

Retrospective Analysis of Twenty-Three Thousand COVID-19 Cases: A Strong Association with Gender and Age / Yirmi Üç Bin COVID-19 Olgusunun Retrospektif İncelemesi: Cinsiyet ve Yaş ile Güçlü İlişki

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Öz

Giriş: Yaş ile bulaşıcı hastalıklar arasındaki ilişki karmaşıktır ve yaş, enfeksiyonların duyarlılığını, siddetini ve ölüm oranlarını etkileyen önemli bir faktördür. Amac: COVID-19 hastalığına bağlı olarak ortaya çıkan entübasyon ihtiyacı, yoğun bakıma yatış ve ölüm oranlarının yaş ve cinsiyet faktörleri ile ilişkisinin incelenmesidir. Yöntem: Tanımlayıcı tipteki arastırmada, gerekli izinler alındıktan sonra Konya ilinde hizmet veren bir hastanede PCR testi yaptırmış, hastanede yatan ya da tedavisi ayaktan planlanıp hastane dışı takip edilen 23.239 olgunun retrospektif incelemesi yapılmıştır. Veriler elektronik ortamda toplanmış olup, tanımlayıcı ve çıkarımsal analizler için SPSS 22.0 paket programı kullanılmıştır. Bulgular: Olguların %50.8'i kadın, %49.2'si erkektir ve genel yaş ortalaması 44.05±16.47 olarak tespit edilmiştir. Cinsiyet ile yoğun bakım hizmeti alma. entübasyon gereksinimi ve ölümler arasındaki ilişki anlamlı bulunmuştur. Erkeklerin yoğun bakım hizmeti alma, entübasyon ve ölüm oranları kadınlara göre daha yüksektir. Yaş da, cinsiyete benzer olarak prognoz göstergeleri ile güçlü ilişki göstermektedir. Yoğun bakıma ihtiyaç duyan hastaların yaş ortalamaları (69.72 ±13.41), bu bakıma ihtiyaç duymayanlara göre (43.03 ±15.74) oldukça yüksektir. Ölen vakaların yaş ortalaması (72.67±12.36), hayatta olanların yaş ortalamasından (43.37 ± 15.94) yüksektir (p<0.0001). Sonuc: Bu arastırma, ileri yaş ve erkek cinsiyetinin COVID-19 hastalığının prognozuna ait bazı göstergelerle güçlü ilişkili risk faktörleri olduğunu göstermiştir.

Anahtar Kelimeler: COVID-19, Risk Faktörleri, Cinsiyet Dağılım

Abstract

Introduction: The relationship between age and infectious diseases is complex and age is an important factor influencing susceptibility, severity and mortality rates of infections. Aim: This study aims to examine the association of COVID-19 disease-related need for intubation, hospitalization in the intensive care unit, and mortality rates with age and gender. Methods: After obtaining the necessary permissions, this retrospective descriptive study evaluated a total of 23.239 patients who had PCR tests in a hospital serving in Konya province and received inpatient or outpatient treatment. The SPSS 22.0 package program was used for descriptive and inferential analyses of the electronically collected data. Results: 50.8% of the cases were female, 49.2% were male, and the mean age was 44.05±16.47 years. A strong



relationship was found between gender and receiving intensive care services, the need for intubation, and mortalities. Intensive care, intubation, and mortality rates of men were significantly higher than women. Similar to gender, age also showed a strong correlation with prognostic indicators. The mean age of patients who needed intensive care (69.72 ± 13.41) was considerably higher than of those who did not (43.03 ± 15.74). The mean age of the patients who died (72.67 ± 12.36) was considerably higher than of the survivors (43.37 ± 15.94) (p<0.0001). Conclusion: This study shows that advanced age and male gender are risk factors strongly associated with various prognostic indicators of the COVID-19 disease.

Keywords: COVID-19, Risk Factors, Sex Distribution

1. Introduction

The novel coronavirus disease (COVID-19) started in China and quickly became a global pandemic (Zhou et. al. 2020). The relationship between morbidity and mortality rates and age has been emphasized since the onset of the disease and was confirmed as epidemiological data emerged (Penna et. al. 2020).

The association between gender and COVID-19 outcomes reveals significant differences in disease severity and mortality between men and women. Men are generally at higher risk of severe outcomes and death from COVID-19 compared to women (Peckham et al., 2020; Nasiri et al., 2020). Studies have reported gender-disaggregated data for many countries, showing that COVID-19 diagnosis in 80 out of 140 countries, mortality rates in 93 out of 107 countries, hospitalization rates in 24 out of 28 countries, and intensive care unit rates in all 20 countries were higher in men than in women (NIPH, 2021). The Ministry of Health's weekly status report on October 19-25, 2020, indicated that 62% of those who lost their lives due to COVID-19 were men(Ministry of Health Turkey, 2021).

The relationship between age and infectious diseases is complex and age is an important factor influencing susceptibility, severity and mortality rates of infections (Kline & Bowdish, 2016). Generally, older adults are at higher risk of infectious diseases due to various physiological and immunological changes associated with aging (Sorgi & Faivre, 2022). Age is an important risk factor for all health consequences of COVID-19. Increasing age is the major cause of COVID-19 mortality (Kaikireddi et. al. 2021). Most of the cases diagnosed with COVID-19 consist of individuals aged 50 and over. The mean age of cases worldwide has been reported as 57 (Karcioğlu, 2020). A study conducted in South Korea reported that cases aged 80 and over accounted for 2.7% of the entire sample and 23.8% of deaths (Shim et. al. 2020). A study conducted in Sweden on the risk factors for the diagnosis of COVID-19, hospitalization, and death, determined older age as the most significant risk factor for hospitalization and intensive care unit admission (Bergman et. al. 2021).

The pandemic effect of the COVID-19 disease, which was identified in the last quarter of 2019, began to be felt worldwide in 2020. Although local studies addressing various aspects of the disease began to be published in the same year, the limited time that has passed is not yet sufficient for the scientific knowledge in this field to mature. In particular, there is still a need for local-scale study findings and results to conduct meta-analysis studies that will increase the validity and reliability of scientific information that will be referenced on a global scale. Local research findings mediate the enrichment of global epidemiological findings regarding COVID-19. In this context, we think that our research constitutes a qualified resource for meta-analysis studies with its data set size and originality. The present study examines the



association of COVID-19 disease-related intubation, hospitalization in the intensive care unit, and mortality rates with age and gender.

2. Materials And Methods

2.1. Type of study

The study was planned as a retrospective study

2.2. Place / Time of study

The study was planned at Konya Numune Hospital between 1 July and 31 December 2020. This date range was preferred due to the availability of records for the relevant period.

2.3. Sample of Study

In our study, a total of 28,260 patients who had PCR (Polymerase Chain Reaction) test and positive results, who were hospitalized in Konya Numune Hospital or were followed out of the hospital with outpatient treatment, were examined within the specified date range. 5021 patients whose medical records could not be fully accessed was excluded from study. The information of 82.2% (23,239) of the research population was used.

2.4. Collection of Data

Medical records archive and hospital online information system of the patients included in the study were reviewed over. Patients with a lack of information in their medical records were excluded from the study. Duplicate registration entries were also detected and reduced to one. Data including gender, age, receiving intensive care service, intubation condition, and survival status of the patients were collected and analysed.

2.5. Data collection tools

Hospital Information Management System (HIMS)

2.6. Evaluation of Data

The study data were collected electronically, converted into the package program compatible format, and coded. SPSS 22.0 package program was used for data analysis. Descriptive statistics were presented as mean, standard deviation, median, frequency distribution, and percentage. For inferential statistics, the chi-square test was used to analyse the difference between the percentages of categorical data. Mann-Whitney U test was used to analyze prognostic variables. The reason why non-parametric testing is preferred is that although the subsets have sufficient volume, the analysis data do not show a normal distribution in the normality plots test analysis. Statistical significance level was accepted as p < 0.05.

2.7. Ethical Aspect of the Research Ethics

All data obtained in the study were collected and processed anonymously, and the raw data and database were secured with digital encryption and a licensed virus shield. Necessary permissions were obtained from the Ministry of Health Scientific Research Platform, Konya Provincial Health Directorate, and Necmettin Erbakan University Health Sciences Scientific Research Ethics Committee to conduct the study. There is no need to "obtain patient"



consent for the study. No data that would reveal the identity of the individuals were used in the study.

3. Results

A total of 23,239 people, 50.8% women and 49.2% men, were included in the study. The ages of the retrospectively examined cases were between 0 and 105 years. While the mean age was 44.05 ± 16.47 , the median age was 42. According to the available data, the rate of those who received intensive care service was 3.8%, the rate of those who were intubated was 1.6%, and the rate of those who died was 2.3% (Table 1).

Characteristic	n %			
Gender				
Female	11813 50.8			
Male	11426 49.2			
Age (overall average)	44.05±16.47			
Female	44.78±16.75			
Male	43.31±16.13			
Prognosis indicator				
Intensive care				
No	22351	96.2		
Yes	888	3.8		
Intubation				
No	22876	98.4		
Yes	363 1.6			
Mortality				
No	22695	97.7		
Yes	544 2.3			
Total	23239 100.0			

Table 1. Demographic characteristics of participants

Table 2 shows various prognostic indicators of COVID-19 positive individuals by gender. 3.1% of women and 4.5% of men were admitted to intensive care. The intensive care unit admission rate of men was significantly higher than that of women (p<0.0001). 1.3% of women and 1.8% of men were intubated. The intubation rate of men was significantly higher than that of women (p=0.004). 2.0% of women and 2.7% of men died. The mortality rate of men was significantly higher than that of women (p<0.0001).

	Gender					
Indicator	Female		Male		X²	р
	n	%	n	%		
Intensive care						
No	11443	96.9	10908	95.5	01.000	p<0.0001
Yes	370	3.1	518	4.5	31.030	
Intubation						
No	11656	98.7	11220	98.2	0 100	0.004
Yes	157	1.3	206	1.8	0.402	0.004
Mortality						
No	11577	98.0	11118	97.3	10.071	p<0.0001
Yes	236	2.0	308	2.7	12.371	
Total	11813	100	11426	100		

Table 2. Various prognostic indicators of COVID-19 positive individuals by gender

The mean age of the patients, who received intensive care service and the patients who did not, were compared. The mean age of patients who needed intensive care (69.72 \pm 13.41) was considerably higher than of those who did not (43.03 \pm 15.74). The difference between the mean ages of these two groups was statistically significant (p<0.0001). The mean age of patients who needed intubation was significantly higher than those who did not (p<0.0001).



The mean age of deceased patients was 72.67 ± 12.36 years. This mean is considerably higher than the mean age of the survivors (43.37 ± 15.94), and the difference between the mean ages of the two groups is highly significant (p<0.0001) (Table 3).

Indicator	Cases (n=23239)			U	р
Intensive care	n	%	Mean age		
No	22351	96.2	43.03 ±15.74	0106750,000	p<0.0001
Yes	888	3.8	69.72 ±13.41	2136752.000	
Intubation					
No	22876	98.4	43.62±16.15	804846 500	p<0.0001
Yes	363	1.6	71.42±12.89	024040.500	
Mortality					
No	22695	97.7	43.37±15.94	1008000.000	p<0.0001
Yes	544	2.3	72.67±12.36	1026202.000	
Total	23239	100	44.05±16.47		

Table 3.	Various pr	rognostic indicators	of COVID-19	positive individuals by	age
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4.Discussion

The study was conducted by retrospectively examining the records of individuals who applied to a hospital for a PCR test and whose results were positive. Of the cases included in the study, 50.8% were women, and 49.2% were men. According to the data of the Ministry of Health, the overall rate in the country is 49% women and 51% men. The distribution of individuals diagnosed with COVID-19 by gender is similar to the country in general (Ministry of Health Turkey, 2021).

The retrospective evaluation revealed that diagnosis rates were similar for both genders, but intensive care need, intubation, and mortality rates were higher in men. This indicates that the COVID-19 infection has a more severe course in men. Similar results have been reported in the literature on the course of COVID-19 disease according to gender. In France, the percentage of COVID-19-related intensive care unit admissions in men was higher (73%-27%) than in women (NIPH, 2021). Studies in China also show that the rates differ by gender (Chen et. al. 2020a; Chen et. al. 2020b; Guan et. al. 2020; Huang et. al. 2020; Wang et. al. 2020; Zhou et. al. 2020). In the United States, rates were reported as 57% men and 43% women (Cai, 2020). In addition, changes in the course of the disease according to gender is also explained by the stronger antibody response against infectious diseases by female genes, the high rates of chronic diseases in men, and the high rates of risky behaviour (smoking, alcohol, not paying attention to social distance) (Abate et. al. 2020; Klein and Flanagan, 2016; Cai, 2020; Granö et. al. 2004; Wong et. al. 2007). Men's health is an issue that is generally not sufficiently addressed in health services and public perception of health. However, health risks in men have a different profile compared to women due to a combination of biological, behavioral and social factors. Men generally have a shorter life expectancy than women and higher mortality rates associated with conditions such as cardiovascular diseases, chronic diseases, cancers and accidents. This highlights the need to develop specific strategies for men's health.

The present study determined that the average age of the patients who needed intensive care and intubation and the patients who died were reasonably high. The results of the study are similar to the literature. A study conducted on patients hospitalized in the intensive care unit in France showed that advanced age was associated with a severe disease course (Roger et. al. 2021). In their study to determine the factors associated with mortality, Conway et al. (2021) revealed that age is one of the important determinants of COVID-19 mortality (Conway



et. al. 2021). A study conducted to determine the risk factors associated with the severity of the disease in COVID-19 patients in north-eastern Mexico determined age as a factor strongly associated with mortality (García-Alvarado et. al. 2021). After examining the data of 18 countries, Asem et al. (2021) determined age as the factor associated with the mortality rate (Asem et. al. 2021). These studies show that age is an important risk factor for infectious diseases, with older adults experiencing higher susceptibility and severity due to factors such as a weakened immune system, physiological changes and greater exposure to health care facilities.

5. Conclusion and Suggestions

The COVID-19 infection has brought life to a standstill by affecting both mortality and morbidity worldwide since December 2019. In order to minimize the losses, it is critical to understand the risk factors well and develop appropriate measures for these factors. Our study showed that advanced age and male gender are risk factors strongly associated with the indicators of the COVID-19 disease course. Findings indicate that baseline immunity levels may differ according to age and gender. Planning studies to understand the risk factors in the fight against the pandemic is critical.

Infectious diseases show sex and gender differences in pathophysiology, incidence, clinical presentation, disease course, response to treatment and outcomes. These differences are due to both biological (e.g. sex chromosomes and steroid hormones) and behavioral factors. However, these factors are often not adequately integrated into research and gender-specific differences are not reflected in medical guidelines. To remedy this situation, funders and medical journals should support research with sex-sensitive and disaggregated data. Furthermore, translating existing evidence into gender-specific medical guidelines, supported by implementation science methods, can lead to more personalized and effective patient care. In addition, existing frameworks on sex and gender impacts have gaps that need to be addressed to improve strategic planning and public health interventions that are appropriate to the needs of men and women.

Preventive measures such as regular vaccination, nutritious diet, physical activity and education programs that increase health literacy should be taken to reduce susceptibility to infectious diseases and disease severity in elderly individuals. While strengthening infection control in healthcare institutions, unnecessary contacts should be minimized through telemedicine services and isolation should be prevented through social support networks. In addition, age-specific guidelines should be developed and research focusing on the relationship between infectious diseases and aging should be supported to create personalized strategies tailored to the needs of older individuals.

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Declarations

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