Original Article

Evaluation of comorbidities in the SARS-CoV-2-related mortalities: A retrospective observation from a dedicated COVID-19 care hospital

Nisha Khanna, Shreekant Bharti, Guralarasan G, Surabhi, Tarun Kumar, Ruchi Sinha, Punam P. Bhadani

Department of Pathology/Lab. Medicine, All India Institute of Medical Sciences, Patna, Bihar, India

Abstract

Since its discovery in Wuhan, China, in December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread rapidly around the world with being declared a pandemic in March 2020 by the World Health Organization (WHO). Comorbidities are one of the most concerning clinical considerations for mortality. **Materials and Methods:** This was a retrospective observational study conducted at the All India Institute of Medical Sciences in Patna, Bihar, from June 2020 to December 2020. It included adult patients who succumbed to coronavirus disease 2019 (COVID-19) during this period, and their relevant information, such as demographic information hospital stay duration, haematological parameters and comorbidities, was gathered. **Results:** The mean age of the study group was 63.5 (11.8) years. Of 150 cases, 126 men (about 84 per cent) and 24 women were involved (16 per cent). In our study, hypertension (HTN) was shown to be the most frequent comorbidity at 68.7% (103/150), followed by diabetes mellitus (DM) at 61.3% (92/150). The most prevalent haematological disorder identified in our investigation was anaemia and leucocytosis. **Conclusion:** The categorisation of patients who would need extra measures including early hospitalisation, heightened monitoring and intense therapy would be made easier by identifying patient traits and conditions.

Keywords: Comorbidities, coronavirus, COVID-19 care, mortality, SARS-CoV-2

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spread rapidly around the world since it was first reported in Wuhan, China, in December 2019. It was declared a pandemic on March 11, 2020, by the World Health Organization (WHO). It has led to a public health emergency globally. The coronavirus disease 2019 (COVID-19) has spread at an unprecedented speed infecting people of all ages and ethnicities leading to millions of deaths worldwide. Coronaviruses (CoVs) are classified into four genera: α-CoV, β-CoV, ϒ-CoV and δ-CoV. Among these, only α- and β-CoVs are known to cause diseases in mammals. The life-threatening respiratory disorders such as SARS in 2003 and the Middle East respiratory syndrome (MERS) in 2012 were caused by β-CoV. SARS-CoV-2 also belongs to β-CoV, and an enveloped virus with a positive-sense Ribonucleic Acid (RNA) genome is culpable for COVID-19.[1] Currently, the lack of effective antivirals, economic burdens and improper treatment tactics have caused a rise in poor clinical outcomes. A risk stratification based on clinical, radiological and laboratory parameters seems necessary to better identify those patients who may need hospital and/or intensive care unit (ICU) admission.[2] The presence of comorbidities is one of the alarming clinical

Address for correspondence: Dr. Shreekant Bharti, Department of Pathology/Lab. Medicine, All India Institute of Medical Sciences, Patna - 801 507, Bihar, India.
E-mail: drskbpath@gmail.com

Received: 11-12-2022 **Revised:** 12-07-2023
Accepted: 17-07-2023 **Published:** 06-03-2024

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_2404_22

How to cite this article: Khanna N, Bharti S, Guralarasan G, Surabhi, Kumar T, Sinha R, *et al*. Evaluation of comorbidities in the SARS-CoV-2-related mortalities: A retrospective observation from a dedicated COVID-19 care hospital. J Family Med Prim Care 2024;13:585-8.

considerations in these patients. Comorbidities are associated with more complex clinical management, worse health outcome and increased healthcare cost. The ongoing infection has put a major responsibility on primary care physicians who are at the forefront of COVID-19 management. It is prudent to enable them with more robust evidence on factors that may affect the outcome of COVID-19 patients so that a better strategy may be adopted by the physicians for different patients having various risk factors. There are multiple risk factors that are associated with COVID-19 outcomes. For example, the male population has a higher rate of SARS-CoV-2 infection compared with females.[3,4] Studies have shown that a higher incidence of severe and fatal COVID-19 is observed with increasing age,[5] and it is speculated that this phenomenon is partly attributed to pre-existing comorbid conditions. Severe outcomes of COVID-19 have been consistently associated with older age and pre-existing chronic conditions in developed countries. There is a paucity of studies on COVID-19-related mortality in Asia, particularly in low-resource settings. The association of definite predictive factor in terms of an associated comorbidity in COVID-19 patients is yet to be elucidated for such high death rates, especially in this part of India. This study aimed to focus on the profiling of comorbidity patterns with common haematological parameters and their impact on COVID-19-related mortality in our regional context.

Materials and Methods

This was a retrospective observational study conducted at All India Institute of Medical Sciences, Patna (AIIMS, Patna), Bihar, including all hospitalised adult COVID-19-positive patients who died at AIIMS, Patna, from June 2020 to December 2020. Paediatric patients (aged less than 14 years) were not included in this study. Patients included in the study had a confirmed COVID-19 diagnosis at the time of death. An Institutional Ethics Committee approval was taken (AIIMS/Pat/IEC/2020/829; 6/01/2022). Patient (deceased) identification data were concealed. Relevant demographic information, that is demographic data (age, sex), duration of hospitalisation, haematological parameters (haemoglobin, total leucocyte count and platelet count) and comorbidities including diabetes mellitus (DM), hypertension (HTN), chronic kidney disease (CKD), coronary artery disease (CAD), tuberculosis, chronic obstructive pulmonary disease (COPD), Human Immunodeficiency Virus (HIV) and autoimmune diseases, was collected from medical records of the patient after retrieving patient files from the medical record department. The collected data were entered in relevant columns of the Excel sheet, and statistical analysis was performed using Jamovi software version 1.6.23. Proportions with mean and standard deviation were derived for specific variables. Standard criteria were used as a cut-off value for specific variables. A hemoglobin level of 10 g/dl or lower was considered as cut-off value for anemia. The normal range of total leucocyte count was considered 4000–11000/mm^3. Values less than 4000/mm^3 were considered leucopoenia and that more than 11000/mm^3 were considered leucocytosis. A platelet count of less than 1 lakh/mm^3 was considered thrombocytopenia.

Results

This study included a total of 150 COVID-19-positive patients admitted to this hospital from June 2020 to December 2020 and succumbed to their illness during the hospital stay. The age range varied from 25 years (lowest) to 89 years (highest). The mean age was found to be 63.5 (11.8) years. Duration of stay (till death) was subdivided into three categories of <7 days, 7—14 days and >14 days with a mean value of 9.74 (Standard Deviation [SD] 6.95) days. The minimum duration of stay was 1 day, and the maximum duration of stay was 37 days. Most hospitalised patients who died due to COVID-19 were in the age group of 46–75 years (72.7%, 109/150) and the least number of cases were in the younger age group 15–45 years (6.7%, 10/150), while elderly age group (>76 years) constituted 20.6% (31/150). Of 150 cases, 126 (84%) were males and 24 were females (16%). The least duration of stay, that is quicker mortality after admission, was seen in 45.2% of total males and 37.5% of total females, whereas the longest duration of stay was found in 14.3% of total males and 41.7% of total females [Table 1].

Anaemia was found to be the most common haematological abnormality present in our study. About 71.3% of cases (107/150) had anaemia. Leucocytosis was more frequently present than leucopoenia. 58.7% of cases (88/150) had leucocytosis, while leucopoenia was seen only in 3.3% of cases (5/150). In 38% of cases (57/150), total leucocyte count was within normal limits. Thrombocytopenia was seen in 14.7% of cases (22/150) [Table 2].

Table 1: Comparision of age and gender with duration of hospitalization in covid-19 related mortalities

	Duration of hospitalisation (days)			
	<7	8–14	>15	Total
Age (years)				
15–45	4	3	3	10 (6.7%)
46–75	47	44	18	109 (72.7)
>76	15	9	7	31 (20.6%)
Sex				
Females	9	5	10	24 (16%)
Males	57	51	18	126 (84%)

Table 2: Comparison of common hematological alterations and the duration of hospitalization in Covid-19 related mortalities

	Duration of hospitalisation (days)			
	<7	8–14	>15	Total
Anaemia				
Present	50	37	20	107 (71.3%)
Absent	16	19	8	43 (28.6%)
Total leucocyte count				
Low	3	0	2	5 (3.3%)
Normal	22	23	12	57 (38%)
High	41	33	14	88 (58.7%)
Thrombocytopenia				
Present	12	7	3	22 (14.7%)
Absent	54	49	25	128 (85.3%)

The most common comorbidity in our study was found to be HTN in 68.7% (103/150) followed by diabetes mellitus in 61.3% of cases (92/150). CKD was seen in 13.3% of cases (20/150) including two cases of renal transplant. CAD was present in 10% of cases (15/150) including one case each of coronary artery bypass graft (CABG), rheumatic heart disease (RHD) and aortic valve replacement (AVR). Cases of known respiratory diseases (3/150, 2%) included two cases of tuberculosis and one case of COPD. No case of autoimmune disease was recorded in our study [Table 3].

Discussion

In this retrospective observational study, we included 150 COVID-19-positive patients with a history of existing comorbidities. We investigated the impact of comorbidities on mortality in COVID-19 patients. The evidence from various studies conducted in different parts of the world reveals that individuals with pre-existing comorbidities are at a higher risk of dying from COVID-19.[6] The risk of COVID-19 mortality has been consistently reported to increase in male patients and patients with advanced age, similar to the observations in our study.[7] In a recent study from Canada, Marc Simard *et al.* compared the risk of complication (hospitalisation, ICU admission and deaths) in Omicron variant-confirmed cases with the presence of number of comorbidities in both vaccinated and unvaccinated individuals and found that the risk of mortality was around 12 times higher in vaccinated cases having ≥3 comorbidities as compared with vaccinated cases without comorbidities (Relative Risk alpha [RRa] = 11.97; 95% Confidence Interval (CI) [7.57–18.91]), while it increased by 38 times (RRa = 38.00; 95% CI [23.62–61.14]) in unvaccinated cases with ≥3 comorbidities.[8]

Our findings have several important implications. Primarily, in our study it was observed that males tend to have a higher chance of lethal outcome and present with a generally younger age at death.[9] In this study, as previously reported in a systematic review and meta-analysis, HTN (68.7%) and DM (61.3%) were the most common comorbidities associated with COVID-19 infection. The pathogenesis proposed for this is that ACE2 expression is increased in diabetes and treatment with Angiotensin Converting Enzyme (ACE) inhibitors and angiotensin II type I receptor blockers increases ACE2 expression, thus facilitating infection with COVID-19. Therefore, a hypothesis that diabetes and HTN treatment with ACE2-stimulating drugs increases the risk of developing severe and fatal COVID-19 has been proposed.[10] Other medical conditions included CKD, CAD and respiratory diseases.[11] All of these findings resonate with other published data.

Table 3: Distribution of hospital stay (in days) in relation to presence or absence of common co-morbidities evaluated

	Duration of stay (days)			
	<7	8–14	>15	Total
HTN				
Present	42	44	17	103 (68.7%)
Absent	24	12	11	47 (3.3%)
DM				
Present	41	36	15	92 (61.3%)
Absent	25	20	13	58 (38.6%)
CKD				
Present	13	7	0	20 (13.3%)
Absent	53	49	28	130 (86.7%)
CAD				
Present	10	2	3	15 (10%)
Absent	56	54	25	135 (90%)

Among the various haematological parameters, anaemia was the most common finding in our study followed by leucocytosis and thrombocytopenia. If we compare our data with developed countries, the reason for anaemia being the most common finding in our study may be that ours is a developing country where nutritional anaemia is very common. Regarding leucocytosis and thrombocytopenia, these results are comparable with other studies as explained by the pathogenesis of COVID-19 as it causes a cytokine storm resulting in neutrophilia and coagulation abnormalities resulting in thrombocytopenia.

In this study, we could include only the hospitalised patients. The data were collected retrospectively, and they pertain to a single region of a country with distinct genetic makeup; therefore, morbidity and mortality from COVID-19 could be underestimated.

Conclusion

We conclude that individuals with comorbidities such as HTN, diabetes, COPD, heart diseases and malignancies are more likely to present with significantly severe symptoms and relatively higher mortality rates. Identifying patient characteristics and conditions associated with mortality in COVID-19 is important to develop targeted intervention strategies, especially for the primary care and family physicians involved in taking management decisions. Such prognostic indicators would help them in categorising patients who would require special precautions such as early hospitalisation, increased monitoring and intensive treatment.

Acknowledgement

The authors are thankful to the team of medical record department of AIIMS, Patna, and especially Mr. Shaban Ali for providing full support in providing patient information files to conduct this research.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Ejaz H, Alsrhani A, Zafar A, Javed H, Junaid K, Abdalla AE, *et al.* COVID-19 and comorbidities: Deleterious impact on infected patients. J Infect Public Health 2020;13:1833-9.
2. Khedr EM, Daef E, Mohamed-Hussein A, Mostafa EF, Zein M, Hassany SM, *et al.* Comorbidities and outcomes among patients hospitalized with COVID-19 in Upper Egypt. Egypt J Neurol Psychiatr Neurosurg 2022;58:92.
3. Osibogun A, Balogun M, Abayomi A, Idris J, Kuyinu Y, Odukoya O, *et al.* Outcomes of COVID-19 patients with comorbidities in Southwest Nigeria. PLoS One 2021;16:e0248281.
4. Ng WH, Tipih T, Makoah NA, Vermeulen JG, Goedhals D, Sempa JB, *et al.* Comorbidities in SARS-CoV-2 patients: A systematic review and meta-analysis. mBio 2021;12:e03647-20.
5. Trecarichi EM, Mazzitelli M, Serapide F, Pelle MC, Tassone B, Arrighi E, *et al.* Clinical characteristics and predictors of mortality associated with COVID-19 in elderly patients from a long-term care facility. Sci Rep 2020;10:20834.
6. Callender LA, Curran M, Bates SM, Mairesse M, Weigandt J, Betts CJ. The impact of pre-existing comorbidities and therapeutic interventions on COVID-19. Front Immunol 2020;11:1991.
7. Cho SI, Yoon S, Lee HJ. Impact of comorbidity burden on mortality in patients with COVID-19 using the Korean health insurance database. Sci Rep 2021;11:6375.
8. Simard M, Boiteau V, Fortin É, Jean S, Rochette L, Trépanier PL, *et al.* Impact of chronic comorbidities on hospitalization, intensive care unit admission and death among adult vaccinated and unvaccinated COVID-19 confirmed cases during the Omicron wave. J Multimorb Comorb 2023;13:1-10.
9. Kirillov Y, Timofeev S, Avdalyan A, Nikolenko VN, Gridin L, Sinelnikov MY. Analysis of risk factors in COVID-19 adult mortality in Russia. J Prim Care Community Health 2021;12:1-7.
10. Fang L, Karakiulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? Lancet Respir Med 2020;8:e21.
11. Sanyaolu A, Okorie C, Marinkovic A, Patidar R, Younis K, Desai P, *et al.* Comorbidity and its impact on patients with COVID-19. SN Compr Clin Med 2020;2:1069-76.