Epidemiological Characteristics of SARS-CoV-2 in Elderly Mexican Population: A Perspective of Mortality

Noelia Carolina Del Castillo Salazar1,2*, Martin Luis Figueroa Velásquez3, Jesús Ojino Sosa-García4, and José Ángel González Sánchez1,2

1Internal Medicine, Hospital General de Zona, Mexico
2Instituto Mexicano del Seguro Social, Hermosillo, Sonora, Mexico
3Fellow in Infectology, Centro Médico Nacional “La Raza”, Instituto Mexicano del Seguro Social, México
4Internal Medicine and Intensive Care, Unidad de Terapia Intensiva, Hospital Médica Sur, México

*Corresponding author: Noelia Carolina Del Castillo Salazar, Internal Medicine, Hospital General de Zona # 2; Instituto Mexicano del Seguro Social, Benito Juárez No. 206, Colonia Modelo, C.P. 83190, Hermosillo, Sonora, México, Tel: +52-(622)-214-14-15

Abstract

Background: COVID-19 caused by the SARS-CoV-2 virus emerged in China at the end of December 2019, affecting the world population. Elderly people are considered a risk population for complications and mortality by SARS-CoV-2.

Methods: We analyzed the open data of COVID-19 from the Mexican government from March 19th to June 19th, 2020. A total of 141,009 cases were included, of which 7,394 were patients over the age of 65 and had a positive RT-PCR test for SARS-CoV-2. We investigated symptoms, comorbidities, pneumonia diagnosis, the need for hospitalization, orotracheal intubation, and intensive care unit (ICU) admission. The data was analyzed with SPSS version 25.0 for Windows.

Results: In a population over the age of 65 years, 57% (n = 3,899) were men; 59.7% (n = 4,413) required hospitalization; and 50.4% (n = 3,724) had a diagnosis of pneumonia. The most frequent comorbidity was hypertension with 46.4% (n = 3,433), followed by diabetes with 34% (n = 2,514). The main symptoms were cough (78.8%), fever (73.8%), dyspnea (58.7%), and headache (65.1%). 8.9% (n = 661) required mechanical ventilation and 5.3% (n = 394) were admitted to the ICU. The mortality was of 39.5% (n = 2,917).

Conclusions: Comorbidities are frequent in older adults and mortality is high. In this population, a small proportion of patients were intubated and admitted to the ICU.

Keywords

SARS-CoV-2, COVID-19, Coronavirus, Elderly population, Mortality

Introduction

In late 2019, a group of patients with pneumonia of unknown origin were linked to a seafood market in Wuhan, China. On December 31st, the Chinese Center for Disease Control and Prevention (CDC of China) sent a rapid-response team to accompany health authorities in Hubei Province and Wuhan City to investigate these cases [1].

In January 2020, a new coronavirus was identified as the causal agent for these patients [2,3]. Subsequently, the virus was named by the World Health Organization (WHO) as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the disease caused by it became known as Coronavirus 2019 (COVID-19) [4,5].

The disease affected various provinces of China and other countries in the world and consequently, it was declared as a pandemic by WHO. The spread of the virus has been such that it has caused a significant economic and healthcare burden on health systems all around the world [6].
Since the first reports of patients with this disease, advanced age was proposed as a risk factor for progressing to severe disease and a ‘darker’ prognosis [7,8]. The proportion of elderly patients admitted to a hospital varies according to the studied region. A study in Wuhan, China found that from all patients infected with COVID-19, 18.6% were elderly people [9] (the proportion of other studies carried out in China ranges from 11-37% [10,11]). This contrasts with studies carried out in other regions of the world. For example, a study carried out in Spain reported that 57.9% of patients hospitalized for COVID-19 were over 65-years-old [12], figures similar to a study carried out in Lombardy Italy, which reported that 60% of patients who were admitted to the hospital were over the age of 60 [13].

On another note, multiple studies have shown that patients over the age of 65 who require mechanical ventilation are more likely to die compared to younger patients [14]. The CDC has reported that 8 out of 10 deaths caused by COVID-19 are from people of the above age group [15].

In addition to age, other factors have been implicated as predictors of poor prognosis. At least five studies have reported that male patients have a worse prognosis. Specific comorbidities have also been associated with worse outcomes in these patients, such as diabetes, hypertension, obesity, and coronary heart disease [16].

In Mexico, there is scarce information in this regard. Therefore, the objective of this study is to describe the epidemiological characteristics of patients over the age of 60 with a diagnosis of SARS-CoV-2 in Mexico City.

**Methods**

An observational, descriptive, transversal for longitudinal and retrospective study was developed. We used the open data from the government of Mexico City (https://datos.cdmx.gob.mx/pages/covid19/) from March 19th to June 19th, 2020. We selected patients over 65 years of age with a positive RT-PCR for SARS-CoV-2. A total of 7,394 patients were included in this study (Figure 1).

We included demographic data such as age, sex, co-morbidities, symptoms presented at the moment of the epidemiological studies, hospitalization requirement, mechanical ventilation, intensive care unit [ICU] admission, and the outcome ‘survived’ or ‘did not survive’ for any cause.

**Statistical analysis**

The data distribution was determined with Kolmogorov-Smirnov. The categorical and continuous data are shown with percentages, and median and standard deviation [SD], respectively. A comparison of groups (‘did not survive’ and ‘survived’) was conducted. T-student test was used to compare means and chi-square to find association in categorical data. The data was analyzed with the statistical package SPSS version 25.0.

**Results**

A total of 141,009 patients were diagnosed with COVID-19. 7,394 patients aged over 65 years were included, of which 57% (n = 4,216) were men. The mean age of the sample was 73.35 ± 7.02 years old (Table 1).

The most frequent comorbidities were hypertension (46.4%, n = 3,433), diabetes (34%, n = 2,514), and obesity (17.9%, n = 1,323). Statistical differences existed with diabetes (p = < 0.001), Chronic Obstructive Pulmonary Disease (COPD) (p = < 0.001), hypertension (p = < 0.001),
23.6% of patients \( (n = 1,744) \) had viral exposure to SARS-CoV-2 (Table 1). This group had less mortality \( (p < 0.001) \). Symptoms like fever, cough, dyspnea, irritability, chest pain, chills, headache, myalgia, arthralgias, malaises, polypnea, abdominal pain, and cyanosis were more frequently found in the non-survivor group. The patients received previous treatment with antipyretics \( (44.5\%, \ n = 3,292) \), antibiotics \( (23.6\%, \ n = 1,746) \), and chronic kidney disease \( (p < 0.001) \), and smoking (Table 1).

The main symptoms were cough \( (78.7\%) \), fever \( (73.7\%) \), headache \( (65.1\%) \) and malaise \( (58.2\%) \). The mean time between the start of symptoms and testing (RT-PCR for SARS-CoV-2) was 7.6 ± 6.6 days. The disease was classified as influenza type in 47.3% \( (n = 3,495) \) and acute respiratory illness in 47.3% \( (n = 3,899) \) (Table 2).

### Table 1: Group comparison of population characteristics based on mortality.

| Characteristics | Total | Did Not Survive | Survived | P-value |
|----------------|-------|-----------------|----------|---------|
| Sex            |       |                 |          |         |
| Men            | 4216  (57.0) | 1877 (64.3) | 2339 (52.2) | < 0.001 |
| Age            | 73.35 ± 7.02 | 74.0 ± 6.94 | 72.8 ± 7.0 | < 0.001 |
| Comorbidities  |       |                 |          |         |
| Diabetes       | 2514 (34.0) | 1115 (38.5) | 1399 (31.4) | < 0.001 |
| COPD           | 466 (6.3) | 216 (7.5) | 250 (5.6) | < 0.001 |
| Asthma         | 109 (1.5) | 30 (1.0) | 79 (1.8) | 0.011 |
| Immunosuppressive therapy | 216 (2.9) | 92 (3.2) | 124 (2.8) | 0.448 |
| Hypertension   | 3433 (46.4) | 1427 (49.3) | 2006 (45.0) | < 0.001 |
| HIV            | 35 (0.5) | 11 (0.4) | 24 (0.5) | 0.334 |
| Other conditions | 294 (4.0) | 132 (4.6) | 162 (3.6) | 0.049 |
| Cardiac disease | 544 (7.4) | 231 (8.0) | 313 (7.0) | 0.125 |
| Obesity        | 1323 (17.9) | 550 (19.0) | 773 (17.4) | 0.069 |
| Chronic kidney disease | 344 (4.7) | 191 (6.6) | 153 (3.4) | < 0.001 |
| Smoking        |       |                 |          |         |
| Viral exposure  | 1744 (23.6) | 256 (26.2) | 1488 (48.4) | < 0.001 |
| Exposure to birds | 134 (1.8) | 40 (1.4) | 94 (2.1) | 0.025 |
| Exposure to pigs | 38 (0.5) | 6 (0.2) | 32 (0.7) | 0.003 |

### Table 2: Group comparison of symptoms based on mortality.

| Symptoms          | Total | Did Not Survive | Survived | P-value |
|-------------------|-------|-----------------|----------|---------|
| Fever             | 5451 (73.7) | 2388 (81.9) | 3063 (68.5) | < 0.001 |
| Cough             | 5822 (78.7) | 2432 (83.5) | 3389 (75.7) | < 0.001 |
| Odynophagia       | 2898 (39.2) | 1171 (41.1) | 1727 (39.3) | 0.138 |
| Dyspnea           | 4340 (58.7) | 2284 (78.3) | 2056 (46.0) | < 0.001 |
| Irritability      | 1330 (18.0) | 568 (19.6) | 762 (17.0) | 0.006 |
| Diarrhea          | 1607 (21.7) | 622 (21.4) | 985 (22.0) | 0.524 |
| Chest pain        | 2314 (31.3) | 1059 (37.2) | 1255 (28.5) | < 0.001 |
| Chills            | 2645 (35.8) | 1126 (39.6) | 1519 (34.6) | < 0.001 |
| Headache          | 4816 (65.1) | 1968 (67.6) | 2848 (63.7) | 0.001 |
| Myalgias          | 4110 (55.6) | 1736 (60.7) | 2374 (53.8) | < 0.001 |
| Arthralgias       | 3935 (53.2) | 1694 (59.3) | 2241 (50.7) | < 0.001 |
| Malaise           | 4304 (58.2) | 1925 (66.9) | 2379 (53.8) | < 0.001 |
| Rhinorrhea        | 1760 (23.8) | 677 (23.8) | 1083 (24.6) | 0.438 |
| Polypnea          | 1625 (22.0) | 908 (32.0) | 717 (16.3) | < 0.001 |
| Vomiting          | 713 (9.6) | 298 (10.5) | 415 (9.5) | 0.146 |
| Abdominal pain    | 1038 (14.0) | 442 (15.6) | 596 (13.6) | 0.017 |
| Conjunctivitis    | 672 (9.1) | 240 (8.5) | 432 (9.9) | 0.047 |
| Cyanosis          | 651 (8.8) | 376 (13.3) | 275 (6.3) | < 0.001 |
| Sudden onset of symptoms | 2706 (36.6) | 1050 (36.5) | 1656 (37.8) | 0.261 |
antivirals (14.8%, n = 1,098). Oseltamivir was the most common with 14% (n = 1,038). 59.7% (n = 4,413) of the patients required in-hospital treatment, where 50.4% (n = 3,724) were diagnosed with pneumonia, 8.9% (n = 661) required mechanical ventilation, and 5.3% were admitted to the ICU (Table 2).

The mortality was of 39.5% (n = 2,917). The time from the start of symptoms until death was 12.8 ± 8.4 days and from admission until death was of 8.4 ± 7.7 days (Table 3). The group of non-survivors was diagnosed with serious acute respiratory disorder (77.8% vs. 36.4%, p < 0.001); ambulatory treatment such as antipyretics, antibiotics, and antiviral use was related to developing pneumonia (78.5% survived, 32.1% did not survive, p < 0.001). 10.9% of out-patients died compared to 89.1% of in-patients (p < 0.001). The first group required mechanical ventilation (20.7% vs. 6.8%, p = < 0.001) and was admitted to the ICUs (10.1% vs. 2.2%, p = < 0.001) (Table 3 and Table 4).

Discussion

A total of 7,394 cases of patients over the age of 65 were included in the study. The percentage of patients with a positive PCR test for SARS-CoV-2 was 5.2%, which contrasts with most of the literature published in other countries where the percentage of patients is higher. For example, in China, ranging from 11% to 37% [10,11] and 57% to 60% in studies carried out in Spain and Italy, respectively. However, these studies only included patients who required admission to a hospital, unlike our analysis which included in-patients and out-patients [12,13].

The mortality was found to be 39.5%, a percentage significantly higher than that of other studies, where mortality does not exceed 5% in elderly patients. The percentage of men in the group of non-survivors was higher (64.3%) and the mean age was two years higher than that of the survivors, which coincides with previous literature where it has been proposed that the male sex and older age are risk factors of fatal outcomes [10,14]. Men were also found to be more affected in the non-survivor group (64.3%), and the mean age was two years older than that of survivors.

Significant statistical differences were found between the group of survivors and those who did not survive in relation to comorbidities. The latter was found to

| Table 3: Group comparison of disorder classification and ambulatory treatment based on mortality. |
|---------------------------------------------------------------|
| **Total** | **Did Not Survive** | **Survived** | **P-value** |
| **Started of symptoms until register** | 7.6 ± 6.6 | 7.25 ± 5.47 | 7.95 ± 7.24 | < 0.001 |
| **Classification disorder** |  |  |  | < 0.001 |
| **Influeza type disease** | 3495 (47.3) | 649 (22.2) | 2846 (63.6) |  |
| **Serious Acute Respiratory Infection** | 3899 (52.7) | 2268 (77.8) | 1631 (36.4) |  |
| **Ambulatory treatment** |  |  |  |  |
| **Antipiretics** | 3292 (44.5) | 1142 (39.7) | 2150 (48.3) | < 0.001 |
| **Antibiotics** | 1746 (23.6) | 739 (68.0) | 1007 (31.2) | < 0.001 |
| **Antiviral** | 1098 (14.8) | 586 (21.7) | 512 (11.9) | < 0.001 |
| **Type of antiviral** |  |  |  | 0.004 |
| **Aciclovir** | 2 (0.02) | 0 | 2 (0.2) |  |
| **Amantadina** | 18 (0.2) | 5 (0.9) | 13 (2.6) |  |
| **Lopinavir/Ritonavir** | 28 (0.4) | 7 (1.2) | 21 (4.1) |  |
| **Oseltamivir** | 1038 (14.0) | 570 (97.4) | 468 (92.3) |  |
| **Rimantadina** | 4 (0.1) | 2 (0.3) | 2 (0.4) |  |
| **Zavamivir** | 2 (0.02) | 1 (0.2) | 1 (0.2) |  |

| Table 4: Group comparison of outcome by mortality. |
|---------------------------------------------------------------|
| **Total** | **Did not Survive** | **Survived** | **P-value** |
| **Management** |  |  |  | < 0.001 |
| **Out-patient** | 2981 (40.3) | 317 (10.9) | 2664 (59.5) |  |
| **In-patient** | 4413 (59.7) | 2600 (89.1) | 1813 (40.5) |  |
| **Pneumonia** | 3724 (50.4) | 2289 (78.5) | 1435 (32.1) | < 0.001 |
| **Mechanical ventilation** | 661 (8.9) | 538 (20.7) | 123 (6.8) | < 0.001 |
| **Intensive care unit admittance** | 394 (5.3) | 294 (10.1) | 100 (2.2) | < 0.001 |
| **Mortality** | 2917 (39.5) |  |  |  |
| **Time from de symptoms until death** | 12.8 ± 8.4 |  |  |  |
| **Time from admittance until death** | 8.4 ± 7.7 |  |  |  |
have multiple comorbidities such as diabetes, hypertension, chronic kidney disease and smoking. However the difference was not significant regarding obesity, which contrast with studies where it has been presented as a risk factor [10,15].

The most frequent symptoms coincide with those reported in recent literature, predominantly fever, cough, general malaise, headache and dyspnea. However, a significant proportion presented chest pain and diarrhea, which have not been reported as frequently in younger patients [9,16,17].

This data provided an overview of the increase of complications in elderly patients, where more than half required hospitalization and mortality was higher. Nevertheless, the proportion of patients managed with mechanical ventilation was relatively low (8.9%). It was found that various comorbidities are related to fatal outcomes in these patients and that they can present symptoms that are considered rare in younger patients.

Conclusions

COVID-19 affects the elderly population resulting in higher mortality compared to results from other countries. Elderly patients are less frequently intubated and admitted to the ICU. More analysis regarding the context of each health clinic should be conducted to determine risk factors and bioethics issues that would help create health interventions for the future that improve treatment and reduce mortality rates.

Ethics

We follow the Mexican guidelines for clinical research.

Acknowledgement

We appreciate the facilities given by the Mexican government for allowing us to download and analyse data for free.

References

1. Zhu N, Zhang D, Wang W, Li X, Yang B, et al. (2020) A Novel Coronavirus from Patients with Pneumonia in China, 2019. N Engl J Med 382: 727-733.
2. Pfefferle S, Reucher S, Nörz D, Lütgehetmann M (2020) Evaluation of a quantitative RT-PCR assay for the detection of the emerging coronavirus SARS-CoV-2 using a high throughput system. Euro Surveill 25: 2000152.
3. Chan JF-W, Kok K-H, Zhu Z, Chu H, To KK-W, et al. (2020) Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan. Emerg Microbes Infect 9: 221-236.
4. Zheng M, Gao Y, Wang G, Song G, Liu S, et al. (2020) Functional exhaustion of antiviral lymphocytes in COVID-19 patients. Cell Mol Immunol 17: 533-535.
5. (2020) Who.int Home (online)
6. Ali A, Mohamed S, Elkhidir I, Elbathani M, Ibrahim A, et al. (2020) The Association of Lymphocyte count and levels of CRP, D-Dimer, and LDH with severe coronavirus disease 2019 (COVID-19): A Meta-Analysis. medRxiv.
7. Zhou F, Yu T, Du R, Fan G, Liu Y, et al. (2020) Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. Lancet 395: 1054-1062.
8. Cheng Y, Luo R, Wang K, Zhang M, Wang Z, et al. (2020) Kidney disease is associated with in-hospital death of patients with COVID-19. Kidney International 97: 829-838.
9. Guo T, Shen Q, Guo W, He W, Li J, et al. (2020) Clinical Characteristics of Elderly Patients with COVID-19 in Hunan Province, China: A Multicenter, Retrospective Study. Gerontology 66: 467-475.
10. Deng Y, Liu W, Liu K, Fang Y-Y, Shang J, et al. (2020) Clinical characteristics of fatal and recovered cases of coronavirus disease 2019 in Wuhan, China: a retrospective study. Chin Med J 133: 1261-1267.
11. Terpos E, Ntanasis-Stathopoulos I, Elalamy I, Kastritis E, Sergentanis TN, et al. (2020) Hematological findings and complications of COVID-19. Am J Hematol 95: 834-847.
12. Casas Rojo JM, Antón Santos JM, Millán Núñez-Cortés J, Lumbreras Bermejo C, Ramos Rincón JM, et al. (2020) Clinical characteristics of patients hospitalized with COVID-19 in Spain: Results from the SEMI-COVID-19 Network. Rev Clin Esp 220: 480-494.
13. Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, et al. (2020) Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy. JAMA 323: 1574-1581.
14. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, et al. (2020) Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. JAMA 323: 2052-2059.
15. Sosa-García JO, Gutiérrez-Villaseñor AO, García-Briones A, Romero-González JP, Juárez-Hernández E, et al. (2020) Experience in the management of severe COVID-19 patients in an intensive care unit. Cir Cir 88: 569-575.
16. Lithander FE, Neumann S, Tenison E, Lloyd K, Welsh TJ, et al. (2020) COVID-19 in older people: A rapid clinical review. Age Ageing 49: 501-515.
17. Liu K, Chen Y, Lin R, Han K (2020) Clinical features of COVID-19 in elderly patients: A comparison with young and middle-aged patients. J Infect 80: e14-e18.