

The Severity of Clinical Symptoms and Paranasal Sinuses CT-Scan Finding in COVID-19 patients in Kirkuk Province

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Abstract

Introduction: COVID-19, first detected in Wuhan, China in December 2019, fast spread across the globe, causing a pandemic affecting many countries around the world. **Objectives:** The aim of this study was to assess the severity of clinical features and paranasal sinuses computed tomography (CT)-scan findings in COVID-19 patients and find the relationship between smoking and severity of COVID-19 symptoms. **Materials and Methods:** A cross-sectional study was achieved on a cohort of 399 patients, who clinically suffer from COVID-19 symptoms. The collected data for those patients included COVID-19 polymerase chain reaction (PCR) tests, presence of the IgG and IgM antigens, and paranasal sinuses CT-scan images. **Results:** This was a cross-sectional study of 399 patients infected with COVID-19. The mean age of the patients was 39 ± 11 years. Approximately 53.6% of them were males, whereas 46.4% were females. 55.6% of them performed CT scan for sinuses. 28.6% of the patients were with severe clinical features. 51.1% of them were smoking. 77.4% of them were of positive PCR, 57.9% positive IgG, and 86.7% positive IgM. 27.8% of patients were of the age group of 40–49 years. There was a significant association between the severity of COVID infection and age group. There was a significant association between the severity of COVID infection and sinus CT-scan findings. There was a significant association between the severity of COVID infection and positive PCR. There was a significant association between the severity of COVID infection and positive IgM. There was a significant association between smoking and sinus CT-scan findings. **Conclusion:** At the time of COVID infection, the severity of infection ranged from mild to moderate. More severe infection with COVID-19 associated with significant finding in sinus CT scan in patients at age group 50–59 years, and sinus also more severe COVID infection associate with positive CT scan finding that occur more in smoking patients.

Keywords: COVID, CT-scan finding, Kirkuk province, paranasal sinuses, the severity

INTRODUCTION

COVID-19, first detected in Wuhan, China in December 2019, fast spread across the globe, causing a pandemic affecting many countries around the world. The main manifestations of COVID-19 include fever, dry cough, and dyspnea. Other manifestations such as constitutive, gastrointestinal, or neurologic symptoms were also reported along with fatigue, headache, nausea, vomiting, and myalgia.^[1] Following several reports of anosmia as a common symptom of COVID-19, the American Academy of Otolaryngology-Head and Neck Surgery and the British Association of Otorhinolaryngology added anosmia and dysgeusia to the list of manifestations mandating screening for COVID-19.^[2] Olfactory dysfunction (loss of smell) includes anosmia (complete loss), hyposmia (partial loss), phantosmia (sensing odors without external stimulant),

and parosmia (a change in the usual feeling of odor). Anosmia is the cardinal olfactory symptom of COVID-19. Interestingly, despite SARS-COV-2 and SARS-COV having similarities in genetic sequence, pathogenesis, and cellular entry, anosmia has not been reported as a common symptom during the SARS-COV epidemic.^[3] Conductive, sensorineural, and mixed etiologies constitute the pathogenesis of post-viral anosmia. Sinonasal disease may lead to nasal obstruction, preventing the entry of odorants to the olfactory cleft, thus leading to conductive loss of olfaction. Treatment and outcomes of smell

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disorder due to conductive loss (mucosal thickening) are different from sensorineural loss. Nonetheless, nasal endoscopy for evaluation of patients with COVID-19 is not recommended due to the risk of virus transmission to health-care workers. Therefore, vast majority of studies in anosmia of COVID-19 are based on the symptoms rather than complete ENT examination.^[4] The aim of this study was to assess the severity of clinical features and paranasal sinuses computed tomography (CT)-scan findings in COVID-19 patients and find the relationship between smoking and severity of COVID-19 symptoms.

MATERIALS AND METHODS

A cross-sectional study was achieved on a cohort of 399 patients, who clinically suffered from COVID-19 symptoms. The study was carried out from July 2020 until February 2022 in Kirkuk General Hospital. In this study, we wanted to find out the relationship between the smoking behavior and the severity of the COVID-19 symptoms in our patients. The collected data for those patients included the following:

- COVID-19 polymerase chain reaction (PCR) tests.
- Presence of the IgG and IgM antigens.
- Paranasal Sinuses CT-scan images.

The 399 patients were divided into two groups (204 smokers and 195 nonsmokers). Every group was classified according to the clinical severity of the symptoms and then further according to the findings in the CT-scan images of the paranasal sinuses (mucosal thickening). Statistical analysis was done by SPSS software program, version 22.0. Frequency and percentage used for categorical data, mean, median and SD for continuous data. Chi-square and fisher exact test used for assessed association between categorical variables. A *P*-value ≤ 0.05 was considered significant.

Ethical approval

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patients' verbal and analytical approval before the sample was taken. The study protocol and the subject information and consent form were reviewed and approved by a local ethics committee according to the document number 123 (including the number and the date in 12/06/2020) to get this approval.

RESULTS

This was a cross-sectional study of 399 patients infected with COVID-19. The mean age of the patients was 39 ± 11 years. 53.6% of them were males, whereas 46.4% were females. 55.6% of them performed CT scan for sinuses. 28.6% of the patients were with severe clinical features. 51.1% of them were smoker, 77.4% of them were of positive PCR, 57.9% positive IgG, and 86.7% positive

Table 1: Distribution of variable included in this study

Variables		Frequency	%
Gender	F	185	46.4
	M	214	53.6
Sinus CT scan	No	177	44.4
	Yes	222	55.6
Clinical finding severity	Mild-moderate	285	71.4
	Severe	114	28.6
Smoking	No	195	48.9
	Yes	204	51.1
PCR	Negative	90	22.6
	Positive	309	77.4
IgG	Negative	168	42.1
	Positive	231	57.9
IgM	Negative	53	13.3
	Positive	346	86.7
Age groups	20-29	97	24.3
	30-39	107	26.8
	40-49	111	27.8
	50-59	80	20.1
	60<	4	1.0

IgM. 27.8% of the patients were in the age group of 40-49 years [Table 1].

As shown in Table 2, there was a significant association between the severity of COVID infection and age group. 56.1% of them were of having a severe infection at 50-59 years old. There was a significant association between the severity of COVID infection and sinus CT-scan findings; 63.2% of severe infections had sinus CT-scan findings. There was a significant association between the severity of COVID infection and PCR; 87.7% of severe infections had positive PCR. There was a significant association between the severity of COVID infection and IgM; 92.1% of severe infections had positive IgM. Other variables had no significant association with the severity of COVID infection.

As shown in Table 3, there was a significant association between patients smoking and positive sinus CT scan finding. 75.5% of patients they smoked have positive sinus CT scan finding.

As shown in Table 4, there was no significant association between severity of symptoms and sinus CT scan finding in smoking patients infected with COVID-19.

DISCUSSION

Numerous clinical features have been described from starting of COVID-19 pandemic; one of the very important ones is anosmia.^[5-7] Post-viral olfactory loss is explained by altered mechanisms such as congestion, secretions, inflammatory changes in the nasal mucosa,^[8-10] and obstruction in the olfactory cleft or neurogenic invasion/ olfactory bulb involvement.^[8,9] Olfactory disturbance

Table 2: Association between severity of COVID infection and variables in this study

Variables		Severity		P Value
		Mild-moderate	Severe	
Age groups	20-29	97 34.0%	0 0.0%	0.0001
	30-39	99 34.7%	8 7.0%	
	40-49	73 25.6%	38 33.3%	
	50-59	16 5.6%	64 56.1%	
	60<	0 0.0%	4 3.5%	
	Total	285 100.0%	114 100.0%	
	Females	138 48.4%	47 41.2%	
Gender	Males	147 51.6%	67 58.8%	0.2
	Total	285 100.0%	114 100.0%	
	No	135 47.4%	42 36.8%	
Sinus CT scan finding	Yes	150 52.6%	72 63.2%	0.05
	Total	285 100.0%	114 100.0%	
	No	136 47.7%	59 51.8%	
Smoking	Yes	149 52.3%	55 48.2%	0.5
	Total	285 100.0%	114 100.0%	
	Negative	76 26.7%	14 12.3%	
PCR	Positive	209 73.3%	100 87.7%	0.001
	Total	285 100.0%	114 100.0%	
	Negative	118 41.4%	50 43.9%	
IgG	Positive	167 58.6%	64 56.1%	0.65
	Total	285 100.0%	114 100.0%	
	Negative	44 15.4%	9 7.9%	
IgM	Positive	241 84.6%	105 92.1%	0.05
	Total	285 100.0%	114 100.0%	

$P \leq 0.05$ (significant)

consists of airflow obstruction, sensory insufficiency ascending from direct neuro epithelium damage; and neural insufficiencies consist of injury to the olfactory bulb,

Table 3: Association between smoking and sinus CT scan of patients

Variables		Smoking		P Value
		No	Yes	
Sinus CT scan	No	127 65.1%	50 24.5%	0.0001
finding	Yes	68 34.9%	154 75.5%	
	Total	195 100.0%	204 100.0%	

$P \leq 0.05$ (significant)

Table 4: Association between severity of symptoms and sinus CT scan finding in smoking patients infected with COVID-19

variables		Severity		P Value
		Mild-moderate	Severe	
Sinus CT scan	No	37 24.8%	13 23.6%	1.000
finding	Yes	112 75.2%	42 76.4%	
	Total	149 100.0%	55 100.0%	

$P \leq 0.05$ (significant)

olfactory tract, or the central olfactory pathway including the prefrontal lobe, septal nuclei, amygdala, and temporal lobe.^[4] Inflammation, infection, and chemical agents can impact the dendritic processes of the olfactory receptors in the cleft area via inflammatory cytokine release, thus inducing apoptosis in neurons.^[11] Coronaviruses are one of the many viruses identified to cause post-infection olfactory dysfunction.^[12,13] Detailed clinical history and imaging (e.g., CT scan and/or magnetic resonance imaging [MRI]) are necessary in the assessment of anosmic patients to identify the underlying etiology. In this study, the mean age of the patients was 39 ± 11 years. 53.6% of them were males, whereas 46.4% were females. This is similar to other study they also stated that the mean of age of COVID-19 infected patients are 45 years old, and also they stated that males more infected with COVID-19 than females.^[14] In this study, there was a significant association between the severity of COVID infection and age group; 56.1% of them were of having a severe infection at 50-59 years. There was a significant association between the severity of COVID infection and sinus CT-scan finding, PCR, and IgM; 63.2% of severe infections had sinus CT scan finding; 87.7% of severe infections had positive PCR; 92.1% of severe infections had positive IgM. This is similar to other studies that state a strong positive correlation between higher CT severity score and male gender ($P = 0.0002$, $R^2 = 0.9$). Also, there was a significant correlation between CT severity score and increasing age ($P < 0.00018$). A significant correlation was found between sinus positive CT scan

finding percentage of lung involvement and positive PCR test results ($P = 0.001917$), as the CT severity index is increasing, the PCR test is more likely to be positive.^[15] Nasal congestion was reported by 41% of SARS-CoV-2 positive patients, this is similar to finding done by Lechien *et al.*,^[16] (36.9%) and Naeini *et al.*,^[14] (32.7%). A recent article included 49 COVID-19 positive patients with anosmia, used the original Lund Mackay scoring system, and showed partial opacification in less than 10% of maxillary, frontal, and sphenoid sinuses, and the ethmoid air cells were normally aerated in all patients.^[16] In a cohort of 16 patients infected with COVID-19 and their tests are positive with olfactory dysfunction, Lechien *et al.*^[14] In this study, no association was observed between gender and severity of symptoms; also, this is similar to other studies that show no association.^[17] In this study, there was a significant association between patients they smoking and sinus CT scan positive finding. (75.5%) of patients they smoking have positive sinus CT scan finding. This is similar to other studies that stated that mucosal thickening was present in 97.4% of maxillary sinuses, 80% of anterior ethmoid air cells, 75.3% of posterior ethmoid air cells, 74.7% of frontal sinuses, and 66.3% of sphenoid sinuses.^[17] Multiple studies have analyzed the pathophysiologic effects of tobacco smoke on sinonasal mucosa. Cigarette smoke induces a physiologic nasal response including increased nasal airway resistance, nasal irritation, nasal congestion, and rhinorrhea. Tobacco smoke extract has been shown to have adverse effects on sinonasal epithelial mucociliary clearance and innate immune function as well as olfactory mucosal metaplasia.^[18]

CONCLUSION

At the time of diagnosis, the severity of clinical features ranged from mild to moderate, with more severe infection with COVID-19 associated with significant findings in sinus CT scan in the age group 50–59 years, and sinus CT scan findings occur more in smoking infected patients.

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Conflicts of interest

There are no conflicts of interest.

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