ORIGINAL ARTICLE

PREVALENCE OF GUSTATORY AND OLFACTORY IMPAIRMENT IN DIFFERENT STAGES OF SARS-COV-2 INFECTED PATEINTS IN ISOLATION WARD

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Background: To evaluate the prevalence of gustatory and olfactory impairment and its correlation with the severity of SARS-Cov-2 infection as per WHO guidelines. **Methods:** A total of 241 patients of both gender having age from 15–80 years were included in the study. It was cross Sectional study conducted at SARS-COV-2 Isolation wards of Pakistan institute of medical science Islamabad from 15thSeptember 2020 to 15th January 2021. Convenient sampling technique was used to collect data. A proforma was designed for this purpose. Participants were divided into 3 groups on the basis of age. Group-1 (15–30 years), group-2 (31–50 years) and group 3 (51–80 years). Further the participants were graded into mild, moderate and severe stages of Sars-Cov-2 infection according to WHO guidelines. Statistical analysis was performed by using SPSS version 20. **Results:** In this study 66% were male and 34% population were the female. Regarding the age groups 72% population were from the group-3. Results of study shows 47% in mild stage, 45% in moderate stage and 8% severe stage. The results regarding the Gustatory and Olfactory impairment showed that 126 had gustatory impairment while 130 patients had olfactory impairment. **Conclusion:** We found strong relationship of olfactory and gustatory changes associated with SARS-COV-2 patients. It is premature to conclude that taste and smell changes are strongly linked to SARS-COV-2 diagnosis. Further multi center researches are required to find out possible pathophysiological mechanism.

Keyword: Anosmia; Gustatory; Olfactory; Hypogeusia; SARS-COV-2 patients

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INTRODUCTION

The potentially lethal Severe Acute Respiratory Syndrome Corona Virus 2 infection was first detected in Wuhan, China at the end of 2019. After the outbreak in China, the infection spread almost all over the world and is declared as a global pandemic by WHO.[1,] SARS-Cov-2 has affected more than 38 million people and has caused more than 10 million deaths, among 38 million more than 28 million peoples have recovered from the infection. Currently 8 million are active cases in which 99% population is in mild stage, and 1% is in critical stage of the diseases.[2] Although early studies have reported that the virus mainly attacks the respiratory system in the majority of patients, the clinical manifestations of Covid-19 are varied and can involve the digestive, Neurosensory, musculoskeletal, cardiovascular and integumentary systems as well. The major clinical symptoms reported from December 2019 to March 2020 were fever (88.5%), fatigue (35.8%), cough (68.6%) and dyspnoea (21.9%).[3] Several anecdotal studies later on reported olfactory and gustatory loss as potential early symptoms of Covid-19 infection. Yan *et al*[4] reported a significant association between taste/smell loss and Coronavirus disease and found that they were 10 fold more frequent in Covid-19 patients. The exact pathogenesis of this chemosensory impairment is not yet known but it is strongly associated with Angiotensin converting enzyme 2 (ACE-2) which has been identified as the cellular receptor of SARS-Cov-2. ACE-2 receptors are dispersed on the mucous membrane of the oral cavity, notably on the tongue and on the nasal mucosa as well. Recent studies show that the virus targets the non-neuronal epithelial cells that express ACE-2 receptors thus altering their function.[5] The reported prevalence of gustatory and olfactory disturbance in Covid-19 patients in the present literature is widely varied and ranges from 19.4–88%.[6] These disturbances are being reported as an early symptom of SARS-Cov-2 infection but there is inconsistent data on the degree of taste and smell disturbances relative to the severity of the infection.

This study is designed to evaluate the prevalence of gustatory and olfactory impairment and its correlation with the infection severity of SARS-Cov-2 as per WHO guidelines. It can be ascertained that changes associated with taste and smell may be as an important diagnostic factor of the SARS-COV-2.

MATERIAL AND METHODS

A single institutional cross-sectional study was conducted to assess their duction/loss of sense of taste and smell in patients reporting with symptoms of SARS Covid-2 in isolation ward of Pakistan Institute of Medical Sciences. The study was carried out after getting the permission from the Ethical Review Board of SZAB Medical University Islamabad. The convenient sampling technique was used in which sample size done by using WHO sample size calculator using 95% confidence interval at the rate of 19.4% prevalence of gustatory and olfactory disturbance with 5% absolute precision the sample size turned out was 241.[6] After explaining the purpose of the study an informed consent was taken from participants. In this study the admitted patients who were diagnosed with Sars-Cov-2 infection after confirmation with real time Polymerase Chain Reaction (PCR), were included. A proforma was designed for this purpose. General information such as name, age, gender and days since diagnosis of Sars-Cov-2 infection were noted. Participants were divided into 3 age groups, i.e., group-1 age from 15–30 years. Group-2 from 31–50 years and group-3 from 51–80 years. Further they were graded into mild, moderate and severe stages of Sars-Cov-2 infection according to WHO guidelines.[7] All the tests were performed by the investigator.

To evaluate gustatory impairment, four different ingredients were used to investigate patient's taste perception for the four primary tastes (salty, sweet, bitter and sour):

- A pinch of salt
- A pinch of sugar
- A bit of citrus peel
- A few drops of lemon juice

A sip of water was given after application of each of the above ingredient and the patient was asked to indicate whether he/she perceived the full flavour, reduced flavour or no flavour.[6] The findings were noted on the proforma as "Normal", "Hypogeusia (decreased taste sensation)" or "Ageusia (no taste sensation)".

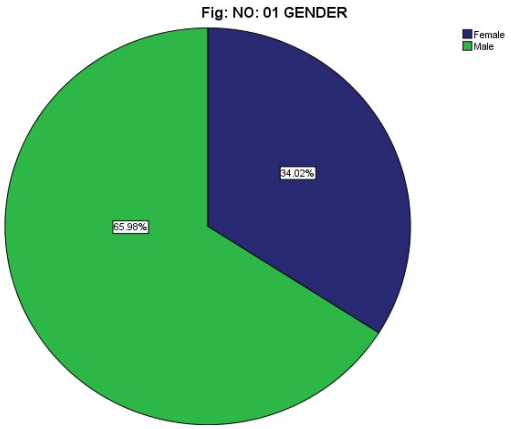
To evaluate olfactory impairment, a strong solution of 4% n-butanol in 60% deionized water was used. The bottle containing the solution placed near the patient's nostrils. After this the patient was asked whether he /she perceived a strong sensation of smell or a weak sensation or no smell at all.[6] The findings were put down as "Normal", "Hyposmia (decreased sense of smell)" or "Anosmia (absence of sense of smell)".

Statistical analysis was performed by using SPSS version 20. Categorical variables are presented as frequency and percentages. The standard deviation and mean were computed for quantitative variables. Analysis of olfactory and gustatory impairment was performed by using CHI Square test. The *p*-value of <0.05 was considered statistically significant.

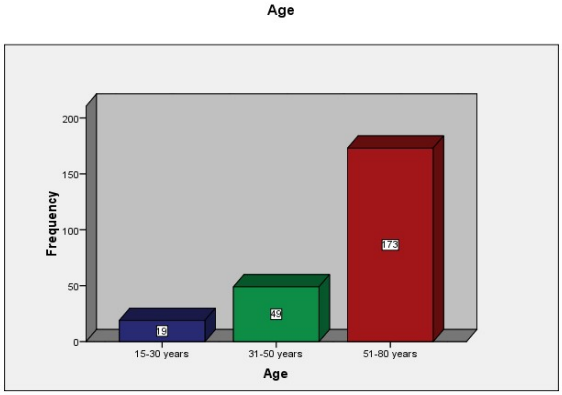
RESULTS

In this study 66% were male and 34% population were the female as shown in fig: No: 01. Regarding the age groups 72% population were from the group-3 as shown in figer-2. The severity of SARS-COV-2 infection were found in participants as 47%in mild stage, 45%in moderate stage and 8% in severe stage of infection. The results regarding the Gustatory and Olfactory impairment showed that 126 had gustatory impairment while the olfactory impairment was 130 as elaborated in table-1.

The correlation of gustatory and olfactory impairment with SARS-COV-2 disease severity was significant as the *p*-value of 0.013 and 0.048 respectively. The correlation of gender and age with SARS-COV-2 disease severity was insignificant as shown in table-2. The CHI-square test of Gender and Age groups with the olfactory and gustatory impairment was insignificant except the correlation of age with gustatory impairment which was significant as shown in table-3 and 4 respectively.



Figer-1: Distribution of genders.



Figer-2: Age groups of the study participants.

Table-1: Descriptive statistics

Variable	Characteristic	Frequency	Percentage
Gender	Male	159	66.0
	Female	82	34.0
	Total	241	100
Age	Group-1	19	7.9
	Group-2	49	20.3
	Group-3	173	71.8
	Total	241	100
Severity of SARS Cov-2	Mild	114	47.3
	Moderate	109	45.2
	Sever	18	7.5
	Total	241	100
Gustatory impairment	Normal	115	47.7
	Hypogeusia	60	24.9
	Ageusia	66	27.4
	Total	241	100
Olfactory impairment	Normal	111	46.1
	Hyposmia	63	26.1
	Anosmia	67	27.8
	Total	241	100

Table-2: Gender, age groups, gustatory and olfactory impairment in correlation with severity of infection

Variables					***p*-value**
Gustatory impairment	**Severity of disease**				
	Mild	Moderate	Severe	Total	
Normal	58	51	6	115	0.013
Hypogeusia	23	35	2	60	
Ageusia	33	23	10	66	
Total	114	109	18	241	
Olfactory impairment	Severity of disease				
	Mild	Moderate	Severe	Total	
Normal	51	55	5	111	0.048
Hyposmia	29	31	3	63	
anosmia	34	23	10	67	
Total	114	109	18	241	
Age groups	**Severity of disease**				
	Mild	Moderate	Severe	Total	
Group 1	9	9	1	19	0.683
Group 2	27	20	2	49	
Group 3	78	80	15	173	
Total	114	109	18	241	
Gender	**Severity of disease**				
	Mild	**Moderate**	**Severe**	**Total**	
Male	72	77	10	159	0.312
Female	42	32	8	82	
Total	114	109	18	241	

Table-3: Gender and age groups correlation with gustatory impairment

Gender	**Gustatory impairment**				***p-value***
	Normal	**Hypogeusia**	**Ageusia**	**Total**	
Male	70	44	45	159	0.232
Female	45	16	21	82	
Total	115	60	66	241	
Age groups	**Gustatory impairment**				
	Normal	**Hypogeusia**	**Ageusia**	**Total**	
Group 1	12	3	4	19	0.042
Group 2	17	20	12	49	
Group 3	86	37	50	173	
Total	115	60	66	241	

Table-4: Gender and age groups correlation with olfactory impairment

Variables					***p*-value**
Gender	**Olfactory impairment**				
	Normal	**Hyposmia**	**Anosmia**	**Total**	
Male	73	40	46	159	0.832
Female	38	23	21	82	
Total	111	63	67	241	
Age groups	**Olfactory impairment**				
	Normal	**Hyposmia**	**Anosmia**	**Total**	
Group 1	11	4	4	19	0.197
Group 2	18	19	12	49	
Group 3	82	40	51	173	
Total	111	63	67	241	

DISCUSSION

Since December 2019 SARS-COV-2 has disturbed the world in every aspect. The current studies has reported high prevalence of Gustatory and Olfactory impairment in SARS-COV-2 patients.[8] Many studies are anamnestic and few are Psychophysical based evaluation for olfactory and gustatory impairment.[9] In this study 47% were in the mild stage (63% male and 37% female,) 45% were in moderate stage (70% male and 30% female) and 8% were in the severe stage of infection (56% male and 44% female).[7]

The prevalence of gustatory impairment was 52% and olfactory impairment was 54%. The rate of Ageusia and Anosmia were more common than the Hypogeusia and Hyposmia in the population. Haji khan *et al* reported gustatory impairment of 49% (45% Hypogeusia and 17% Ageusia) and olfactory impairment of 61% (45% Hyposmia and 32.5% Anosmia) which slit higher than the percentage we found.[10] other investigators had also report different percentage of olfactory impairment such as Guan W *et al*[11] in China reported 5%, Giacomelli A *et al*[12] from Italy reported 34%, Yan CH *et al* from united states reported 68% and the prevalence of Gustatory impairment was similar to that of olfactory impairment.[4] currently there are few studies investigating the assessment of Gustatory impairment with electrophysiological tools.[13] Lechien JR *et al* had reported the prevalence of gustatory impairment of 56% which is the similarity with our study.[14]

It is suggested that the SARS-COV-2 virus causes the obstruction of olfactory clefts which disturb the normal mechanism of olfactory epithelial and stem cells as a result olfactory impairment develops.[15,16] Recently the Gustatory and Olfactory impairment has been accepted as a SARS-COD-2 symptom due high frequency reported worldwide.[17–19]

The COVID-19 pandemic initially began in China and intensified globally thereafter.[20] The aim of WHO was to help us to recognize the pandemic and confirmed that we are experiencing a public health crisis in which every person of every country needs joint

efforts.[21] A variety of hypotheses have been suggested to explain the viral smell and taste impairment pathophysiology, but still need to be precisely proven. Stuffy nose, rhinorrhoea and loss of sensory feedback to neurons which comes from smell and taste receptors, but a certain number of COVID-19 infected patients have no other symptoms except Anosmia and/or Ageusia.[10,22,23] Evidence based studies are important tools to find out essential parameters of the disease in the current circumstances. In this regard there is insufficient data as much as we need regarding the olfactory and gustatory impairment to add as a diagnostic and prognostic factor.

CONCLUSION

Our study shows strong relationship of Olfactory and gustatory changes associated with SARS-COV-2 patients. Since changes in taste and smell perception are as common as other diagnostic symptoms, it may be included as a diagnostic factor for mild to moderate cases with or without major sign symptoms. Despite encouraging results, it is premature to conclude that taste and smell changes are strongly linked to SARS-COV-2 diagnosis. Further multicenter researches are required to find out possible pathophysiological mechanism and its long-term effects on prognosis of SARS-COV-2 infected patients.

AUTHORS'S CONTRIBUTION

MKS: Conceptualization of study design and literature search. FAP: Data collection. ZAR: Proof reading. HHM: Write up. AUR: Data analysis. BAJ: Data interpretation.

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