, Karad and fulfilling the above inclusion criteria were enrolled in our study.

Ethics:

Ethical clearance was obtained from the institutional ethics committee of Krishna Institute of Medical Sciences, KIMSDU, Karad, before the commencement of the study followed by permission from respective departments of KIMSDU. (Protocol No. 240/2020-2021 and Ref No. KIMSDU/IEC/02/2021, Date 16/04/2021)

Participation in this study was entirely voluntary and the participants were allowed to withdraw from the study at any time should they wish to do so. It was emphasized that strict confidentiality would be maintained at all times and that no names or personal details would be mentioned in the write-up of the study. Anonymity was achieved by not using participants' names during sample collection and was identified using serial numbers.

Study Design

Participants were selected by using a convenience sampling technique.

Methodology

The participants were evaluated for the changes in taste perception by taste kit. Taste disturbances were examined by using a taste kit (Bartovation taste strip). On the anterior two-thirds of the dorsum of the tongue, taste strips were placed. After placing the strips, the taste recognition was recorded, and whether presence or absence of taste was documented for every taste. Between testing each strip, the subjects would be asked to rinse their mouth thoroughly with distilled water. In our study, patients were considered to have a loss of taste sensation if they were unable to identify any individual tastes.

Method of statistical analysis

Microsoft Excel was used to enter and sort the data (v.2013). Software from IBM Corp.'s Statistical Package for Social Sciences (SPSS) (v.21.0) was employed. To determine whether there are significant differences between two characteristics, the chi-square test of association were used. 95% confidence intervals were used for all statistical tests.A p-value of less than 0.05 was considered statistically significant in the study, with an alpha error of 5%, a beta error of 20% and a power of study at 80%.

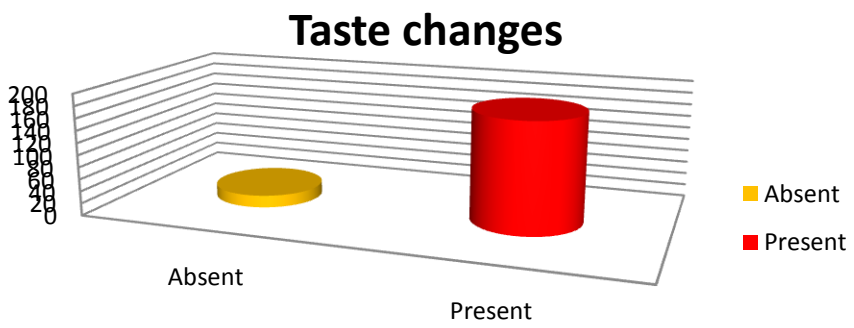
RESULTS

A total of 200 hospital-discharged COVID-19 survivors were evaluated for the different aspects of their oral health status. The purposes of our study were to correlate taste changes with age, post-discharge duration, and COVID severity criteria in the study population.

The gender distribution of study subjects was 136(68%) males and 64(32%) females with a ratio of 2.5:1. Patients within the age range of 18-90 years were covered in this study. There were four age groups: 34 (17%) of participants were between the ages of 18 and 35, 78 (36%) were between the ages of 36 and 53, 74 (37%) were between the ages of 54 and 71, and 16 (8%) were between the ages of 72 and 90. Patients with history of COVID infection between one to twelve months after hospital discharge were included in our study. They were categorized into 4 post-discharge duration groups: 1-3 months had 36(18%) participants, 3-6 months had 74(37%) participants, 6-9 months had 54(27%) participants and 9-12 months had 36(18%) participants. Post-COVID-19 study participants were also classified into mild, moderate, and severe, based on COVID severity criteria guidelines by the National Institute of Health. In our study majority of participants, 134(67%) had mild COVID severity followed by 60(30%) participants with moderate and 6(3%) participants with severe COVID severity criteria.

Out of 200 participants, 180(90%) had normal taste sensations; however, 20(10%) did not experience any taste sensations (*Graph 1*). A statistically significant difference was observed (p-value = 0.000) between post-discharge duration and taste changes in our study (*Table 1*). The loss of taste was observed in 20 subjects in 1-3 months of post-discharge duration.

"Graph 1: Details of the study participants according to taste changes"



However, there was no statistically significant difference (p-value > 0.05) between COVID severity criteria and taste changes (*Table 2*). Additionally no statistically significant difference (p-value > 0.05) between different age groups and taste changes (*Table 3*).

"Table 1: Comparison of post discharge duration with taste changes"

Post discharge duration * Taste changes

Post discharge duration	Taste changes		Total	p-value
	Absent	Present		
1-3 months	20	16	36	
3-6 months	0	74	74	
6-9 months	0	54	54	**0.000***
9-12 months	0	36	36	
Total	20	180	200	

"Table 2: Comparison of COVID severity criteria with taste changes"

COVID severity criteria* Taste changes

COVID severity criteria	Taste changes		Total	p-value
	Absent	Present		
Mild	10	124	134	**0.140***
Moderate	8	52	60	
Severe	2	4	6	
Total	20	180	200	

Table 3: Comparison of age with taste changes

Age * Taste changes

Age	Taste changes		Total	p-value
	Absent	Present		
18-35 years	2	32	34	**0.598***
36-53 years	8	68	76	
54-71 years	8	66	74	
72-90 years	2	14	16	
Total	20	180	200	

DISCUSSION

World Health Organization is now hopeful that the COVID-19 epidemic is nearing its end. However, there is still an increasing number of reports of prolonged and persistent complications following acute COVID-19 surfacing in recent times.[3,4]The most severely affected countries include the U.S., China, and Brazil. China has lifted its restrictive COVID-19 policies, the country is likely to see waves of infections and deaths. The US reported about 26,000 juvenile with Covid-19 positive in the week ending January 12. Yet, because it is novel, it is crucial to raise public awareness so that they can act quickly to prevent harm.

The term "post-COVID syndrome" or “Long COVID” used to indicate the existence of numerous symptoms, even weeks or months after being infected with SARS-CoV-2, regardless of the viral status. Its nature might either be continuous or relapsing and remitting.[4]

Given the variety of signs and symptoms reported and the lack of a clear definition, it is challenging to determine an abundance of “long COVID” symptoms.[4]Up to one-third of patients with a less severe initial condition may have worse symptoms during long COVID.[7]However, in numerous cases of long COVID, symptoms appear in patients who were generally healthy during their initial disease course.[8]In addition, numerous studies have reported prolonged oral symptoms in post-COVID patients, such as taste disorders, dry mouth, halitosis, inflammation of the parotid gland, and mucosal lesions.[9] Thus, the prevalence of oral signs and symptoms and whether they are a direct result of SARS-CoV-2 infection or are merely secondary indications.[4]

The purpose of this study was to ascertain the effects of COVID-19 causing taste alteration of recovered COVID patients after a hospital discharge. 200 Subjects reporting to the Krishna Institute of Medical Sciences, Karad and fulfilling the inclusion criteria were enrolled in our study. With the aid of convenience sampling, participants were chosen. Participants in our study whose ages ranged from 18 to 90 years were enrolled. The majority of the study participants were 76(38%) in the age group of 36–53 years, and the least number of participants was 16(8%) in the age group of 72–90 years.The gender distribution of the participants in our study was 136(68%) men and 64(32%) women, in a ratio of 2.5:1. However, Heron Gezahegn *et al.* 2022

examined 55 volunteer COVID-19 patients and included ages, ranging from 8 to 90 and noted 36 men and 19 women.[10] Camila Alves Costa *et al.* examined128 COVID-19 hospitalised patientsand their ages ranged from 20 to 97 years.[11]

Patients with history of COVID-19 infection after hospital discharge between one to twelve months were included in our study. The post-discharge duration groups were classified into 1-3 months, 3-6 months, 6-9 months and 9-12 months. The post-discharge duration group of 3-6 months had a maximum of 74(37%) participants whereas, the 1-3 months and 9-12 months post-discharge duration groups both had 36(18%) participants each.

According to the National Institutes of Health's guidelines for the COVID severity criteria, post-COVID-19 participants in our study were classified into three categories mild, moderate, and severe. In our study, the majority of participants 134(67%) had mild COVID severity criteria followed by 60(30%) participants with moderate and 6(3%) participants with severe COVID severity criteria. While Wentai Pang *et al.* 2020, assessed the tongue features of 1043 COVID patients and classified participants into mild, moderate, severe and critical, based on the criteria of Diagnosis and Treatment Protocol for COVID-19 (Trial Version 7).There were 225(21.57%) mild cases, 663(63.57%) moderate cases, 147(14.09%) severe cases and 8(0.77%) critical cases in their study.[12]

Many SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) patients reported loss of taste as a prolonged symptom even after systemic symptoms disappearance. In this study, among 200 participants, 180(90%) had normal taste sensations; however, 20(10%) did not experience any taste sensations was reported.

When the association between post-discharge duration and taste changes was assessed in our study, a statistically significant difference between them was observed (p-value 0.05). The absence of taste (55%) was observed in the 1- 3 months post-discharge duration group suggesting that taste sensation can be a reliable indicator that someone has COVID-19 infectionand it can take time almost 1-3 months to regain a sense of taste. Similar to this result, the Lee *et al*. study from Korea, which used daily phone surveys of over 3,191 COVID-19-positive patients, found that ageusia may persist in some patients for up to 40 days (more than 1

month).[13]Evan R. Reiter *et al.* in their initial survey of 549 COVID-19 patients, found that approximately one-third of patients recovered completely to normal taste function within one month of diagnosis, two-thirds of patients had fully recovered within two months, and less than 5% reported absence of taste even after 3-6 months of post-discharge duration.[14]Ameen Biadsee *et al.* 2021, reported 40 COVID-19 survivors with gustatory dysfunction among which 48% of patients reported only partial recovery within 229 days.[15]However Alka Kumari Muthayam *et al.* results did not correlate with our results. According to their observational studies, around 72% of patients had altered taste, among which 53% of patients showed symptoms for more than 2 weeks after hospital discharge with no significant difference based on variables except for age groups.[16]In the questionnaire study by Paolo J. Fantozzi *et al.* in 2020 of 107 COVID-19 patients treated at home or in the hospital, among which 15 patients were diagnosed with taste dysfunction which may persist for at least two weeks after discharge. However, in their study, some patients' taste functions did not improve two weeks after treatment.[17]

No statistically significant difference between the COVID severity criteria and taste changes was found in our study (p-value > 0.05).However, our result contraindicated with Lechien *et al.* finding of 417 patients with COVID-19 infection who reported that gustatory dysfunction was prevalent in mild to moderate COVID-19 infection.[18]

When the association between age groups and taste changes were assessed in our study, there was no statistically significant difference (p-value > 0.05) between different age groups and taste changes.

Many different viral infections are linked to taste abnormalities. The angiotensin-converting enzyme has two receptors, widely expressed in the oral epithelial cells, and is targeted by the coronavirus to penetrate the cells.[19]In the early stages of COVID-19, damage to the oral cavity's mucosal cells results in ageusia. The pathophysiological mechanism underlying ageusia in COVID-19 may be explained by these evidence.[19]

The present study, however, has some limitations because it was carried out at a single tertiary care hospital. For generalized application, future studies can be conducted with a multi-centre approach which will better reflect the common population. Due to limited access to previous

medical history reports of the patients, the present study could not ascertain the authenticity of previously present signs and symptoms. Longitudinal studies can be undertaken in the future to establish timelines for individual signs and symptoms for COVID-19 survivors.

CONCLUSION

Overall, the findings indicate that COVID-19 may target the oral cavity because the vast majority of survivors still experience taste changes days after their clinical recovery. In this study, some patients who survived COVID-19 infection exhibited taste impairment for at least six months. Hence, maintaining good dental health should be a priority after the treatment of COVID-19. To fully understand the relationship between the long COVID effect and oral disorders, more research is required.

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