

Clinical Characteristics and Outcomes among Patients with Covid-19 in Different Regions of the World

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ABSTRACT

The SARS-CoV-2 outbreak began in China in December 2019 and rapidly spread globally. Up to July 2020, the number of cases of coronavirus disease 2019 (COVID-19) had been increasing in the USA, Italy, England, Spain and numerous other countries. Patients with this disease in different countries present with different clinical manifestations and different prognosis. The present study aimed to analyse the clinical characteristics of patients infected with SARS-CoV-2 in different regions of the world and provide special advices for the different regions to prevent the spread and a second outbreak of COVID-19.

Key Words: COVID-19, SARS-CoV-2, Characteristics, Worldwide.

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INTRODUCTION

The novel coronavirus severe acute respiratory syndrome corona virus-2 (SARS-CoV-2) has been rapidly spreading worldwide, with >10 million patients infected with this disease. Up to July 2020, the number of cases of coronavirus disease 2019 (COVID-19) had been increasing in the USA, Italy, England, Spain and numerous other countries.¹⁻⁴ There have been ~13 million reported cases of this pandemic and >500,000 deaths. This disease was originated in Wuhan (Hubei, China).⁵ SARS-CoV-2 has been classified into A, B and C types, according to the gene variants.⁶ Different countries are associated with different SARS-CoV-2 types. European and American patients are mostly infected with the A and C types, while East Asian patients with B type.⁶ Patients with this disease in different countries present with different clinical characteristics including demographics, clinical presentations, comorbidities, and mortalities. It was reported that the median patient age was 52 years in China;⁷ however, the median age of the patients was 40 years in Korea.⁸ The most common symptoms included fever (85.81%; 399 of 465) on admission, followed by cough (67.10%; 312 of 465) in China.⁹ In Poland, the most common symptoms of COVID-19 were fever (43.78%; 74 of 169), shortness of breath (36.09%; 61 of 169), and fatigue (33.73%; 57 of 169).¹⁰ However, the most common symptoms were cough (73.8%; 738 of 1,000), and fever (72.8%; 728 of 1,000), followed by dyspnea (63.10%; 631 of 1000) in the USA.¹¹

The aim of this review was to assess the characteristics of COVID-19 among different countries. The healthcare data of patients with COVID-19 reported worldwide, which may provide specific suggestions for different countries for the diagnosis and prevention of a second outbreak of COVID-19.

METHODOLOGY

Literature review was conducted according to preferred reporting items for systematic reviews and meta-analyses guidelines. Medline, Embase and Web of Science databases were searched between December 1, 2019 and April 30, 2020. The search strategy used a combination of MeSH terms and free terms: '2019-nCoV' or 'SARS-CoV-2' or 'COVID19' and 'clinical feature' or 'clinical characteristics' or 'symptom' or 'manifestation'. Searches were limited to literature published in English.

Studies published in English language about the clinical characteristics, including demographics, clinical presentation, comorbidities and mortality of covid19 were selected. The inclusion criteria were full manuscript on the clinical characteristics of patients with SARS-CoV-2 infection. All the patients in these studies were confirmed with SARS-CoV-2 by laboratory test with a positive result on the reverse transcriptase polymerase chain reaction assay for SARS-CoV-2. Articles with incomplete information, review articles, editorial, case reports, ongoing studies and guidelines were excluded. Two investigators reviewed each full-text articles and finished the studies selection independently. Selected studies were checked together and the disagreements were resolved through consensus. Of the 522 studies reviewed (Figure 1), 27 articles were finally selected. All the patients in the 27 articles were included in this study.

Primary outcome is discharge; and second outcome is remained in hospital. Characteristic included demographics, clinical presentations, comorbidities and mortalities. Data

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about the characteristics including demographics, clinical presentations, comorbidities and mortalities in these studies were extracted by independent investigators. Then the investigators verified the data together. Controversies among investigators were solved by discussion or counselling evidence-based medicine experts in the department. Quality of evidence for randomised studies was assessed according to the cochrane collaboration's tool for assessing risk of bias, and the Newcastle Ottawa scale was used to assess quality of nonrandomised studies.

Five hundred and twenty-two studies were reviewed (Figure 1), and 27 articles were finally selected. The data was analysed through Chi-square test and Fisher's exact test, as appropriate. All statistical analyses were performed using the IBM SPSS version 20.0. Confidence interval (CI) is 95%. A p-value of less than 0.05 was considered to be statistically significant.

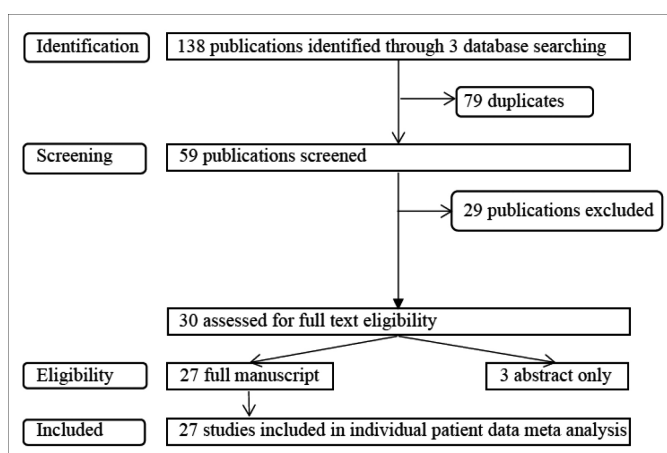


Figure 1: Prisma flow diagram showing the literature research and selection strategy.

RESULTS

A total of 38,753 patients from 27 studies were included in the present study. Characteristics of the studies included in the systematic analysis are listed in Table I.

Before March, the COVID-19 outbreak mainly occurred in Asia. A total of 97.51% (1,723 of 1,767) of the COVID-19 cases were located in Asia. Between March and April, 55.25% (20,425 of 36,968) of COVID-19 cases were found in Europe, with Europe becoming the new main site of the COVID-19 outbreak. Concurrently, the disease began to rapidly spread in the USA, with a total of 33.92% (12,541 of 36,968) cases of COVID-19 occurring in the USA.

To assess the characteristics of COVID-19 according to the month of presentation, the clinical manifestations of COVID-19 reported before March and between March and April were analysed (Table II).

Based on the results, hypertension was among the most common comorbidities. In addition to liver disease and HIV, patients with neurological disorders, chronic lung disease and diabetes mellitus had more COVID-19 in March and April, compared with before March. Fever and cough were the most

common symptoms of COVID-19. As regards dyspnea in the context of COVID-19, the proportion of patients with dyspnea between March and April was 58.47% compared to 14.50% before the period as above.

To date, the COVID-19 outbreak was mainly spread in Asia, Europe and USA. Hence, the world was divided into three regions (Asia, Europe and USA). The characteristics of patients with COVID-19 were compared among different regions of the world (Table III).

The compared characteristics included comorbidities, symptoms and outcomes. The comorbidity rates of patients with COVID-19 vary across different areas, ranging between 0.90 and 55.01%. The hypertension rate was 55.01% in the USA, while it was 44.56% in Europe and 7.81% in Asia.

In Asia, only 3.97% of the patients had heart disease, whereas 17.95% of patients in Europe and 33.2% of those in the USA had heart disease. The rates of diabetes mellitus in Europe (15.67%) and in the USA (28.61%) were also higher compared with those in Asia (5.37%). Similar to the aforementioned comorbidities, 15.50% patients with COVID-19 in Europe and 18.34% in the USA had chronic lung disease, which was higher compared with the reported percentage in Asia (4.00%). By contrast, liver disease is more common as comorbidity among Asians (3.24%).

Next, the symptoms of COVID-19 were compared among Asia, Europe and the USA. The most common symptoms of COVID-19 were fever, coughing and shortness of breath, observed in all regions of the world. However, compared to Asia, the incidence of dyspnea among COVID-19 patients in Europe and the USA is higher. Myalgia is less common in Europe, accounting for only 4.17%, as 26.65% of the patients in the USA suffered from myalgia. As regards nausea and vomiting, only 4.46% and 3.55% had this symptom in Asia and Europe, respectively as compared with 17.80% in USA. Diarrhea was reported in 6.14% in Asia and 5.16% in Europe, whereas 21.32% of patients with COVID-19 in the USA had diarrhea.

Finally, the outcome of COVID-19 among Asia, Europe and USA were compared. In the present study, 41% of patients were discharged overall, 74.12% were discharged in Asia and 40.56% were discharged in Europe. In the USA, 35.62% of patients were discharged, which is lower compared with in Asia. A total of 37.54% of patients in all reported data still remained in hospital to receive treatment, where 18.94% remained in hospital in Asia, compared to 33.86% in Europe. Additionally, 51.34% (5,925/11,541) of patients remained in hospital in the USA. The rates of patients remaining in hospital in the USA and Europe were higher compared with in Asia. Around 25.60% patients died with COVID-19 in Europe, which is higher compared with Asia (6.46%) and the USA (12.58%).

DISCUSSION

The present study described the characteristics of 38,753 patients with COVID-19; worldwide between December 1st 2019 and April 30th, 2020. This disease was first reported in Wuhan, China and rapidly spread to other countries, including Korea, USA, Italy and Iran, among others.²⁹

Table 1: Characteristics of studies and patients included in the systematic analysis.

Authors	Time	Region	Sample	Median age	Males (%)	Study type	
Zhongwei Xiong ⁷	February 9th to March 5, 2020	China	421	52 (39-61)	214	retrospective study	single-center study
Jiangshan Lian ⁹	January 17, 2020, to January 31	China	465	45(5-88)	243 (52.26%)	retrospective study	multicenter study
Marta Colaneri ¹²	February 21 to 28	Italy	44	67.5	28	retrospective study	single-center study
Dawei Wang ¹³	January 1 to 28	China	138	56(42-28)	63	retrospective study	single-center study
Mengyao Ji ¹⁴	January 2 to 28	China	101	51.0 (37.0-61.0)	48 (48%)	retrospective study	single-center study
Michael G Argenziano ¹¹	March 1 to April 5	USA	1000	63.0 (50.0-75.0)	596	retrospective study	single-center study
Annemarie B Docherty ¹⁵	February 6 to and 19 April 2020.	UK	20133	72.9 (58.0-82.0)	12 068 (59.9)	prospective cohort study	multicenter study
Christopher M Petrilli ¹⁶	March 1 2020 to 8 April	USA	5279	54 (38-66)	2615 (49.5)	prospective cohort study	single-center study
Yalei Shanga ¹⁷	January to 2020 to January 26	China	62	41 (32-52)	35 (56)	retrospective study	multicenter study
Håkon Ihle-Hansen ¹⁸	March 9 to 31	Norway	42	72.5	28	retrospective study	single-center study
Helena Barrasa ²	March 1 to 31	Spain	48	63 (12)	27 (56%)	prospective cohort study	multicenter study
Mohamad Nikpouraghdam ⁴	February 19 2020 to April 15 2020	Iran	2964	56(46-65)	1955	retrospective study	single-center study
Guqin Zhang ⁹	February 2 to 10, 2020.	China	221	55.0 (39.0-66.5)	108	retrospective study	single-center study
Ying Sun ²⁰	Before April	China	63	47	37	unclear	unclear
Simone Piva ³	March 2 and March 13	Italy	33	64 (59-72)	30	prospective cohort study	single-center study
Wenjie Yang ²¹	January 17 to February 10	China	149	45.11 ± 13.35	81	retrospective study	multicenter study
Matthew J Cummings ²²	March 2 to April 1, 2020	USA	257	62 (51-72)	171	prospective cohort study	multicenter study
Yalei Shang ¹⁷	January 10th 2020 to March	China	307	46(33, 55)	164	prospective cohort study	multicenter study
Chaolin Huang	January 2, 2020	China	41	49.0 (41.0-58.0)	30	prospective cohort study	single-center study
Nanshan Chen ²³	January 1 to Jan 20, 2020	China	99	55.5 (13.1)	67 (68%)	retrospective study	single-centre study
Eu Suk Kim ⁸	January 19 2020 to February 17, 2020	Korea	28	42.6 ± 13.4	15 (53.6)	prospective cohort study	multicenter study
Rui Huang ²⁴	January 22, 2020 to February 10, 2020	China	202	44.0 (33.0, 54.0)	116 (57.4)	retrospective study	multicenter study
Yiwu Zhou ²⁵	January 20, 2019, and February 8, 2020.	China	366	43 (31.8-51.0)	207 (56.6)	retrospective study	multicenter study
Jeremy A W Gold ²⁶	March 1 to March 30, 2020	USA	305	60(46-69)	49.50%	prospective cohort study	multicenter study
Błażej Nowak ¹⁰	March 16, 2020 and 2020/4/7	Poland	169	63.7 (19.6)	87	retrospective study	single-center study
Safiya Richardson ²⁷	March 1, 2020, and April 4, 2020	USA	5700	63 (52-75)	3437	unclear	multicenter study
Kyung Soo Hong ²⁸	Before March 29th	Korea	98	55.4±17.1	38.00	retrospective study	single-center study

The disease characteristics, such as admission rates, fatality rates and symptoms, vary widely among different regions of the world.⁹⁻¹¹

The aim of the present study was to comprehensively analyse the characteristics of COVID-19 and analyse the risk factors of COVID-19; in different regions of the world providing personal suggestions for the different regions. It was observed that patients in the USA had the highest rate of comorbidities such as hypertension, heart disease, chronic lung disease, and diabetes mellitus; whereas in Asia, the most common comorbidities were liver diseases and HIV infection. This finding indicates that Europe and the USA must improve the screening and preventive

measures for COVID-19 in patients with hypertension, heart disease, chronic lung disease and diabetes mellitus, particularly those with hypertension and/or heart diseases. As regards the clinical symptoms, fever and cough are the most common symptoms worldwide; whereas, the incidence of dyspnea is higher among patients with COVID-19 in Europe and the USA. This finding indicates that, in addition to fever and cough, screening for dyspnea is important for preventing the spread of SARS-CoV-2. This phenomenon may be partially attributed to the high proportion of related comorbidities in patients from Europe and the USA.

Table II: Characteristics of patients with COVID-19 before March and March-April.

	Before March	March-April	p
Comorbidities			
Heart diseases	8.41%	21.75%	0.000
Neurologic disorder	2.94%	11.96%	0.000
Chronic lung disease	1.94%	15.37%	0.000
Diabetes mellitus	7.15%	19.17%	0.000
Hypertension	18.23%	39.68%	0.000
Liver disease	3.27%	1.66%	0.000
Malignancy	2.86%	5.52%	0.000
Kidney disease	1.56%	8.51%	0.000
HIV	2.24%	0.47%	0.000
Symptoms			
Fever	74.98%	62.77%	0.000
Cough	52.53%	63.85%	0.000
Sputum	57.05%	8.89%	0.000
Myalgia	13.52%	23.28%	0.000
Fatigue	27.65%	23.11%	0.047
Short of breath	14.50%	58.47%	0.000
Nausea and vomiting	4.78%	13.21%	0.000
Diarrhea	7.23%	13.89%	0.000
Headache	9.22%	9.03%	
Rhinorrhoea	3.33%	7.50%	0.002
Sore throat	11.86%	9.10%	0.051
Clinical outcomes			
Remains in hospital	62.55%	36.70%	0.000
Discharged	30.94%	43.57%	0.000
Died	3.88%	4.48%	0.478

Table III: Characteristics of COVID-19 patients among Asia, Europe and America.

	Asia	Europe	America	p
Comorbidities				
Heart diseases	w3.97%	17.95%	33.20%	0.000
Neurologic disorder	10.45%	11.99%	11.03%	0.209
Chronic lung disease	4.00%	15.50%	18.34%	0.000
Diabetes mellitus	5.37%	15.67%	28.61%	0.000
Hypertension	7.81%	44.56%	55.01%	0.000
Liver disease	3.24%	1.88%	1.05%	0.000
Malignancy	1.34%	5.70%	6.53%	0.000
Kidney disease	0.90%	8.41%	10.55%	0.000
HIV	2.25%	0.27%	1.04%a	0.000
Fever	72.08%	62.12%	72.47%	0.000
Cough	57.08%	63.76%	71.68%	0.000
Myalgia	15.30%	4.17%	26.65%	0.000
Short of breath/dyspnea	12.38%	59.94%	65.31%	0.000
Nausea and vomiting	4.46%	3.55%	17.80%	0.000
Diarrhea	6.14%	5.16%	21.32%	0.000
Clinical outcomes				
Remains in hospital	18.94%	33.86%	51.34%	0.000
Discharged	74.12%	40.56%	35.62%	0.000
Died	6.46%	25.60%	12.58%	0.000

Patients in Asia had higher rates of discharge and lower rates of mortality compared with Europe and USA ($p=0.000$). In the USA, although the rate of discharge was the lowest among the three areas, the mortality of patients with COVID-19 was not the highest. A possible explanation may be the advanced medical technology available in the USA. However, the mortality rate of patients with COVID-19 in Europe was very high. The higher mortality rates of COVID-19 in Europe and USA may be due to the high rate of comorbidities, suggesting

that more attention should be paid to patients with comorbidities, such as more health monitoring, more protective equipment, more supportive treatment etc.

CONCLUSION

COVID-19 has higher prevalence among patients with comorbidities, such as heart disease, chronic lung disease, and hypertension in the USA and Europe compared with Asia ($p=0.000$). Liver disease and HIV were risk factors associated with COVID-19 in Asia. Hence, patients with HIV and liver disease also should be closely followed in Asia to prevent the spread and a possible second outbreak of COVID-19. Furthermore, not only the symptoms such as fever and cough should be monitored; but also the dyspnea, myalgia, nausea, vomiting, and diarrhea should be screened in Europe and USA. The mortality rates in Europe and USA were significantly higher compared with that in Asia.

PATIENTS' CONSENT:

The consents of the patients were taken prior to the writing of the manuscript.

CONFLICT OF INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

ZY, FH: Contributed to the design of the work and acquisition, analysis, or interpretation of data for the work together. They worked on the drafting of the work or revising it critically for important intellectual content and approved the version to be published. They agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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