



# Effects of Waterpipe Smoking on the Course of COVID-19 Infection

## Nargile İçiminin COVID-19 Enfeksiyonu Sürecine Etkileri

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### ABSTRACT

**Objective:** Smoking, and also water pipe smoking (hookah), is a common method of tobacco use in Southwest Asia and Middle East countries. Although the relationship between coronavirus disease-2019 (COVID-19) infection and smoking has been evaluated in many studies, no study has been conducted to evaluate the relationship between COVID-19 infection and water pipe smoking.

**Methods:** We enrolled 150 in-hospital patients. The severity of disease classified as mild, moderate, severe, and critically ill. The relationship between waterpipe smoker, smoker and non-smoker patients and severity of disease statistically evaluated.

**Results:** Patients with minimal involvement (1-25%) on thorax computed tomography were found to be higher in the smoker and cigarette-hookah smoking group compared to the non-smoking group, and the patients with moderate involvement (51-75%) were found to be less in the smoking-hookah group. in terms of disease degree; It was found that there were more mild and moderate smokers in the smoking and smoking-hookah group than the non-smoking group. The C-reactive protein and sedimentation values of cigarette-waterpipe tobacco smokers were found to be lower than non-smokers.

**Conclusion:** Waterpipe smoking does not aggravate the course of the disease in the young population, but new studies are needed for its effects on the elderly population.

**Keywords:** COVID-19, emergency department, pneumonia, waterpipe

### ÖZ

**Amaç:** Sigara ve nargile içimi (Nargile), Güneybatı Asya ve Orta Doğu ülkelerinde yaygın bir tütün kullanım yöntemidir. Koronavirüs hastalığı-2019 (COVID-19) enfeksiyonu ile sigara kullanımı arasındaki ilişki birçok çalışmada değerlendirilmiş olsa da COVID-19 enfeksiyonu ile nargile içimi arasındaki ilişkiyi değerlendiren bir çalışma yapılmamıştır.

**Gereç ve Yöntem:** Hastanede yatan 150 hastayı kaydettik. Hastalığın şiddeti hafif, orta, şiddetli ve kritik olarak sınıflandırılır. Nargile içen, sigara içen ve içmeyen hastalar ile hastalık şiddeti arasındaki ilişki istatistiksel olarak değerlendirildi.

**Bulgular:** Toraks bilgisayarlı tomografide minimal tutulumu olan hastalar (%1-25), sigara içen ve sigara-nargile içen grupta sigara içmeyen gruba göre daha yüksek bulundu ve orta düzeyde tutulumu olan hastalar (%51-75) sigara-nargile grubunda daha az bulundu. Hastalık derecesi açısından; sigara ve nargile içen grupta, sigara içmeyen gruba göre daha hafif ve orta düzeyde sigara içenlerin olduğu bulundu. Sigara-nargile içenlerin C-reaktif protein ve sedimentasyon değerleri içmeyenlere göre daha düşük bulundu.

**Sonuç:** Nargile içimi genç popülasyonda hastalığın seyrini kötüleştirmez ancak yaşlı popülasyon üzerindeki etkileri için yeni çalışmalara ihtiyaç vardır.

**Anahtar Kelimeler:** COVID-19, acil servis, pnömoni, nargile

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## INTRODUCTION

Coronavirus disease-2019 (COVID-19) infected over 140 million and caused more than 3 million deaths up to April 2021 (1). The main route of the transmission is respiratory droplets and patients usually present with respiratory symptoms like dry cough, fever, fatigue and sometimes atypical presentations also with loss of taste and smell.

Smoking, and water pipe smoking (Hookah), is a common method of tobacco use in Southwest Asia and Middle East countries. Recently, its popularity has increased and its usage has become widespread in Europe and America, carries the same risks as smoking (2,3). The prevalence of respiratory diseases, lung cancer, cardiovascular diseases and metabolic syndrome are increased in water pipe smoking. In addition, impairment in oral hygiene and a high incidence of periodontal disease are common outcomes of water pipe smoking (4). Although the relationship between COVID-19 infection and smoking has been evaluated in many studies, no study has been conducted to evaluate the relationship between COVID-19 infection and water pipe smoking. Therefore, we have designed this study whether water pipe smoking can be associated with the severity of COVID-19 infection or not.

## METHODS

This is a retrospective single center study conducted at Gebze Government Hospital. We enrolled 150 in-hospital patients between 02 April 2020-03 May 2020. The study was approved by the Ankara City Hospital Clinical Research Ethics Committee (no: E2-22-1492, date: 02.03.2022) and the Ministry of Health COVID-19 Science Board.

COVID-19 was diagnosed according to World Health Organization guidance. Nasopharyngeal swap samples were used for real-time reverse transcriptase polymerase chain reaction (PCR) tests. Patients older than 18 years and confirmed of COVID-19 infection by PCR testing were enrolled in the study.

Those who use waterpipe tobacco at least twice a week was considered as a waterpipe tobacco smoker.

### Data Collection

Patients demographic features, symptoms and signs, co morbidities, laboratory tests and chest computed tomography (CT) scans were evaluated. All data were collected from the electronic hospital information system. The medical records of the patients were reviewed by an expert investigator. Peripheral venous blood samples were measured at the biochemical laboratory of Gebze

Government Hospital following standard operative procedures. The routine blood tests [including white blood cell count, leukocyte subtypes (neutrophil, lymphocyte, eosinophil, basophil), hemoglobin count, and platelet count] were measured with multi-function automatic blood analyzer. Biochemical parameters were measured using the ARCHITCT ci16200 automatic biochemistry analyzer (Abbott Laboratories, Illinois, United States) C-reactive protein (CRP) and serum ferritin were measured using latex-enhanced immunoturbidimetry (Cobas 8000; Roche).

### Assessment of Disease Severity

Mild disease was defined as the absence of dyspnea and patients with fever, malaise, cough, upper respiratory symptoms, and/or less common features of COVID-19. Patients who developed dyspnea without hypoxia were defined as having moderate disease. Severe COVID-19 was defined as the existence of dyspnea, blood oxygen saturation  $\leq 94\%$  on air room and need for oxygenation or ventilatory support (4). Critical COVID-19 is defined as the occurrence of respiratory failure, septic shock and/or multiple organ functions (5).

Chest CT of the patients was assessed and classified for the degree of parenchyma involvement and noted as following: No involvement (0%), minimal involvement (1%-25%), mild involvement (26%-50%), moderate involvement (51%-75%) and severe involvement 76%-100% (6).

### Statistical Analysis

Statistical analyses were performed using SPSS for Windows version 24.0 (SPSS, Chicago, IL, USA). The one-sample Kolmogorov-Smirnov test was used to verify the normality of data distributions. Results are expressed as numbers, percentages; median, minimum, and maximum. Chi-square test was used for categorical variables. An independent sample t-test was used to analyze parametric numerical data, and the Mann-Whitney U test was used to analyze non-parametric data. One-Way ANOVA with a post hoc Bonferroni and Kruskal-Wallis tests were used in normally and non-normally distributed continuous data, respectively. Values of  $p < 0.05$  were considered statistically significant for all results.

## RESULTS

Patients were divided into three groups; group one was a smoker, group two was cigarette and waterpipe smoker; and group three was non-smokers. The demographic, clinical and biochemical characteristics of all patients are summarized in Tables 1 and 2. The difference between thoracic CT involvement and severity index groups was

examined by chi-square and Bonferroni tests. No significant difference was found between smokers, cigarette and waterpipe smokers and non-smokers among patients thoracic CT with no involvement, mild involvement and

severe involvement. Among the patients with minimal involvement on CT, there was no significant difference between cigarette smoker patients and cigarette and waterpipe smoker patients, the group with non-smoker

**Table 1. Demographic characteristics of patients with COVID-19**

	Non-smoker	Cigarette smoker	Cigarette + waterpipe smoker	Total
<b>Age (year)</b>				
18-35	1	9	16	26
36-50	0	21	16	37
51-65	11	28	0	39
>65	36	11	1	48
Male	17	51	27	95
Female	31	18	6	55
<b>Co morbidity</b>				
Hypertension	3	10	4	17
Diabetes	7	11	3	21
Chronic kidney disease	2	4	0	6
Cardiovascular disease	24	12	3	39
Respiratory disease	6	10	5	21
Chronic liver disease	1	2	0	3
Solid tumour	2	2	0	4
Hematologic malignancy	1	0	0	1
Rheumatic disease	1	0	0	1
No co morbidity	1	18	18	37
<b>Severity index</b>				
Mild	1	7	7	15
Moderate	9	27	20	56
Severe	36	32	5	73
Critically ill	2	3	1	6
<b>Bt involvement</b>				
No involvement	1	2	4	7
<25%	4	19	14	37
25-50%	16	23	10	49
50-75%	20	20	4	44
>75%	7	5	1	13
Outpatient follow up	1	2	3	6
Ward follow up	14	38	23	75
Intensive care unit	25	22	7	54
Mechanic ventilation	7	6	0	13
Exitus	8	4	0	12

COVID-19: Coronavirus disease-2019, CT: Computed tomography

**Table 2. Laboratory findings of patients with COVID-19**

Laboratory	Non-smoker (n=15) mean/(STD)	Cigarette smoker (n=56)	Cigarette + waterpipe smoker
Leukocyte count, 10 <sup>3</sup> cells/L	9.72 (4.76)	8.51 (4.68)	7.81 (3.54)
Neutrophil count, 10 <sup>3</sup> cells/L	3.99 (2.4-9.07)	4.18(1.4312.12)	6.25 (0.00-78.0)
Lymphocyte count, 10 <sup>3</sup> cells/L	2.04 (0.64-3.88)	1.78 (0.55-7.44)	1.49 (0.00-5.49)
Monocytes count, 10 <sup>3</sup> cells/L	0.56 (0.36-1.46)	0.69 (0.18-5.00)	0.72 (0.00-5.20)
Hemoglobin level, g/L	12.7 (8.3-16.10)	13.8 (7.4-16.7)	12.0 (6.4-16.7)
Platelet count, 10 <sup>3</sup> cells/L	288.0 (133.0-385.0)	250.0 (53.0-546.0)	223.0 (13.8-491.0)
Fibrinogen, g/L	245.0 (198.0-580.0)	356.0 (231-619)	455.0 (233.0-749.0)
D-dimer, mg/L	0.37 (0.14-0.58)	0.47 (0.08-6.29)	1.17 (0.08-25.06)
C-reactive protein level, mg/L	4.53 (1.0-9.0)	8.0 (2-17)	23.0 (9-54)
ESR, mm/60 min	12.0 (10.0-12.0)	14.0 (10.0-54.0)	23.0 (11.0-101.0)
Serum ferritin ng/mL	90.6 (7.0-370.6)	63.5 (4.0-1086.0)	132.2 (6.9-1834.0)
Creatinine level, mg/dL	0.8 (0.58-1.38)	0.83 (0.38-2.64)	0.93 (0.55-3.2)
Urea level, mg/dL	12.0 (7.0-43.0)	12.0 (5.0-63.0)	17.0 (6.0-156.0)
Procalcitonin ng/mL	0.04 (0.01-0.41)	0.03 (0.00-1.93)	0.09 (0.0-60.96)
Neutrophil/lymphocyte	1.93 (0.89-4.07)	2.41(0.7-14.55)	4.05 (0.0-24.26)

ESR: Erythrocyte sedimentation rate, STD: Standard deviation, COVID-19: Coronavirus disease-2019

patients was found to be statistically significantly lower than the other two groups. Among the patients with moderate involvement, there was no significant difference between the smoker and non-smoker patient groups, while the group with cigarette and waterpipe smoker patients was found to be statistically significantly lower than the other two groups ( $p < 0.005$ ).

No significant difference was found between the smoker group and cigarette and waterpipe smoker groups among those with the COVID severity index-mild. Among those with COVID severity index-moderate, cigarette smoker, cigarette, and waterpipe smoker patients and non-smokers were all significantly different from each other. COVID severity index-severe patients, cigarette smokers, cigarette and waterpipe smokers and non-smokers were all significantly different from each other. There was no significant difference between patients with critical illness severity index ( $p < 0.001$ ). CRP values, respectively; cigarette smokers mean 14.8 (12.5-17.2), cigarette and waterpipe smoker patients mean 10.6 (8.0-13.3), non-smokers, mean 22.5 (18.9-26.1) detected. No statistically significant difference was found between group one and group two in terms of CRP values. A significant difference was found between the CRP values of only group three, group one and group two patients ( $p < 0.001$ ). Sedimentation values are respectively; average of 20.3 (17.6-23.1) in 67 smokers, 16.2

(13.9-18.4) in 31 cigarette-waterpipe smokers, 23.3 (19.2) in 47 non-smoking patients (27.4) and a statistically significant difference was found between the cigarette-smoking patient group and the non-smoking patient group. In other words, the sedimentation value was found to be higher in the non-smoker group ( $p < 0.005$ ).

## DISCUSSION

Patients with minimal involvement (1%-25%) on thorax CT were found to be higher in the smoker and cigarette-hookah smoking groups compared to the non-smoking group, and the patients with moderate involvement (51%-75%) were found to be lower in the smoking-hookah group. In terms of disease degree; it was found that there were more mild and moderate smokers in the smoking and smoking-hookah groups than in the non-smoking group. The CRP and sedimentation values of cigarette and waterpipe smokers were found to be lower than non-smokers (5). In fact, our findings were unexpectedly confusing. In a study conducted in the UK, smokers were divided into two as current smokers and ex-smokers, and it was found that current smokers have an increased risk of hospitalization and death (6). Lippi and Henry (7) defined a relationship between smoking and COVID-19 in their study. It was emphasized that there was a significant

correlation between smoking and the need for ICU support and mechanical ventilation according to the meta-analysis of Vardavas Nikitara (8). Cattaruzza et al. (9) stated that smoking is 'the most important preventable risk factor'. However, according to the results of our study, COVID-19 shows a milder course and inflammatory markers tend to be at a lower level in patients who smoke and hookah. In Turkey hookah smoking has become popular among the young population over the past decade. But it has not become popular among the middle and advanced age group. In our study, all those who smoked waterpipe were young patients. In our opinion, therefore the disease tended to have a mild course among cigarette and waterpipe smoker groups and as a result, inflammatory markers were not high.

Angiotensin converting enzyme (ACE-2) receptors play a great role in viral replication and modification of the immune response in cells infected with severe acute respiratory syndrome coronavirus 2. ACE-2 has anti-inflammatory effects and a decrease in activity may result in severe infection course. Tobacco usage negatively affects receptor activity and may predispose severe lung injury (10). Of course, this is not the only factor that affects the course of the disease. Age and comorbid diseases are one of the most important factors determining the disease course. In our study, we had no patient over fifty years. This was the most important factor in the mild course of disease.

Tobacco use is an important form of transmission for both active and passive smokers (11). With waterpipe use social distancing rule is often violated and the same equipment is used by other people, this creates a very suitable environment for disease transmission. It is obvious that although waterpipe smoking does not aggravate the severe course of the disease, it does cause an increase in the risk of transmission.

## CONCLUSION

Waterpipe smoking does not aggravate the course of the disease in the young population, but new studies are needed on its effects on the elderly population.

## ETHICS

**Ethics Committee Approval:** The study was approved by the Ankara City Hospital Clinical Research Ethics Committee (no: E2-22-1492, date: 02.03.2022) and the Ministry of Health COVID-19 Science Board.

**Informed Consent:** Permission from cases and/or their relatives was obtained with an informed consent form.

## Authorship Contributions

Surgical and Medical Practices: N.E.S., Concept: H.C., Ö.S., Design: H.C., Ö.S., E.E.S., Data Collection or Processing: Ö.S., N.E.S., Analysis or Interpretation: H.C., Ö.S., E.E.S., Literature Search: H.C., E.E.S., N.E.S., Writing: H.C.

**Conflict of interest:** No conflict of interest was declared by the authors.

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