

Corona virus (COVID19) risk groups: Scrutinizing the death cases reported in South Korea

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ABSTRACT

Introduction: The outbreak of COVID19 has led to a global health and economic crisis. Although no approved treatment exists to date, vaccine prototypes, antiviral medication, preventive measures, and treatment strategies are studied by scientists and pharmaceutical companies worldwide. The objective of this paper is to examine the COVID19 death cases in South Korea in order to identify the distinct features of the deceased, such as sex, age, underlying medical conditions, which can be targeted when searching for a COVID19 treatment strategy.

Material and Methods: Data regarding sex, age, and underlying conditions of the deceased and current cases was obtained from South Korea's Centers for Disease Control and the Korean Statistical Information Service (data retrieved on May 21, 2020). The data were examined to identify any trends between the parameters using direct statistical analysis. Personal variables of COVID19 patients were studied, such as their sex, age, and preexisting health conditions. The data were analyzed in terms of possible factors leading to COVID19 complications and resulting in patients' deaths.

Results: As of May 21, 2020, 11142 confirmed cases and 264 deaths were reported in South Korea. Sex has not had an impact on the death rate, but it directly correlates with age. No deaths were reported for cases of individuals under 30 years old, and only five deaths were reported between the ages of 30 and 50. Additionally, 98.5 % of victims suffered from an underlying condition. The primary underlying condition in deceased cases was related to circulatory system disorders. The results of the statistical analysis were further used to devise a classification of COVID19 risk factors. It consists of three categories ranging from low to high-risk levels.

Conclusion: Treatment targeted at patients over 60 years old and with circulatory system disorders can reduce the death rate of COVID19 infected patients in South Korea.

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INTRODUCTION

The outbreak of COVID-19 has led to a global health crisis. Phylogenetic analysis suggests that although bats are the original hosts of the virus, it is most likely that an unknown animal sold at the seafood market in Wuhan acted as the intermediate host that facilitated the emergence of the virus in humans [1-5]. Due to its rapid transmission, global and local travel has come to a standstill [6].

Treatment for patients diagnosed with the coronavirus disease currently consists of supportive therapy and coping with any developed complications when indicated. As of now, there is no

drug approved for the treatment of the disease, but numerous trials are in progress for finding rational medicines that are effective and safe for the treatment of the coronavirus disease. These include investigational drugs as well as drugs used for other conditions. Remdesivir, chloroquine or hydroxychloroquine, hydroxychloroquine and azithromycin, lopinavir/rotonavir, and other HIV protease inhibitors, interferon alpha and beta, interleukin-1 and interleukin-6 inhibitors, janus kinase inhibitors, and corticosteroids are under evaluation [7]. The use of blood products, such as convalescent coronavirus patient plasma, SARS-CoV-2, and non-SARS-CoV-2 immunoglobulins, are also

investigated [7]. As for prophylaxis, there is currently no approved drug, but the use of hydroxychloroquine, chloroquine, and HIV protease inhibitors for pre- and post-exposure prophylaxis are investigated [7]. Several vaccines against SARS-CoV-2 are going through clinical trials. Due to the current lack of agents for treatment and prophylaxis, the importance of taking precautionary measures against the virus, such as personal hygiene and wearing of masks, is emphasized.

On the other hand, additional measures are necessary in terms of pandemic control. Research [8-10] shows that countries that implemented a rapid and aggressive approach to prevent the lethal virus's spreading have demonstrated better results. Nevertheless, new cases are still reported despite the most serious of measures, so, further research is required to determine risk groups in relation to COVID-19 and possible ways of reducing the death toll by accurate measures. Overall, one of the major impediments in terms of COVID-19 control is asymptomatic transmission of the disease [11].

In order to decrease the death rate of COVID-19 infected patients, it is crucial to understand which patients are more likely to be affected by the disease. It will aid in determining the correct treatment approach. For this reason, our research team obtained and screened data regarding sex, age, and underlying conditions of deceased COVID-19 patients in South Korea and identified some critical factors that can be used when developing COVID-19 treatment strategies.

MATERIAL AND METHODS

This paper examines confirmed COVID-19 cases and the death toll in South Korea in terms of the victims' sex, age, and underlying conditions in deceased patients [12]. Data was obtained from South Korea's Centers for Disease Control (CDC), a control tower of the COVID-19 epidemic in South Korea, and the government-owned Korean Statistical Information Service (KOSIS) [12]. The data from the CDC is reviewed by hundreds of KOSIS data specialists every day. This implies that South Korea's CDC has one of the best COVID-19 data sets around the world. The data was retrieved [12] on May 21, 2020. Providing timely, accurate, and transparent data to the public is essential, seeing as it prevents further infection (as was the problem with the MERS-CoV outbreak in South Korea) [13].

The lethal rate (Eq. 1) was used, along with confirmed cases and death reports, as a statistical measure to screen important factors that can be used as treatment options to reduce the COVID-19 mortality rate.

$$\frac{\text{Amount of deaths reported}}{\text{The amount of confirmed cases}} \times 100 \quad (1)$$

RESULTS

The confirmed cases, deaths reported, and lethal rates for each sex are provided (Table 1).

Table 1: COVID-19 death toll divided by sex [9]

	Deaths reported		Confirmed cases		Lethal Rate (%)
	F	%	F	%	
Male	138	52.3	4616	41.4	2.99
Female	126	47.7	6526	58.6	1.93
Total	264	100	11142	100	2.37

When considering the total death toll, 52.3 % were male and 47.7 % female. The lethal rates were 2.99 % and 1.93 %, respectively, for males and females. Males are slightly more vulnerable to COVID-19, but there is no significant difference between the two sexes' data. This result is similar to that found from the earlier SARS-CoV virus but different from the MERS-CoV virus, where the male to female ratio was 3.3:1 [6]. The confirmed cases, deaths reported, and lethal rates for each age group are provided (Table 2).

Table 2: COVID-19 death toll divided by age [9]

Age	Confirmed cases		Deaths reported		Lethal rate (%)
	F	%	F	%	
0-9	149	1.3	0	0	-
10-19	633	5.7	0	0	-
20-29	3111	27.9	0	0	-
30-39	1225	11.0	2	0.8	0.16
40-49	1473	13.2	3	1.1	0.20
50-59	1374	17.7	15	5.7	0.76
60-69	1369	12.3	38	14.4	2.78
70-79	718	6.4	78	29.5	10.86
80+	490	4.4	128	48.5	26.12
Total	11142	100	264	100	2.37

It is common knowledge that children and the elderly are vulnerable to infectious diseases. However, according to the obtained data, children are not as affected by COVID-19 as initially thought. Only 1.3 % of the total confirmed cases and 0 % of deaths were reported for children younger than nine. The age group of 20 to 29 reported the highest percentage of confirmed cases (27.9 %) but 0 % deaths. The death toll and lethal rate increase from the age of 30 and are significant for the age groups above 60 years old. The total reported cases are equal to 264, 244 of which were confirmed for patients over the age of 60. Also, 92.4 % of deaths occurred in this age group.

Therefore, COVID-19 is lethal for the elderly but not for the young. This is opposed to the SARS-CoV virus, where healthier and younger individuals (average age of 39.9 years) were affected more, but similar to the MERS-CoV virus, where the average infected age was 56 [6].

Table 3: COVID-19 death toll divided by underlying diseases [9]

Underlying conditions	Amount of deceased that suffered from the underlying condition	%(calculated from a basic of 264 deaths)
Circulatory system	202	76.5
Endocrine disruptors	26	47.7
Mental illness	116	43.9
Respiratory system	62	23.5
Urinary system	45	17.0
Cancer	38	14.4
Nervous system	16	6.1
Digestive system	10	3.8
Musculoskeletal system	6	2.3
Hematopoietic system	5	1.9

The amount of deceased with an underlying condition is presented (Table 3). It is important to note that there is an overlap in the statistics (e.g., deceased patients had more than one underlying condition). COVID-19 is transmitted through respiratory droplets (sneezing or coughing) and is, therefore, classified as a respiratory disease [6]. Research has shown that COVID-19 can be carried through person-to-person transmission and asymptomatic transmission [14]. It causes fever, tiredness, coughing, and breathing problems. Accordingly, one might assume that it would affect patients with underlying respiratory conditions the most. However, the current research shows that only 62 deceased patients suffered from a respiratory disorder, as opposed to 202 suffering from a circulatory condition.

Therefore, it is possible to divide all variables analyzed during the research into three major categories: low-risk, moderate-risk, and high-risk groups (Table 4). Accordingly, individuals with two variables belonging to the high-risk group are to be particularly supervised and receive emergency treatment.

DISCUSSION

The data shows that COVID-19 is only lethal to the elderly (above the age of 60) and people with underlying conditions. The four main underlying conditions responsible for COVID-19-related deaths are circulatory system disorders, endocrine

disruptors, mental illnesses, and respiratory system disorders. It is unclear why circulatory system disorders account for the majority of COVID-19-related deaths. The heart and lungs are closely related and might, therefore, be the reason for this tendency. As for mental illnesses, most patients have severe dementia and Schizophrenia and are unable to understand and communicate their health problems.

Table 4: COVID-19 risk groups

	Low-risk	Moderate-risk	High-risk
Age	0-59	60-69	70+
Sex	-	-	-
Underlying conditions	Nervous system	Respiratory system	Circulatory system
	Digestive system	Urinary system	Endocrine disruptors
	Musculoskeletal system	Cancer	Mental illness
	Hematopoietic system		

The data indicate that COVID-19 mortality decrease treatment strategies should be focused on people over 60 years that are suffering from circulatory system disorders. A selection of South Korean hospitals has already followed this approach and received positive results. There are other studies [15] that confirm an increased mortality rate among elderly people in comparison to younger generations.

On the other hand, it might be important to discuss the limitations of the present study. As a matter of fact, the results presented in this research are exclusive to South Korea, while other countries' figures might vary. Therefore, additional research is necessary in order to compare the data with other nations and draw conclusions on the global level. The results of this study reflect the accurate statistics as of the day when the data was collected. It is possible that, as the situation progresses, a larger sample of cases will alter the numbers and tendencies presented in this research.

CONCLUSION

The purpose of this paper was to examine the COVID-19 death cases in South Korea to identify features in the deceased, such as sex, age, and underlying medical conditions, which can be targeted when searching for a COVID-19 treatment strategy. It was discovered that the elderly (people over the age of 60) suffering from circulatory system disorders are the most vulnerable to COVID-19, and treatment strategies should be primarily aimed at them to reduce the death rate of COVID-19.

It is recommended that a similar study is conducted but with relevant data from across Korea and worldwide.

AUTHOR'S CONTRIBUTION

The author agrees on this final form of the manuscript.

CONFLICTS OF INTEREST

The author declare no conflicts of interest regarding the publication of this study.

FINANCIAL DISCLOSURE

No financial interests related to the material of this manuscript have been declared.

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