

Loss of taste and smell sensation in COVID 19: A questionnaire based multicontinental study with review.

ABSTRACT –

Introduction – Taste buds are the peripheral organs of gustation and are located mainly in the tongue epithelium and palate. Taste buds further sample the chemical makeup of foods and beverages for nutrient content, palatability, and potential toxicity. On the other hand, the smell acts as a major factor and mostly functions involuntarily thereby identify chemical makeup and protecting from potential toxic insult. The coronavirus disease 2019 (COVID-19) is an ongoing viral pandemic that emerged from East Asia and quickly spread to the rest of the world. An important highlight is an atypical new presentation of the disease: patients with olfactory and gustatory dysfunctions.

Objectives – to know whether the loss of taste and smell are a reliable symptomatic indicator in early diagnosis of COVID as well as how it impacts on the nutrition and early patient's recovery.

Results – A questionnaire originally developed by AAO – NHS (American academy of otolaryngology neck and head surgery) was modified to include the questions related to loss of taste. We have included a total of 512 patient of which 82.4% were females. The common risk factor reported by our patients was close contact with a potentially confirmed case which accounted for 46.1%. The common comorbidities reported in the population has largely been related to breathing problems in the form of asthma 10.2%, sinus and smoking allergies of 5.7% which is a known factor in the spread of Covid in these patients. We have noticed in our population that there was a loss of smell and taste noticed in all the subjects and among them 66.5% reported with anosmia and 52.3% reported with ageusia which was either overlooked or not understood by most of the patients. Hyposmia and Parosmia was 18.6% and 14.9% respectively while Hypogeusia and dysgeusia was 32.2% and 15.4% indicating that though complete loss of taste is less when compared to complete loss of smell but alteration in taste is much higher and was felt for a much longer duration of time and often reported but complete remission from loss of taste is not completed

Conclusion – Loss of smell and taste should be considered as one of the reliable symptomatic indicators to covid infection and an active attempt should be made for its early remission for the patients to return back to normal intake of food leading to adequate nutrient supply

Key word: Taste, smell sensation, COVID-19, viral pandemic, symptomatic

Introduction

Taste buds are the peripheral organs of gustation and are located mainly in the tongue epithelium and palate. Taste buds sample the chemical makeup of foods and beverages for nutrient content, palatability, and potential toxicity. The substantial diversity and redundancy of the molecular receptors for the food compounds may reflect the importance of identifying nutrients and avoiding chemical threats from the environment. The molecular recognition of tastants, which occurs at the apical tips of taste bud cells, ultimately results in sensory perceptions (for example, sweet, salty, and so on) that guide appetite and trigger physiological processes for absorbing nutrients and adjusting metabolism [1]. On the other hand, the smell acts as a major factor and mostly functions involuntarily thereby identify chemical makeup and protecting from potential toxic insult. The coronavirus disease 2019 (COVID-19) is an ongoing viral pandemic that emerged from East Asia and quickly spread to the rest of the world [1]. This infection is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [2]. the most prevalent symptoms consist of fever, cough, dyspnea, sputum production, myalgia, arthralgia, headache, diarrhoea, rhinorrhoea, and sore throat [3,4]. An important highlight is an atypical new presentation of the disease: patients with olfactory and gustatory dysfunctions. The occurrence of smell dysfunction in viral infections is not new in otolaryngology. Many viruses may lead to olfactory dysfunction (OD) through an inflammatory reaction of the nasal mucosa and the development of rhinorrhoea; the most familiar agents being rhinovirus, parainfluenza, Epstein–Barr virus, and some coronavirus [5,6]. However, olfactory dysfunction linked to COVID19 infection seems as it is not associated with rhinorrhoea. In a similar way lot of patients have also reported complete loss of taste sensation much before the arrival of identifiable symptoms [7,9]. Initially the patients as well as the doctors attending them overlooked it, since it was not reported as a possible symptom by the patient and neither it was recorded by the attending doctors as reported in literature [7,8,9]. The initial objective mode of transmission of coronavirus included even surface and aerosol transmission which has stopped the dental treatment for quite some time but the symptoms of loss of taste and smell has gained a lot importance to be taken seriously as it is believed to be first sign even in the absence of objective symptoms.

Materials and Methods –

A questionnaire originally developed by AAO – NHS (American academy of otolaryngology neck and head surgery) has questions related to loss of smell which was modified in this study to include the questions related to loss of taste. The original AAO – NHS tool was developed by 2 committees of the AAO-HNS: the Infectious Disease and Patient Safety Quality Improvement committees. The tool is completed online either by the medical provider or the patient and consists of 17 questions relating to demographic factors, COVID status, risk factors, symptoms, and onset of anosmia/dysgeusia and so on and may be found at <https://www.entnet.org/content/reporting-tool-patients-anosmia-related-covid-19>. This anosmia reporting tool collects data to establish the importance of smell and taste impairment in the clinical course of COVID-19. We have modified this tool and added questions to it thereby taking the total count of questions in the questionnaire to be 33 (Table – 1). We also had a systematic review of articles from the MEDLINE, Embase and Global Health, also Web of Science and Scopus including pre prints from the year 2019 december to may 2021.

Patient selection – We have enrolled 512 patients who were diagnosed with COVID and fully recovered from it, through a database of COVID prescribed hospitals in Saudi Arabia. In Saudi Arabia all the citizens were allowed to go for a free PCR testing even with minor symptoms of fever and cough. After collecting the database, these patients were contacted through telephonic conversation and after each patient’s approval the questionnaire was filled by 3 independent reviewers who are well versed with the spoken language in the Saudi Arabia. **To avoid confusion, we have enrolled only those patients who were diagnosed with covid PCR report.**

Inclusion criteria – All the patients who will be having loss of taste and / or smell sensation during their phase of COVID 19 infection. All the patients were more than 18 years. Both male and female patients who can recollect and give exact information were included. **A total of 600 patients were contacted, out of which 512 patients cooperated and recollected the symptoms of loss of taste and smell during their infection due to corona virus.**

Exclusion criteria – Those patients who have recovered from COVID 19 but never experienced or are not able to recall the loss of taste and / or smell sensation, **out of total 600 patients, 50 were not able to recollect the symptoms of loss of taste and smell while 38 patients confirmed that there was no loss of taste or smell experienced by them.**

Table – 1 – Questionnaire used to evaluate COVID-19 positive subjects (Adopted from the American Academy of Otolaryngology-Head and Neck Surgery COVID-19 Anosmia Reporting tool)

	Questions	Please indicate the answer here
Q1.	Name/Surname	
Q2.	Phone /e-mail address	
Q3.	Age (numbers)	
Q4.	Gender	<ul style="list-style-type: none"> • Female •Male
Q5.	Please list any risk factors for COVID-19 infection present	<ul style="list-style-type: none"> • None • Healthcare worker • Close contact with a confirmed case • Homeless • Congregant living (dorms, fraternities/sororities, shelters, jail, prison, skilled nursing, assisted living, adult family home) • Travel to known areas with widespread community transmission • Other
Q6.	Other risk factors/comorbidities	<ul style="list-style-type: none"> • None • Smoking • Head trauma • Sinusitis/allergy • Chronic respiratory disease/Asthma • Cardiac disease • Neurologic disease (e.g. Parkinson's) • Other
Q7.	Complaints when the sample is received from the patients (this will be excluded as ours is a retrospective study)	<ul style="list-style-type: none"> • None • Fever • Chills • Malaise • Cough • Headache • Nasal congestion • Rhinorrhea • Gastrointestinal distress • Pneumonia • Other
Q8.	Is the source of the COVID-19 infection identifiable?	<ul style="list-style-type: none"> • Yes • No
Q9.	What is the patient's current COVID-19 infection status? (will be removed as ours is a retrospective study)	<ul style="list-style-type: none"> • Active • Recovered
Q10	Did the patient receive treatment?	<ul style="list-style-type: none"> • Yes • No
Q11.	Did the patient have smell/taste impairment?	<ul style="list-style-type: none"> • Yes

		<ul style="list-style-type: none"> • No
Q12.	Definition of smell impairment (if present)	<ul style="list-style-type: none"> • Anosmia • Hyposmia • Parosmia
Q12a.	Please indicate the degree of hyposmia on 10 scale VAS (indicate number)	0 1 2 3 4 5 6 7 8 9 10 (10 indicate normal)
Q13.	Definition of taste impairment (if present)	<ul style="list-style-type: none"> • Ageusia • Hypogeusia • Dysgeusia
Q13a.	Please indicate the degree of hypogeusia on 10 scale VAS (indicate number)	0 1 2 3 4 5 6 7 8 9 10 (10 indicate normal)
Q14.	What was the condition of the COVID-19 infection at the time the smell/taste impairment was observed?	<ul style="list-style-type: none"> • Inpatient /hospitalized • Outpatient
Q15.	When was the smell/taste impairment first noticed by the patient	<ul style="list-style-type: none"> • Before diagnosis • After diagnosis
Q16.	Did the patient have any other symptoms before the development of smell/taste impairment?	<ul style="list-style-type: none"> • Yes • No
Q17.	What symptoms did the patient have at the time of smell/taste impairment?	<ul style="list-style-type: none"> • None • Fever • Chills • Malaise • Cough • Headache • Nasal congestion • Rhinorrhea • Gastrointestinal distress • Pneumonia • Other
Q18.	Did the patient's condition worsen or improve after the smell/taste impairment was observed?	<ul style="list-style-type: none"> • Worsen • Improve
Q19.	Did the smell/taste impairment resolve?	<ul style="list-style-type: none"> • Yes • No
	ADDITIONAL QUESTIONS	<ul style="list-style-type: none"> •
Q20	Was there any change in the salivation noticed	<ul style="list-style-type: none"> • Yes • No
Q21.	What symptoms did the patient have at the time of salivation change?	<ul style="list-style-type: none"> • None • Fever • Chills • Malaise • Cough • Headache

		<ul style="list-style-type: none"> • Nasal congestion • Rhinorrhea • Gastrointestinal distress • Pneumonia • Other
		<ul style="list-style-type: none"> •
Q22	Definition of change in salivation	<ul style="list-style-type: none"> • Over salivation – watery/turbid • Under salivation – ropy/ dryness
Q23.	Did the patient's condition worsen or improve after the smell/taste impairment was observed?	<ul style="list-style-type: none"> • Worsen • Improve
Q24.	Was there any burning sensation noticed in the by the patient	<ul style="list-style-type: none"> • Yes • No
Q25.	What symptoms did the patient have at the time of burning sensation?	<ul style="list-style-type: none"> • None • Fever • Chills • Malaise • Cough • Headache • Nasal congestion • Rhinorrhea • Gastrointestinal distress • Pneumonia • Other
Q26	Was there any other symptoms noticed by the patient	<ul style="list-style-type: none"> • Bad odor • Bleeding gums • Any other
Q27.	What symptoms did the patient have at the time symptoms?	<ul style="list-style-type: none"> • None • Fever • Chills • Malaise • Cough • Headache • Nasal congestion • Rhinorrhea • Gastrointestinal distress • Pneumonia • Other
Q28	Has the symptoms resolved	<ul style="list-style-type: none"> • Yes • No
Q29	Were these symptoms described to the physician	<ul style="list-style-type: none"> • Yes • No
Q30	Is the patient aware of what treatment was given by the physician towards the said complaint	<ul style="list-style-type: none"> • None • Verbal assurance • Medications • Oral application • Any other
Q31	Were the symptoms resolved following the treatment	<ul style="list-style-type: none"> • Yes • No

Results –

We have included a total of 512 patients, most of our patients happened to be females which accounted for about 82.4% suggesting that more females were affected than the males. The common risk factor reported by our patients was close contact with a potentially confirmed case which accounted for 46.1% followed by coming in contact with a suspected case while in congregation which was 13.1% (Table 2) suggesting that the initial response of the population towards understanding the spread of infection was less which gradually increased primarily due to governments active mass awareness programmes and strict follow up of the protocol where mass gathering were avoided which had a great effect in controlling spread of infection. The common comorbidities reported in the population has largely been related to breathing problems in the form of asthma 10.2%, sinus and smoking allergies of 5.7% which is a known factor in the spread of Covid in these patients (Table – 3). Most of the population about 56.3% were able to identify the symptoms of the infection and reported themselves for screening indicating the success of mass awareness carried out by the government authorities. About 71.1% were admitted to the hospital which is again suggestive of the governments readiness in providing the treatment to the population and secondly lack of social stigma which made the patients to come forward at the very early stage which reduced the mortality rate drastically. We have noticed in our population that there was a loss of smell and taste noticed in all the subjects and among them 66.5% reported with anosmia and 52.3% reported with ageusia which was either overlooked by the doctors treating these patients or was not considered as a relevant symptom by most of the patients. Hyposmia and Parosmia was 18.6% and 14.9% respectively (Table – 4) suggesting that decrease in smell sensation is more rather than altered smell sensation while Hypogeusia and dysgeusia was 32.2% and 15.4% (Table – 5) indicating that though complete loss of taste is less when compared to complete loss of smell but alteration in taste is much higher and was felt for a much longer duration of time, as our patients still suffered with these symptoms even during the time of writing this article. Hence, we can believe that though the loss of smell sensation may be an initial sign and loss of taste, or its alteration is a more prolonged process with patients still suffering even after all the known symptoms have subsided. Most patients noticed the loss of taste and smell as secondary to other symptoms like fever which accounted for 52.7%, nevertheless about 47.3% patients noticed loss of taste and smell after being diagnosed of covid through PCR test which suggests that the awareness to acknowledge the loss of taste and smell as a symptom to covid is lacking. After the identification of loss of taste and smell symptom, the condition of the patient was more worsened as reported by 82.8% and about 73.4% patients still

have not recovered fully from the loss of taste and smell sensation as the case of hypogeusia and dysgeusia is higher when compared to hyposmia and parosmia. Most of the patients were still under vitamin and nutrient supplements since their appetite has reduced and they blame it largely to the altered taste sensation.

Table – 2

list any risk factors for COVID-19 infection present	Frequency	Percent
	11	2.1
Close contact with a confirmed case,	236	46.1
Close contact with a confirmed case, Congregant	67	13.1
Close contact with a confirmed case, Within home,	3	0.6
Close contact with a confirmed case, Outside home (relative)	6	1.2
Close contact with a confirmed case, Outside Home (during travel)	5	1
Close contact with a confirmed case, Travel to k	41	8
Close contact with a confirmed case, Travel to kn	1	0.2
Close contact with a confirmed case, Congregant li	1	0.2
Close contact with a confirmed case, Congregant living	1	0.2
Congregant living (e.g. dorms),	3	0.6
Congregant living (e.g. dorms), Travel to known ar	2	0.4
Healthcare worker,	15	2.9
Healthcare worker, Close contact with a confirmed	45	8.8
Healthcare worker, Congregant living (e.g. dorms),	7	1.4
Healthcare worker, Homeless, Travel to known areas	1	0.2
Healthcare worker, Travel to known areas with wide	1	0.2
Homeless,	2	0.4
Homeless, Congregant living (e.g. dorms), Travel to	1	0.2
None	51	10
None Close contact with a confirmed case,	1	0.2
None Close contact with a confirmed case, Travel	1	0.2
Travel to known areas with widespread community tr	9	1.8
Works in grossary store	1	0.2
Total	512	100

Table – 3

comorbidities	Frequency	Percent
Cardiac disease,	5	1
Cardiac disease, Neurologic disease (e.g. Parkinso	1	0.2
Chronic respiratory diseaseAsthma,	52	10.2
Chronic respiratory diseaseAsthma, Cardiac disease	23	4.5
Chronic respiratory diseaseAsthma, Neurologic dise	4	0.8

Head trauma	1	0.2
Head trauma,	9	1.8
Head trauma, Chronic respiratory diseaseAsthma,	2	0.4
Head trauma, Chronic respiratory diseaseAsthma, Ca	3	0.6
Head trauma, Chronic respiratory diseaseAsthma, Ne	1	0.2
Head trauma, Sinusitisallergy,	6	1.2
Head trauma, Sinusitisallergy,Chronic respiratory	15	2.9
Head trauma, Sinusitisallergy,Neurologic disease (2	0.4
Neurologic disease (e.g. Parkinsonism),	2	0.4
None	165	32.2
Sinusitis, allergy,	59	11.5
Sinusitis, allergy,Cardiac disease, Neurologic disease	1	0.2
Sinusitis, allergy,Chronic respiratory diseaseAsthma	57	11.1
Sinusitis, allergy, Neurologic disease (e.g. Parkinso	4	0.8
Smoking,	12	2.3
Smoking, Cardiac disease,	1	0.2
Smoking, Chronic respiratory disease, Asthma	1	0.2
Smoking, Chronic respiratory disease, Asthma,	17	3.3
Smoking, Chronic respiratory disease, Asthma, Cardiac	19	3.7
Smoking, Chronic respiratory disease, Asthma, Neurologic	1	0.2
Smoking, Head trauma, Chronic respiratory disease	2	0.4
Smoking, Head trauma, Sinusitis, allergy, Chronic respiratory	3	0.6
Smoking, Sinusitis, allergy,	6	1.2
Smoking, Sinusitis, allergy, Cardiac disease	1	0.2
Smoking, Sinusitis, allergy, Chronic respiratory disease	29	5.7
Total	512	100

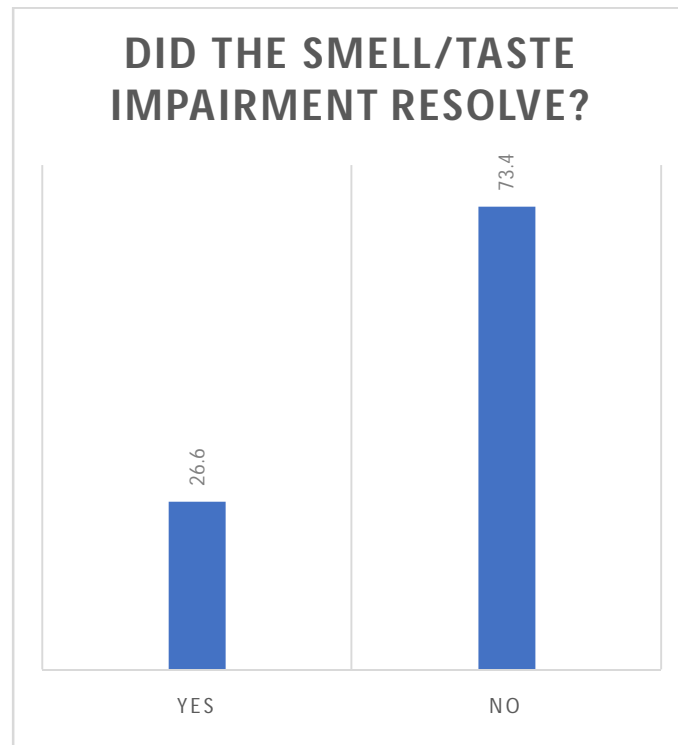
Table – 4 – Loss of smell sensation

Definition of smell impairment	Frequency	Percent
Anosmia	339	66.5
Hyposmia	95	18.6
Parosmia,	76	14.9
Total	510	100

Table – 5 – Loss of taste sensation

Definition of taste impairment	Frequency	Percent
Ageusia	268	52.3
Hypogeusia	165	32.2
Dysgeusia	79	15.4
Total	512	100

Fig – 1



Discussion –

According to recent research, similar to SARS-CoV and Middle East respiratory syndrome coronavirus (MERS-CoV), SARSCoV-2 is zoonotic, with Chinese horseshoe bats (*Rhinolophus sinicus*) being the most probable origin as per Chan et al. 2020; Lu et al. 2020 [10] and pangolins as the most likely intermediate host (The Chinese Preventive Medicine Association 2020)[11]. Based on findings of genetic and epidemiologic research, it appears that the COVID-19 outbreak started with a single animal-to-human transmission, followed by sustained human-to-human spread (Chan et al. 2020; Del Rio and Malani 2020)[12]. Although patients with symptomatic COVID-19 have been the main source of transmission, recent observations suggest that asymptomatic patients and patients in their incubation period are also carriers of SARS-CoV-2 (Chan et al. 2020; Rothe et al. 2020)[13]. This epidemiologic feature of COVID-19 has made its control extremely challenging, as it is difficult to identify and quarantine these patients in time, which can result in an accumulation of SARS-CoV-2 in communities (The Chinese Preventive Medicine Association 2020)[14,15]. There has been various questionnaires used now and even before for identification of loss of smell for other diseases like influenza, rhinovirus, parainfluenza Epstein–Barr virus, and some coronavirus. Well fabricated questionnaire has been

of The American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS). The acceptance of this was due to a result of cumulative anecdotal evidence of anosmia/dysgeusia around the world during the outbreak, the COVID-19 Anosmia Reporting Tool was developed in March 2020 by the AAO-HNS [10]. This tool was developed by 2 committees of the AAO-HNS: the Infectious Disease and Patient Safety Quality Improvement committees. The tool is completed online either by the medical provider or the patient and consists of 17 questions relating to demographic factors, COVID status, risk factors, symptoms, and onset of anosmia/dysgeusia and so on and may be found at [https:// www.entnet.org/content/reporting-tool-patients-anosmiarelated-covid-19](https://www.entnet.org/content/reporting-tool-patients-anosmiarelated-covid-19). This anosmia reporting tool collects data to establish the importance of smell and taste impairment in the clinical course of COVID-19. For this purpose, we used the tool and conducted a comparative study with COVID-19– negative subjects. Further, the study conducted by Ibrahim Sayin added supplemental questions by adding separate questions for Anosmia and dysgeusia. These supplemental questions were included in our study which included 17 questions, with 1 question asking about both anosmia and dysgeusia. This helped in obtaining more data from the subjects [10]. As evident through our study it was proven beyond doubt that coronavirus spread through person – person contact by respiratory spread and the initial response of the governments in making the mouth mask as a compulsion was a correct move [16,17,18,19]. The common comorbidities associated with covid infection were people with other respiratory complications like asthma, sinusitis, upper respiratory infection and the habit of smoking which was seen in other populations as well to an extent that patients losing the taste to smoking leading to its withdrawal by themselves [19,20]. Other comorbidities like cardiac diseases were reported to cause less effect as there was no direct relation of COVID in patients who were under ACE inhibitors was reported in our study. This can be related to most of the patients having multiple comorbidities rather than cardiac alone. In our population loss of smell was reported more than the loss of taste. Even in them a complete loss of taste and smell is higher than the alteration in either smell or taste which is seen even in other populations [21, 22,23]. The resumption of smell was faster and complete in many of our patients, but the loss of taste still continues to worry some of the patients but however the complete loss of taste has changed itself into altered taste sensation rather than complete loss. This has been the case in other populations around the world [22,23]. This loss of taste has taken longer time to get recovered from the covid infection as altered taste has caused them reduced diet leading to inadequate nutrition which has further caused dependability of patients to medications rather than gaining sufficient nutrient supply through diet [24,25].

Conclusion –

It has been noticed through our study that in the early stages of covid progression the community was at large callous to adhere to the COVID norms which has caused the spread of infection to a pandemic stage and only after the WHO declared it to be pandemic the governments were able to put up guidelines and it was only through the strict adherence of the guidelines the populations were protected. In our population, mass education was provided to all, and efficient application of guidelines helped in maintaining the infected persons rate low. Secondly the patients have voluntarily come forward for the treatment and the government was able to provide complete health support leading to lesser death rate compared to many countries. Lastly the lack of taste and smell sensation should be considered as an important symptom as it can affect the patient's ability to take up high nutrient food [24,25] which can lead to early remission and ability to fight with the infection. Our questionnaire can be used to ascertain the symptoms of loss of taste and smell and further follow up of the progress in the symptoms remission.

Ethical Approval:

This study is being conducted in the Dar al Uloom university after obtaining ethical clearance from its ethical committee.

Consent

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

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