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Original Research Article

Institutional evaluation of anosmia and ageusia in COVID-19 positive health care workers of clinical and non-clinical departments

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ABSTRACT

Background: Health Care Workers (HCW's) are disproportionately at high risk to acquire COVID-19, through their close and extended contact in outpatient, inpatient departments, and operation theatres. This study aims to compare anosmia and ageusia in COVID-19 positive health workers in clinical and non-clinical categories who tested positive for COVID-19.
Methods: A retrospective Institutional study was performed on 106 HCW's of clinical and non-clinical departments from July 2020 to February 2021. Cases were HCW's who tested positive on RTPCR for SARS-CoV-2 and were working at Indira Gandhi Institute of Medical Sciences, Patna during the COVID-19 pandemic. On the basis of symptoms and oxygen support, we made a grading system named COVID-19 proposed grading system based on symptom and supplementary oxygen requirement to simplify the patient category and treatment plan. The Subjective Self-assessment olfactory and gustatory functions of each individual were collected telephonically including time of onset, severity, duration, and time of improvement.
Results: Out of 106 positive individuals, 68 were males and 38 were females. Forty-five out of the 106 HCW's had anosmia and ageusia as initial symptoms. The prevalence of anosmia and ageusia was 42.4% in the COVID-19 positive HCW's. The affected HCW's were also enquired about the department they worked in to explore the relationship between viral load exposure and the development of anosmia and ageusia as symptoms. 61.3% of HCW's working in clinical departments had anosmia and ageusia as symptoms as compared to 38.7% in non-clinical departments.
Conclusions: The prevalence of anosmia and ageusia was higher in HCW's affected with SARS-CoV-2 placed in the clinical department than in the non-clinical department. It also emphasizes that the patient-to healthcare transmission is the major factor, then the transmission of viruses in HCW by other means. Hence, the modified strategies must be made to protect the HCW's in view of their maximum utilization to manage the COVID-19 or non-COVID-19 patients.

Keywords: COVID-19, Anosmia, Ageusia, Health care workers

INTRODUCTION

Novel coronavirus SARS-COV-2 is one of the highly pathogenic beta coronaviruses which infect humans. On 11th February 2020, the World Health Organization named SARS-COV-2 COVID-19. The virus was first identified in Wuhan, the capital of Heibei, China in December 2019 and has become a pandemic.

Symptoms and signs are variable, ranging from asymptomatic, mild symptoms like fever, malaise, myalgia to severe lower respiratory disease with pneumonia and dyspnea or Gastro-Intestinal complaints like diarrhea, nausea, and abdominal pain. Transmission of the virus is mainly through the respiratory route via droplets and aerosols.

Health care Workers (HCW's) are at a high risk to acquire COVID – 19, through their close and extended contact in outpatient, inpatient departments, and operation theatres. They may also spread infection through their contact with patients. They are at a disproportionately risk of acquiring the infection in comparison to the general population. Up to 40% of HCW's are asymptomatic, representing an important chain of transmission to be further investigated. There is an urgent need for a non-invasive investigating screening test to help in the early identification of infected individuals.

Villareal in their study describes olfactory dysfunction in 68% and taste alteration in 70% of HCW's who tested positive for COVID-19. Similar results were also shown by Iversan who concluded that loss of smell and taste were the symptoms most strongly associated with seropositivity.[1,2]

Loss of smell and taste has been reported as one of the cardinals and early symptoms of COVID – 19. It can be caused due to obstruction of nasal airways, damage to olfactory sensory neurons, olfactory center damage in the brain, and olfactory supporting cell dysfunction. British Association of Otorhinolaryngology reported both dysfunctions to be present in 3-20% of patients. Another study done by Dell 'Era on 355 patients who tested positive for COVID 19, shows smell and taste disorders in 70%, they were the first symptoms to present in 8.7% of patients.[3]

Butowt et al mentions in their article that the nasal epithelium has been shown to harbor a larger viral load than the lower respiratory tract epithelium.[4]

Lower prevalence of anosmia has been reported from Asian countries in comparison to western counterparts. This has been attributed to genetic variation at the level of virus and host respectively.

However, no study has been undertaken in South East Asia comparing anosmia and ageusia in COVID-19 positive health workers of clinical and non-clinical departments who tested positive for COVID-19. This study attempts to determine the prevalence of anosmia and ageusia amongst the two groups. This study can also support the hypothesis of virus load influencing the symptoms of COVID-19 infected person. We also simplify the severity grading system by formulating the proposed COVID-19 grading system (Table 1) that is more practical for the underdeveloped country where Computerized Tomography (CT) scan is not accessible to most of the population.

METHODS

A retrospective Institutional study was conducted at Indira Gandhi Institute of Medical Sciences, Patna between July 2020 – February 2021. There was no randomization made in this study. In all of 106 patients, the COVID-19 positivity was diagnosed by reverse transcription-polymerase chain reaction (RT PCR) of dual nasopharyngeal and oropharyngeal swab performed by the genetic laboratory of our Institution. These HCW's were divided into working in the clinical and non-clinical departments. Care has been taken to exclude all those HCW's who suffered from a previous history of anosmia or ageusia, history of head trauma any sinonasal mass, individuals suffering from psychiatric disorders, or those who had undergone radiation therapy anosmia. However, no HCW were placed under these categories. The study was conducted in accordance with the 1996 Helsinki Declaration and approved by the institutional ethical committee.

Subjects and settings

Data of patients with RTPCR confirmed SARS-COV-2 were collected from the Department of Preventive and Social Medicine Department, Indira Gandhi Institute of Medical Sciences, Patna. The objective, electrophysiological or psychological olfactory and gustatory function tests were not possible due to the highly infectious stage of the disease and the strict isolation-hospitalization protocol including the imposition of lockdown imposed by the state government hence, Subjective Self-assessment olfactory and gustatory functions scores of each individual were collected telephonically including time of onset, severity, duration, and time of improvement. The outcome measure of each individual was validated by remote telephonic patient-reported outcome measures. The questionnaire included in the study about any subjective decrease or loss of smell and/or taste, its severity, time of onset as well recovery and restoration of these senses. Demographic data including age, sex, job role, and department of origin were also collected for all participants in the case group to investigate any potential influence.

Statistical analysis

Data were entered in an Excel sheet and statistical analysis was performed using SPSS version 16.0. Quantitative data were expressed by mean and standard deviation, and qualitative data were expressed by percentages. The difference between the proportions was observed by the Chi-square test or Fisher's exact test. A confidence interval of 95% was used and $P<0.05$ was considered significant.

RESULTS

Olfactory and gustatory outcomes

Forty-five (42.4%) out of 106 positive HCW's experienced anosmia and ageusia as initial symptoms for which they went for RT PCR testing for COVID 19 whereas sixty-one (57.6%) HCW's experienced rhinorrhea, fever as an initial symptom and never experiences olfactory and gustatory symptoms during the whole course of COVID 19 disease. (Figure 2). The department with maximum affected HCW's was General surgery with 12 COVID-19 positive individuals.

Table 1: Proposed COVID-19 grading system.

Grade	Symptom and oxygen suppliants
Grade 1	Asymptomatic
Grade 2	Fever, anosmia, ageusia, cough, others without respiratory distress
Grade 3	Grade 2 with respiratory distress managed without oxygen supplements
Grade 4	Respiratory distress managed with oxygen supplements without ventilatory support
Grade 5	The patient requires ventilatory support

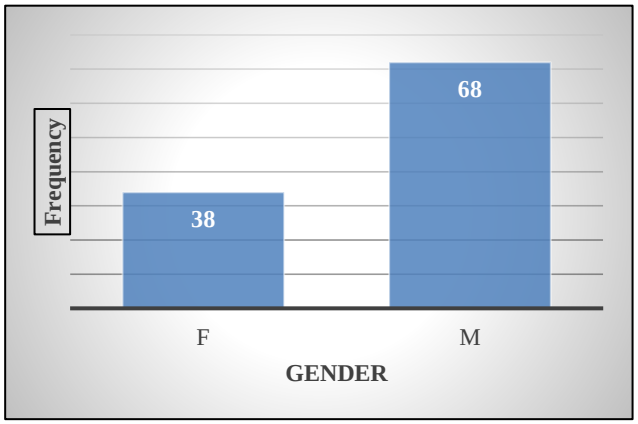

Figure 1: 68 COVID-19 positive HCW's were males and 38 were females.

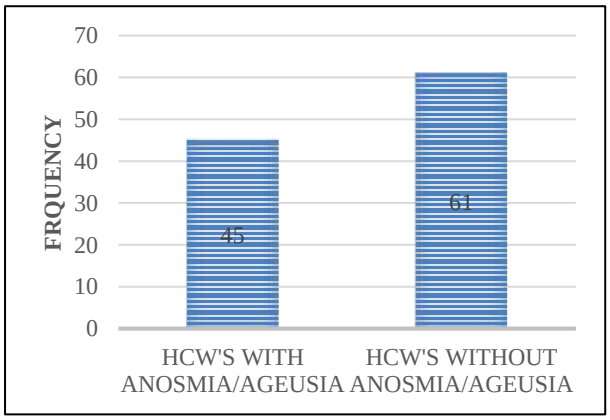

Figure 2: 45 out of 106 HCW's had anosmia and ageusia as symptoms.

The olfactory and gustatory symptoms appeared at the same time as suffering from anosmia, also reported ageusia as a symptom. Gustatory impairment consisted of decreased or absent four taste modalities - salty, sweet, bitter, and sour. Out of Forty-five HCW's suffered from anosmia and ageusia 61.3% of individuals worked in clinical departments as compared to 38.7% from non-clinical departments. (Figure 3). All sufferers of olfactory and gustatory symptoms HCW's recovered completely within 15 days of initial symptoms and chronicity has not developed in any individual. There was no statistical difference in the severity of recovery of clinical or non-clinical HCW's. Data were collected from 106 COVID-19 positive health care workers. Out of 106 positive individuals, 68 were males and 38 were females (Figure 1). A Chi-square test was applied to find an association between anosmia and gender. It was found to be non-significant. (p=0.812, x2=.057, df=1)

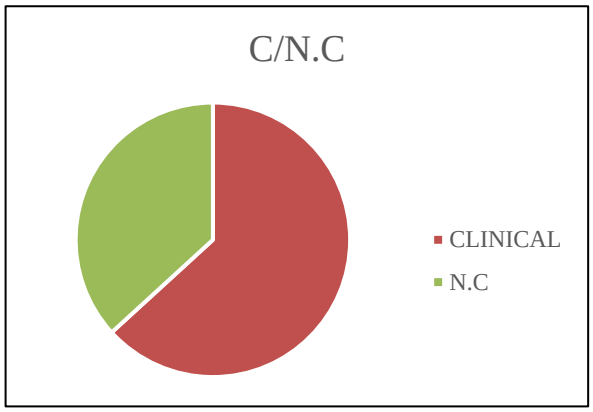

Figure 3: 61.3% respondents from clinical departments had anosmia versus 38.7 % from non-clinical departments.

To simplify this grading system and treatment protocol, we have proposed a new COVID-19 grading system. (Table 1) This system is important for underdeveloped countries to formulate their treatment and preventive strategies and national plan to fight this pandemic. At present, the COVID-19 positive patients are categorized as mild, moderate, and severe, which is not practical to fight the pandemic due to the inclusion of a large group of people in very few categories. Moreover, the severity assessment by CT scan of chest or CT score by RTPCR is not possible again for this densely populated and underdeveloped country, where only a few percentages of the population can avail these advanced diagnostic facilities.

DISCUSSION

Virus-induced chemosensory deficit such as smell and taste disorder is not a rare symptom. However, the deficit of smell and taste elicited by COVID-19 is quite different from the deficit caused by other viruses. This differentiation can be elicited in form of chronicity versus early recovery, universal versus different population

propensity as well as pathogenicity. The anosmia or ageusia caused by the COVID-19 virus has shown unique features which have been reported subsequently with the progression of scientific studies. The journey started from China with the detection of anosmia caused by the COVID-19 virus concluding that this symptom is uncommon in infected persons. Initial studies done in Wuhan, China on 140 patients by Zhang in February 2020 did not include anosmia or ageusia as symptoms.[5] Another research also done in Wuhan, China in April 2020 by Mao did not identify anosmia or ageusia as symptoms of COVID-19.[6] A couple of months later, a German study noticed it as a common and initial presentation of COVID-19 infection. It is being postulated that the incidence of olfactory and gustatory involvement is lesser in the East Asian population than the European and American sufferers. On Bartheld and others in their study stated that the prevalence of anosmia and ageusia in Asian countries like Korea, Singapore, and Japan was much lower than in Western countries.[7] They also mentioned in their article that the reason for this difference is still under evaluation. However, genetics has been postulated as a major factor apart from the difference in case reporting and data collection. A multicentric study was done by Leichen et al in Belgium also showed a high prevalence of anosmia in Caucasians.[8]

For further evaluation, the anatomical configuration of the nose and nasopharynx among the people of East Asia, Europe, and America needs to be evaluated before coming to any fruitful conclusion. Differences in the nasofacial index amongst races have been documented in studies done by Wai and Jaberi in their respective studies.[12,13]

The anosmia or ageusia caused by the COVID-19 virus is sudden in onset and completely recovers within a couple of weeks, mostly within 10 to 14 days of the onset of symptoms. This has been mentioned by Paolo in their article.[11] The study also states that the speedy recovery indicates that the virus does not damage the sensory or neural pathway of olfaction and taste rather temporarily blocks the neurotransmission at the sensory receptor level, which recovers permanently with the development of neutralizing viral antibodies. The same is not a feature of olfactory or gustatory damage produced by other neurotropic viruses, which cause permanent damage at sensory and/or neuronal levels.

The COVID 19 virus is transmitted from one human to another by droplet infection. Till now, there is no annotated report in support of other ways of transmission of the virus from other animals to human beings. Sun has mentioned that most of the time virus gets an entry into the human body through the nasal cavity or mouth, sometimes through the conjunctiva.[10] Before being propagated to the lower respiratory tract, the virus gets adapted and multiplies in the nasopharynx. Rafal et al mention in their study that it is during this adaptation and multiplication, they interact with ACE-2 and MLTRSS-2 receptors present in olfactory and gustatory sensory cells.[4] The degree of interaction with these cells is highly dependent upon the initial viral load, which is determined by the degree of exposure of an individual. Health care workers are at high risk due to their long-time interaction with the COVID 19 positive patients. Amongst the health care workers, as Miller states in her article, the Otolaryngologists face unique risks from COVID-19 along with Ophthalmologists and Dentists, as they are getting maximum viral load and exposure at a time due to their nature of work.[9] However, no study has been conducted to differentiate the olfactory and gustatory symptom correlation with respect to the degree of exposure in different sectors of health care workers.

Limitations of the study

One of the limitations of our study was that subjective sensations of anosmia or ageusia were evaluated on memory-based questionnaires and not on clinical assessment of the same which could not be conducted due to strict imposition of the lockdown imposed by the state government. This could lead to the inclusion of false positives and false negative answers.

CONCLUSION

This study shows anosmia and ageusia are characteristic symptoms suggestive of COVID-19 and that the prevalence of anosmia and ageusia was found to be higher in HCW's affected with SARS-CoV-2 working in clinical departments than non-clinical departments. It also emphasizes that the patient to healthcare worker transmission is the major factor, then the transmission of the virus in HCW's by other means. We must come up with effective strategies to protect the healthcare workers, especially those exposed to high aerosol load, to utilize their potential maximally in the treatment of patients affected with COVID-19 or other diseases inflicting mankind.

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