



BRIEF REPORT

# Clinical Characteristics and In-Hospital Mortality for COVID-19 Across The Globe

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## ABSTRACT

**Introduction:** Numerous case series have reported on the baseline characteristics and in-hospital mortality of patients with COVID-19, however, these studies included patients localized in a specific geographic region. The purpose of our study was to identify differences in the clinical characteristics and the in-hospital mortality of patients with a laboratory-confirmed diagnosis of COVID-19 internationally.

**Methods:** A comprehensive search of all published literature on adult patients with laboratory-confirmed diagnosis of COVID-19 that reported on the clinical characteristics and in-hospital mortality was performed. Groups were compared using a Chi-square test with Yates

correction of continuity. A two-tailed  $p$  value of less than 0.05 was considered as statistically significant.

**Results:** After screening 516 studies across the globe, 43 studies from 12 countries were included in our final analysis. Patients with COVID-19 in America and Europe were older compared to their Asian counterparts. Europe had the highest percentage of male patients. American and European patients had a higher incidence of co-morbid conditions ( $p < 0.05$  for all variables). In-hospital mortality was significantly higher in America (22.23%) and Europe (22.9%) compared to Asia (12.65%) ( $p < 0.0001$ ), but no difference was seen when compared with each other ( $p = 0.49$ ).

**Conclusions:** There is a significant variation in the clinical characteristics in patients diagnosed with COVID-19 across the globe. In-hospital mortality is similar between America and Europe, but considerably higher than Asia.

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## Key Summary Points

### Why carry out this study?

Numerous case series have reported on the baseline characteristics and in-hospital mortality of patients with COVID-19, however, these studies included patients localized in a specific geographic region.

There is a significant variation in the clinical characteristics in patients diagnosed with COVID-19 across the globe.

### What was learned from the study?

We found American and European patients diagnosed with COVID-19 are older and had a higher incidence of comorbid conditions as compared to Asian patients.

In-hospital mortality is similar between America and Europe, but considerably higher than Asia.

## INTRODUCTION

Coronavirus disease (COVID-19) was declared a pandemic by the World Health Organization on March 11, 2020 [1], and has placed an unprecedented burden on the various health care systems across the globe [2]. Numerous case series have reported on the baseline characteristics and in-hospital mortality of patients with COVID-19, however, these studies included patients localized in a specific geographic region [3–8]. The purpose of our study was to identify differences in the clinical characteristics and the in-hospital mortality of patients with a laboratory-confirmed diagnosis of COVID-19 internationally.

## METHODS

We performed a comprehensive search of PubMed, MEDLINE, Scopus, and Web of

Sciences databases for studies published between January 1, 2020, and May 1, 2020. The following keywords were used for search in different combinations: “Coronavirus 2019”, “COVID-19”, “novel coronavirus”, “SARSCoV2”, “clinical characteristics”, “baseline demographics”, “mortality”, “all-cause mortality”, “in-hospital outcomes”, and “outcomes”. We included studies that had more than ten adult patients (> 18 years), and reported clinical characteristics of patients diagnosed with laboratory-confirmed COVID-19, along with all-cause mortality as one of the outcomes. We excluded studies from publicly available databases, which did not report clinical characteristics. In addition, we excluded nationwide in-hospital sample datasets and multicenter registries to avoid an overlap in patient populations. All studies from China were thoroughly evaluated for duplication of patients. If a single center had multiple publications, studies with a smaller sample size and those lacking outcomes of interest were excluded.

## Compliance with Ethics Guidelines

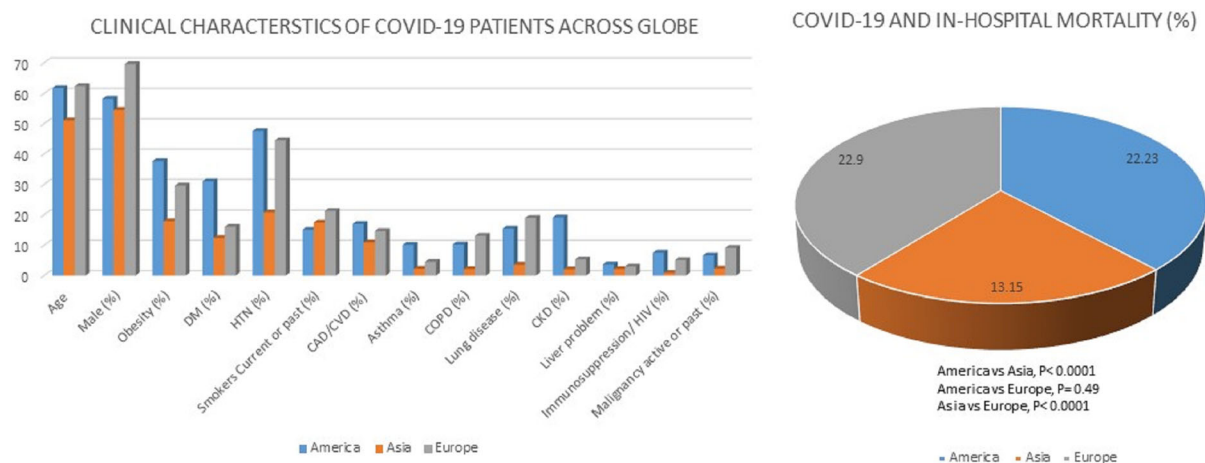
This article is based on previously conducted studies and does not contain any studies with human participants or animals performed by any of the authors. The database used in the study is publicly available and can be found at <https://pubmed.ncbi.nlm.nih.gov/?term=COVID-19+AND+clinical+characteristic+AND+Mortality&sort=date&size=100>.

## RESULTS

After screening 516 studies across the globe, 43 studies from 12 countries [3–45] were included in our final analysis. We categorized these studies into three geographical areas: America [11 studies (10- United States; 1- Brazil)], Asia [24 studies (20- China; 1-India; 1-Iran; 1-Korea; 1-Singapore)], and Europe [8 studies (3-Italy; 2-France; 1- Denmark; 1-Ireland; 1-Spain)]. Of the 43 studies, 11 of them reported data strictly on patients who were in critical condition [4–6, 10, 11, 22, 32, 35, 38, 42, 45]. A Chi-square test with Yates correction of continuity for

**Table 1** Clinical characteristic of COVID-19 patients across the globe

Geographical area	America	Asia	Europe	America vs. Asia [% Difference, (95% CI), <i>p</i> value]	America vs. Europe [% Difference, (95% CI), <i>p</i> value]	Asia vs. Europe [% Difference, (95% CI), <i>p</i> value]
Total number	7287	6776	2624			
Average age (years)	61.73	51.12	62.37	NA	NA	NA
Male (%)	58.21	54.51	69.58	3.7 (2.05–5.34), <i>p</i> < 0.0001	11.37 (9.24–13.46), <i>p</i> < 0.0001	15.07 (12.91–17.19), <i>p</i> < 0.0001
Obesity (%)	37.65	17.9	29.63	19.75 (18.29–21.19), <i>p</i> < 0.0001	8.02 (5.91–10.09), <i>p</i> < 0.0001	11.73 (9.75–13.73), <i>p</i> < 0.0001
DM (%)	30.97	12.39	16.08	18.58, (17.24–19.9), <i>p</i> < 0.0001	14.89 (13.08–16.64), <i>p</i> < 0.0001	3.69 (2.08–5.34), <i>p</i> < 0.0001
HTN (%)	47.57	20.8	44.5	26.77 (25.25–28.27), <i>p</i> < 0.0001	3.07 (0.82–5.30), <i>p</i> < 0.0074	23.7 (21.55–25.58), <i>p</i> < 0.0001
Smokers current or past (%)	15.08	17.46	21.32	2.38 (1.14–3.61), <i>p</i> = 0.0001	6.24 (4.47–8.05), <i>p</i> < 0.0001	3.86 (2.05–5.71), <i>p</i> < 0.0001
CAD/CVD (%)	17	10.91	14.65	6.09 (4.94–7.23), <i>p</i> < 0.0001	2.35 (0.69–3.94), <i>p</i> = 0.0058	3.74 (2.2–5.33), <i>p</i> < 0.0001
Asthma (%)	10.15	2.25	4.5	7.9 (7.11–8.69), <i>p</i> < 0.0001	5.65 (4.54–6.69), <i>p</i> < 0.0001	2.25 (1.39–3.17), <i>p</i> < 0.0001
COPD (%)	10.25	2.13	13.1	8.12 (7.33–8.91), <i>p</i> < 0.0001	2.85 (1.39–4.36), <i>p</i> = 0.0001	10.97 (9.64–12.36), <i>p</i> < 0.0001
Lung disease (%)	15.48	3.56	19	11.92 (10.97–12.87), <i>p</i> < 0.0001	3.52 (1.8–5.27), <i>p</i> < 0.0001	15.44 (13.83–17.05) <i>p</i> < 0.0001
CKD (%)	19.15	2.04	5.35	17.11 (16.14–18.08), <i>p</i> < 0.0001	13.8 (12.5–15.04), <i>p</i> < 0.0001	3.31 (2.04–4.29), <i>p</i> < 0.0001
Liver problems (%)	3.65	2.16	3	1.49 (0.92–2.05), <i>p</i> < 0.0001	0.65 (– 0.18 to 1.41), <i>p</i> = 0.13	0.84 (0.11–1.63), <i>p</i> < 0.02
Immunosuppression/ HIV (%)	7.52	0.84	5.1	6.68 (6.03–7.34), <i>p</i> < 0.0001	2.42 (1.33–3.44), <i>p</i> < 0.0001	4.26 (3.41–5.19), <i>p</i> < 0.0001
Malignancy active or past (%)	6.64	2.3	9.12	4.34 (3.65–5.02), <i>p</i> < 0.0001	2.48 (1.25–3.77), <i>p</i> < 0.0001	6.82 (5.67–8.03), <i>p</i> < 0.0001
In-hospital mortality (%)	22.23	13.15	22.9	9.08 (7.82–10.33), <i>p</i> < 0.0001	0.67 (– 1.19 to 2.58), <i>p</i> = 0.49	9.75 (7.95–11.58), <i>p</i> < 0.0001



**Fig. 1** Clinical characteristics and in-hospital mortality of COVID-19 patients across the globe

comparison of two proportions (from independent samples) was performed. A two-tailed  $p$  value of less than 0.05 was considered as statistically significant.

In total, 16,687 patients had a laboratory-confirmed diagnosis of COVID-19 (Americas 7287, Asia 6776, and Europe 2624). Patients diagnosed with COVID-19 from America and Europe were older compared to their Asian counterparts. Europe had the highest percentage of male patients ( $p < 0.0001$ ). American and European patients diagnosed with COVID-19 had a higher prevalence of co-morbid conditions—obesity, diabetes mellitus (DM), hypertension (HTN), coronary artery disease (CAD)/cardiovascular disease (CVD), asthma, chronic obstructive pulmonary disease (COPD), lung disease, chronic kidney disease (CKD), liver problems, immunosuppression/human immunodeficiency virus infection (HIV), and malignancy compared to Asian patients ( $p < 0.05$  for all variables) (Table 1). Baseline characteristics varied considerably between American and European patients as well ( $p < 0.05$  for all variables), except for liver disease ( $p = 0.13$ ). The reported in-hospital mortality was 22.23% in America, 22.9% in Europe, and 12.65% in Asia (Fig. 1). In-hospital mortality was significantly higher in America and Europe compared to Asia ( $p < 0.0001$ ), but no significant difference in in-hospital mortality was seen when compared with each other

( $p = 0.49$ ), despite most of the reported patients from Europe being critically ill.

## DISCUSSION

To the best of our knowledge, this study is the first to systematically evaluate the overall prevalence of comorbid conditions and in-hospital mortality among patients diagnosed with COVID-19 across the globe. When comparing patients based on their geographic location, a significant difference in the clinical characteristics and in-hospital mortality was seen among patients diagnosed with COVID-19. Despite considerable variations in the individual studies due to the sample size, severity of disease (mild illness vs. critical illness) and geographical region, cardiovascular comorbidities such as HTN, DM, and CAD/CVD were the most common comorbidities in patients diagnosed with COVID-19. Apart from cardiovascular diseases, respiratory conditions [lung disease, COPD, or asthma], CKD, and immunosuppression/HIV were also prevalent among COVID-19 patients.

### Limitations

Our results should be interpreted with the caveat that most studies did not have complete follow-up data, and the majority of patients were still hospitalized without a definite

outcome (i.e., mortality). Therefore, it is difficult to ascertain an accurate case fatality rate from this study. In addition, patient age was reported as mean in some studies and median in others, and as a result, we cannot determine if patient age was significantly different between the groups.

## CONCLUSIONS

There is a significant variation in the clinical characteristics in patients diagnosed with COVID-19 across the globe. In-hospital mortality is similar between America and Europe, but considerably higher than Asia.

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**Disclosures.** Sunny Goel MD, Tarun Jain MD, Amit Hooda MD, Rohit Malhotra MD, Gurpreet Johal MD, Reza Masoomi MD, Haroon Kamran MD, Parasuram Melarcode Krishnamoorthy MD, Nagendra Boopathy Senguttuvan MD, Abhishek Sharma, MD, Umesh Gidwani MD have nothing to disclose.

**Compliance with Ethics Guidelines.** This article is based on previously conducted studies and does not contain any studies with human participants or animals performed by any of the authors. The database used in the study is publicly available and can be found at <https://pubmed.ncbi.nlm.nih.gov/?term=COVID-19+AND+clinical+characterstic+AND+Mortality&sort=date&size=100>

**Data Availability.** The datasets during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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