



A STUDY OF ORAL HEALTH IN HEALTH CARE PROFESSIONALS DURING CURRENT PANDEMIC OF COVID 19 IN A TERTIARY CARE CENTRE- A CROSS-SECTIONAL OBSERVATIONAL STUDY

Dr. Swati Jitendra Rathod¹, Dr. Jitendra Kerba Rathod^{2*}

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Abstract

Background: COVID -19 is highly infected and transmitted through droplets. Health care workers (HCW) are at high risk due to close contact with the infected patients and hence taking extra precaution by wearing mask and PPE kit is mandatory. We conducted this study to check that wearing a mask for more time can affect the oral cavity or not.

Methods: This is a cross sectional observational study. A questionnaire based online survey was conducted consisting of 16 questions. The questionnaire was prepared on google form and sent to health care workers working in the tertiary health care centre. The responses were collected through personal E-mail.

Results: 403 health care workers were participated in this survey. Out of which 254 were male and 149 were females, between the age groups of 25 to 65years. The HCW were categorized into three groups - 44% doctors, 31% residents and 25% paramedical staff. Among the 403 HCW, 59.8% were using N95 mask, 15.9% Respirator, 12.9% three ply mask and 11.6% cotton mask. 85.4% HCW were using the mask for more than 6 hours and only 14.6% were using mask for less than 6 hours. 67.5% HCW have noticed dryness of mouth, 57.55% bad breath (Halitosis) 15% bleeding gums and 13% ulcers. The experience of dryness of mouth and bad breath is when compared to the time of wearing mask, a significant positive correlation was found (chi square value 19.88, $P < 0.0001$ and 11.34, $P < 0.0001$ respectively).

Conclusion: HCW in survey group had noticed dryness of mouth, halitosis in majority followed by bleeding gums and ulcers.

Key words: health care workers, N 95 mask, respirator, three ply mask, dryness of mouth, bad breath, bleeding gums, ulcers,

¹Associate Professor, Department of Dentistry, M.G.M. Medical College and Hospital, Aurangabad, (Affiliated To MGMIHS, Navi Mumbai) Maharashtra, INDIA.

^{2*}Associate Professor, Department of Otorhinolaryngology, M.G.M. Medical College and Hospital, Aurangabad. (Affiliated To MGMIHS, Navi Mumbai) Maharashtra, INDIA,
Email: Jitendrarathod02@gmail.com

***Corresponding Author:** Dr. Jitendra Kerba Rathod

*Associate Professor, Department of Otorhinolaryngology, M.G.M. Medical College and Hospital, Aurangabad. (Affiliated To MGMIHS, Navi Mumbai) Maharashtra, INDIA,
Email: Jitendrarathod02@gmail.com

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Introduction

In 2020 the whole world has witnessed the century's biggest pandemic when WHO had declared the novel Coronavirus (COVID-19) outbreak a global pandemic [1]. The first case of Covid 19 was diagnosed in Wuhan, China when a group of people affected with unexplained viral pneumonia [2]. Over 100 million individuals got infected with SARS-CoV- 2 and had killed over 2.15 million people worldwide as till January 2021 and the numbers still continue to grow [3].

During this period the lifestyle of people has changed drastically. Wearing mask, maintaining extra sanitization, keeping social distancing was new normal. Even though wearing mask was mandatory there can be some effects of it on oral hygiene. The questionnaire based online survey was conducted on health care workers working in the tertiary healthcare centre 1) To know if health care workers have noticed any kind of changes in oral cavity after long term use of mask. 2) To know any adverse effect of mask on oral cavity.

Methods

The present study is designed as Cross-sectional observational study. This is a questionnaire based online survey. The research was primarily done at MGM medical college and hospital, Aurangabad. This study was conducted on health care workers working in the tertiary care centre of MGM Medical College and hospital. The health care workers eligible for the survey were doctors, residents and paramedical staff. The variables were divided based on demographic profile, medical history, how much time the participant used mask, type of mask, oral hygiene practices such as brushing habits and use of mouth wash, water intake in a day, experienced bad breath and dryness of mouth, whether participants felt any other changes in oral cavity, steam inhalation and nasal irrigation practices. The primary data source of study was consisted of questionnaire based online survey. The questionnaire was prepared with a set of 16 self explanatory questions. The questions were simple and easy to understand by the participants and the options were mostly in Yes/No format. This helped the participant to assess their oral cavity at their own and on the basis of their own experience participant could answer the questions accordingly. This questionnaire was prepared on google form. One link is formed on personal email. This link is then sent to each

participant via personal wats app number and emails. The responses were collected back on my personal email address. At the beginning of questionnaire, short information was given about the survey and consent was written saying those who are willing to fill the form can do so and rest can ignore the link. There were 403 health care workers were participated in the survey. The participants were broadly divided depending upon gender into male and female. Depending upon the age they were categorized into four groups such as 25 – 35, 36 – 45, 46 – 55 and 56-65 years. Chi-square test was applied (P - value of < 0.05 will be considered statically significant). Data was entered in Microsoft Excel and analyzed using SPSS VERSION 24.0TH mean and SD was calculated for quantitative variables and proportions was calculated for categorical variables.

The face mask is used to cover face or part of face for protection. During this pandemic wearing a mask is compulsory [4]. We aimed this study to see any ill effect of wearing mask for longer duration. There are different types of mask available in the market. Commonly used masks are cotton mask, three ply mask, N95 mask and respirator. Gingivitis is inflammation of gums and the chief complaint of a patient is bleeding from gums [5]. Halitosis or bad breath is an unpleasant odor emanates from oral cavity [6]. The self assessment was made by participants own experience about halitosis whether they felt any kind of unacceptable odor in mouth or not.

Results

There were 403 health care workers participated in this survey. The data were collected over a period of one year. Out of which 254 (63%) were male and 149 (37%) were females. The participants were distributed according to the age groups such as 50% of the HCW were from 25- 35 (204), 31.8% of 36-45 (128), 12.9% from 46-55 (52) and 4.7 % were from 56-65 age groups (19) The HCWs were broadly categorized into three groups such as doctors, residents and paramedical staff. Out of 403 HCW, 44% were doctors (177), 31% residents (126) and 25% paramedical staff (100) (Table 1). All the HCW were asked about the medical history. Out of 403 HCW, 10 had hypertension, 15 had diabetes mellitus, 5 had hypothyroid and 5 had ischemic heart disease. All were taking medication for their respective diseases.

Table 1: Demographic profile of participants

		Number	Percentage
Gender	Male	254	63
	Female	149	37
Age	25- 35	204	50.6
	36-45	128	31.8
	46-55	52	12.9
	56-65	19	4.7
Profession	Doctors	177	43.9
	Residents	126	31.3
	Paramedical staff	100	24.8

Among the 403 HCW, 241(59.8%) were using N95 mask, 64 (15.9%) were using Respirator, 52 (12.9%) were using three ply mask and 46 (11.6%) were using cotton mask. Almost all the doctors and residents were using mostly N95 and some of them were using Respirator. Paramedical staff mostly

preferred to use either three ply or cotton mask. Based on how much time the mask used, HCW were divided into two groups. 344 (85.4%) HCW were using the mask more than 6 hours and only 59 (14.6%) were using mask for less than 6 hours. (Table 2)

Table 2: Type and time of usage of mask.

		Number	Percentage
Use face mask in a day?	>6 Hours	344	85.4
	< 6 hours	59	14.6
Type of mask used?	N95	241	59.80
	Three ply	52	12.9
	Respirator	64	15.9
	Cotton mask	46	11.40

HCW were asked about the oral hygiene habits. It was observed that only 152 (37.7%) HCW used to brush their teeth twice a day and rest 251 (62.3%) brush their teeth once a day. 94 (23.3 %) of HCW uses mouthwash along with brushing while the rest

309 (76.7%) do not use mouthwash. HCW were asked about the daily intake of water. 51.9% of HCW were drinking less than 3 liter of water and rest 48.1% more than 3 liter. (Table 3)

Table 3: Oral hygiene practices among the health care worker

		Number	Percentage
Maintenance of oral hygiene	Brushes once daily	251	62.3
	Brushes twice daily	152	37.7
Use of mouthwash	Yes	94	23.3
	No	309	76.7
Water intake in a day	< 3 litre	209	51.9
	>3 litre	194	48.1

Out of 403 HCW 272 (67.5%) have noticed dryness of mouth. Out of 59 HCW who used mask for less than 6 hours 25 had noticed dry mouth when compared to the 247 HCW who used mask more than 6 hours out of 344. The experience of dryness

of mouth is when compared to the time of wearing mask, a significant positive correlation was found (chi square value 19.88, P<0.0001). Out of 403 HCW (54.1%) 218 had experienced bad breath (Halitosis) (Table 4).

Table 4: Association between experiences of dryness of mouth after use of mask and how much time mask used in a day during this pandemic period

How much time do you use face mask in a day	You Experienced Dryness Of Mouth After Using Mask During This Pandemic Period		Total	Chi-square value	P-value
	Yes	No			
Less than 6 hours	25	34	59	19.88	P<0.0001 S
More than 6 hours	247	97	344		
Total	272	131	403		

The 59 HCW were using the mask for less than 6 hours of which only 20 HCW had experienced bad breath. The 344 HCW were using mask more than 6 hours out of which 198 (57.55%) had experienced

bad breath. The experience of bad breath (Halitosis) when compared to the time of wearing mask a significant correlation was found (chi square value 11.34, P<0.0001) (Table 5).

Table 5: Association between experiences of bad breath (Halitosis) after the use of mask and how much time mask used in a day during this pandemic period

How much time do you use face mask in a day	Have you experienced bad breath (halitosis) after using mask during this pandemic period		Total	Chi-square value	P-value
	Yes	No			
Less than 6 hours	20	39	59	11.35	P<0.0001 S
More than 6 hours	198	146	344		
Total	218	185	403		

The HCW were asked whether they have noticed any kind of changes in oral cavity during this pandemic. More than 68% of HCW responded to this question positively. 15% of HCW Have

noticed bleeding gums while 12% have suffered from ulcers during this period along with dryness of mouth and bad breath. (Table 6)

Table 6: Effect of using mask on oral cavity

		Number	Percentage	
Have you experienced dryness of mouth after using mask during this pandemic period?	Yes	272	67.5	
	No	131	32.5	
Have you experienced bad breath (halitosis) after using mask during this pandemic period?	Yes	218	54.1	
	No	185	45.9	
Have you noticed any other changes in oral cavity during this pandemic period?	Bleeding gums	Yes	62	15.4
		No	341	84.6
	Ulcers	Yes	51	12
		No	352	88
Do you feel that oral hygiene is same before pandemic and now?	Yes	270	67.0	
	No	133	33.0	

During the period of pandemic many HCW had started steam inhalation and nasal wash as a preventive measures. We wanted to find out how many of HCW practice this. So the question about

the same was asked. About 51% of HCW were doing steam inhalation and only 23.1% were doing nasal irrigation /wash. (Table 7)

Table 7: Preventive measures practiced by health care worker during pandemic

		Number	Percentage
Do you take steam inhalation during this pandemic period?	Yes	201	49.9
	No	202	50.1
Are you doing nasal wash/irrigation during this pandemic period?	Yes	93	23.1
	No	310	76.9

The HCW were asked whether they felt any kind of changes in oral cavity during this pandemic period. 67% of HCW have experienced changes in oral cavity such as dryness of mouth, bad breath, bleeding gums and ulcers. (Table 6)

68% of HCW have experienced changes in oral cavity during COVID 19 pandemic.

60% of HCW were using N95 mask compared to other type of mask. Almost 85% of HCW were using mask for more than 6 hours and approximately 52% of HCW drinking water less than 3 litre. This results in dryness of mouth (67.5%) and halitosis (57.55%). Some of the the HCW also experienced bleeding gums and ulcers.

Discussion

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is the main etiologic agent responsible for this pandemic [7]. Coronavirus (CoV) is from family of Coronaviridae, and subfamily Orthocoronavirinae. It consists of a group of enveloped, single stranded RNAviruses [8]. SARS-COV-2 infection can be subdivided into three phases: the spread of infection (Viremia), the acute phase with

appearance of clinical signs, and the stage of convalescence, which may progress to either recovery or death [9]. SARS – COV 2 patients may present with wide range of clinical symptoms such as from mild/ moderate to severe and rapidly progressive diseases. The most common symptoms of COVID -19 are fever, myalgia or fatigue, headache, sore throat. Some patient may experience loss of taste (hypogeusia), loss of smell (hyposmia) which can be considered as warning sign for early detection and self -isolation. There are some atypical symptoms seen such as, hymoptysis, vomiting, diarrhea and rhinorrhea [10-13].

Burden over the health care workers were very high during this pandemic. They had to work for extended period in extra shift to compensate the work load. HCW had to work with extra precautions wearing PPE kit and mask all the time as they were working in close contact with infected people. We decided to conduct this study to check whether they have noticed any kind changes in oral cavity during this pandemic period.

403 HCW were participated and they were categorized mainly into three groups such as doctors, resident and nursing staff. 344 HCW were using mask for more than 6 hours (85.4%). The incidence of dryness of mouth was significantly high in the HCW who wore the mask more than 6 hours (67.5%). In literature the definition of dry mouth is confusing. The hypofuction of saliva and xerostomia have been used interchangeably. Xerostomia is the subjective symptom of dry mouth and can be assessed by asking questions directly to the individuals [14, 15]. In the present survey we asked the individuals weather they feel dryness in mouth or not and the answer were recorded in yes/no response format. There are various causes for dryness of mouth such as some medications like antihistaminics, antihypertensive, antidepressants and anticholinergic, Sjogren's syndrome, Rheumatoid arthritis, systemic lupus erythematosus, radiotherapy, anxiety and depression [14, 16, 17]. In the present survey none on the individuals were suffering from any of major disease except only 10 were having hypertension, 15 were diabetic and 5 had ischemic heart disease and were taking medication for the same. The incidence of dry mouth is very high among the HCW when compared to the individuals having systemic illnesses and can be concluded that the local factor may be affecting the oral cavity. There were 52% HCW who drank more than 3 liter of water but still many individuals had felt dryness of mouth. WL Yip et al had conducted one study in which he concluded that wearing of mask for a

certain period of time could increase the temperature inside the oral cavity by evaporation of heat from the mouth to the surrounding and by minimising the convection [18].

Halitosis is referred to an unpleasant and offensive odour to others that emits from oral cavity [19]. Halitosis cab be classified as genuine halitosis (intra-oral and extraoral halitosis), transient (temporary) halitosis and pseudohalitosis/ halitophobia (imaginary bad breath) [20, 21]. There are various methods to check halitosis such as organoleptic method, gas chromatography, and portable sulphide monitoring [22]. In the present survey we asked the individuals about the experience of unpleasant odour (Halitosis) and the responses were recorded in Yes/No format. Out of 403 HCW 218 had experienced bad breath (halitosis) and 198 were using a mask for more than 6 hours. A significant positive correlation was found between the wearing of mask and bad breathe (54.10%). Gingivitis, periodontitis, pericoronitis, dental caries, decreased salivary secretions, oral ulceration, oral malignancy, tongue coating, and dry sockets are some reasons for the intra oral halitosis [23-25]. Nasopharyngeal and respiratory disorders, intestinal and renal diseases are some extra- oral cause for halitosis [26, 27]. Among 403 HCW 62 had noticed bleeding gums and 51 had noticed ulcers during this period of pandemic. This number is very less as compared to the total number of HCW with bad breath. Out of 272 HCW who experienced dry mouth 218 had bad breath and can be considered as a contributing factor for the same. HCW in survey group were asked about the oral hygiene practices. 37.7% of HCW brushes their teeth twice daily and 23.3% uses mouthwash along with brushing. Rest 62.3% brushes their teeth once daily. Arinola JE and Olukoju OO conducted one study on halitosis amongst students in tertiary institutions in Lagos state where he concluded there is good awareness of halitosis among students [6]. Similarly in present survey HCW were aware of condition and also experienced the incidence had increased during the pandemic.

Steam inhalation has been used for centuries as a home remedy for treating common cold or influenza virus. COVID-19 infection is highly contagious and spread through droplets to upper respiratory tract [28]. SARS –CoV – 2 and influenza virus are structurally similar and both show a strong relevance towards steam inhalation [29]. Ivan Minic have concluded in his study that virus activity in the indicated region of the body has reduced and also the possibility of virus transmission in deeper part of the airway decreased

after the application of water vapour to nasal cavity and the application of a solution of NaOCl [30]. Hironya Borah and Abhilasha Goswami believed that regular alkaline nasal irrigation is a simple preventive and therapeutic measure for upper respiratory tract infection and can be effective in SARS-CoV -19 infection too [31]. In present survey we asked HCW about taking steam inhalation and nasal irrigation as preventive measure, 51% responded positively for nasal irrigation and 23% were doing nasal irrigation. It can also conclude that taking continuous steam can also makes oral mucosa dry.

67% of HCW Felt that the oral cavity is not same as it was before pandemic and experience dryness of mouth, bad breath (halitosis), bleeding gum, and ulcers. The majority of HCW from the age group of 25-35 have noticed the ulcers in mouth. There are various predisposing factors responsible for the development of aphthous ulcer such as genetic factors, local trauma, food allergens, hormonal alteration (menstrual cycle), psychological stress and anxiety [32, 33]. The value was recorded by HCW's own experience and a thorough case history must be taken before concluding about the reason behind ulcers.

Conclusion

1. Majority of HCW were using mask for more than 6 hours.
2. Most of the HCW preferred using N 95 mask
3. Significant number of HCW had dry mouth and bad breath. Few of them had bleeding gums and stomatitis.
4. In the given online questionnaire based survey it can be concluded that wearing mask for longer duration may affect the physiology of oral cavity. Further study has to be conducted with larger group of people to see cause - effect relationship.

What is already know on this topic

1. During this pandemic health care workers had to wear mask for longer time.
2. There is drastic change in routine life style of people especially health care workers.

What this study adds

1. Usage of mask for longer time may affect the oral cavity such as dryness of mouth, halitosis, bleeding gums and ulcers
2. Care must be taken to avoid any ill effect on oral cavity.
3. Oral hygiene should be maintained by brushing teeth twice daily, using a mouth wash and sipping more water.

Competing interests

The authors declare no competing interest.

Authors' contributions

All the authors have contributed in collecting data and writing an article.

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