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Cardiovascular risk factors and evolution of patients attended with COVID-19 in a National Reference Hospital from Lima, Peru

Factores de riesgo cardiovascular y evolución de pacientes con COVID-19 atendidos en un Hospital Nacional de Referencia de Lima, Perú

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Abstract

Introduction: Coronavirus disease 2019 (COVID-19) fatal outcomes have been associated with multiple cardiovascular risk factors. In new epidemic areas, such as Latin America, there is a lack of studies about this. **Objectives**: To evaluate demographic data, signs and symptoms during emergency arrival, prevalence of cardiovascular risk factors, laboratory and ECG findings and their influence in mortality, in a retrospective cohort of patients in a national reference hospital of Lima, Peru. **Methods**: Review the clinical records of the patients attended at Hospital Rebagliati Hospital during March 6th and April 30th, 2020, using rRT-PCR was used for the detection of the RNA of SARS-CoV-2 following the protocol Charité, Berlin, Germany, from nasopharyngeal swabs at the National Institute of Health. Bivariate analysis and multivariate analysis using logistic regression was done. Values of $p < 0.05$ were considered significant for all analyses. **Results**: One hundred six hospitalized patients were evaluated. The mean age of patients was 61.58 years (SD 16.81). Cardiovascular risk factors among them were hypertension (46.2%), diabetes (28.3%), and obesity (28.3%), among others. Fifty-six patients died (52.8%). Mortality associated factors at the multivariate analysis were arterial hypertension (OR=1.343, 95% 1.089-1.667), myocardial injury (OR=1.303, 95% 1.031-1.642), and mechanical ventilation (OR 1.262, 95% 1.034-1.665), as associated factors. **Conclusion**: Cardiovascular risk factors and cardiovascular signs or symptoms are common during emergency arrival in patients with COVID-19. Arterial hypertension, myocardial injury and mechanical ventilation were associated with mortality in multivariate analysis, as observed in other regions of the world.

Keywords: COVID-19, SARS-CoV-2, risk factors, outcomes, cardiovascular, Latin America.

Resumen

Introducción: Los desenlaces fatales de la enfermedad por coronavirus 2019 (COVID-19) se han asociado con múltiples factores de riesgo cardiovascular. En nuevas áreas epidémicas, como América Latina, faltan estudios al respecto. **Objetivos**: Evaluar datos demográficos, signos y síntomas durante la ingreso a emergencia, prevalencia de factores de riesgo cardiovascular, hallazgos de laboratorio y ECG y su influencia en la mortalidad, en una cohorte retrospectiva de pacientes en un hospital nacional de referencia de Lima, Perú. **Métodos**: Se revisaron las historias clínicas de los pacientes atendidos en el Hospital Nacional Edgardo Rebagliati durante los días 6 de marzo y 30 de abril de 2020, se utilizó rRT-PCR para la detección del ARN del SARS-CoV-2 siguiendo el protocolo Charité, Berlín, Alemania de hisopos nasofaríngeos en el Instituto Nacional de Salud. Se realizó análisis bivariado y análisis multivariado mediante regresión logística. Los valores de $p < 0,05$ se consideraron significativos para todos los análisis. **Resultados**: Se evaluaron ciento seis pacientes hospitalizados. La edad media de los pacientes fue de 61,58 años (DE 16,81). Los factores de riesgo cardiovascular entre ellos fueron hipertensión (46,2%), diabetes (28,3%) y obesidad (28,3%), entre otros. Fallecieron 56 pacientes (52,8%). Los factores asociados a la mortalidad en el análisis multivariado fueron hipertensión arterial (OR = 1.343, 95% 1.089-1.667), lesión miocárdica (OR = 1.303, 95% 1.031-1.642) y ventilación mecánica (OR 1.262, 95% 1.034-1.665), como factores asociados. **Conclusión**: Los factores de riesgo cardiovascular y los signos o síntomas cardiovasculares son comunes durante la llegada de emergencia en pacientes con COVID-19. La hipertensión arterial, la lesión miocárdica y la ventilación mecánica se asociaron con la mortalidad en el análisis multivariado, como se observó en otras regiones del mundo.

Palabras clave: COVID-19, SARS-CoV-2, factores de riesgo, Desenlaces, cardiovascular, Latinoamerica.

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Introduction

Coronaviruses are single-stranded positive-sense Ribonucleic Acid (RNA) viruses, with the capacity for rapid mutation and recombination. They are known to cause respiratory or intestinal infections in humans and animals. Moreover, acute respiratory infections including influenza, respiratory syncytial and bacterial pneumonia are triggers for cardiovascular diseases and, on the other hand, the underlying cardiovascular disorders are usually associated with comorbidities, which may increase tie incidence and severity of infectious disease (1-3).

Cardiovascular complications associated with the coronavirus infection were described since infections with severe acute respiratory coronavirus (SARS-CoV) and recently with severe acute respiratory coronavirus type 2(SARS-CoV-2). The later generate the clinical pattern defined as Coronavirus disease 2019 (COVID-19) , described in the first time in December 2019 in Wuhan, Hubei province, China. After that, there were mentioned direct effects of the virus and the consequences

associated with the host immune response (1,4-8).

Cardiovascular compromise in patients with COVID-19 has not been well studied because data is scarce. However, there were described cases of myocardial injury, myocarditis, thromboembolic disease, arrhythmias, among others. But there is no information about the long-term consequences of this disease (9-26).

Edgardo Rebagliati Martins national hospital is the largest hospital of the Peruvian social security (formal workers that represent the 30% of the total Peruvian population), with 2,000 hospital beds and is considered as a national reference center for patients with COVID-19 and concentrate a higher quantity of severe cases associated with this clinical condition (19).

The objectives of the present study are to describe the prevalence of cardiovascular risk factors in the selected population, to evaluate the clinical findings, laboratory and electrocardiographic data, and describe the evolution of patients, taking into count the presence of some cardiovascular risk factors.

Methods

An observational, retrospective study of a cohort of patients with COVID-19 who need medical attention, was carried out in the adult emergency service of Hospital Nacional Edgardo Rebagliati Martins- EsSalud, located in the district of Jesus María in Lima-Perú. This service accounts for 180 beds and realizes 164,370 medical attentions per year and 22,883 admissions per day in patients over 14 years of age with a public health insurance system.

Patients considered for this study were those with a clinical diagnostic of COVID-19 and confirmed by molecular testing, RT-PCR, from nasopharyngeal swabs, attended and hospitalized between March 6th and April 30th of 2020, in the Hospital Rebagliati. Only patients with confirmed pulmonary lesions by CT scan and oxygen saturation level below 93% were hospitalized due to a higher demand for health care services in Peruvian public hospitals. There were excluded patients transferred to other health centers and patients that arrive without vital signs.

We obtained demographic data (age, gender), cardiovascular risk factors (hypertension, Diabetes, obesity), history of previous cardiovascular disease, time of symptoms, symptoms and signs during emergency arrival, prevalence of myocardial injury, Electrocardiographic (ECG) findings, time of hospitalization, prevalence of mechanical ventilation and evolution, from electronic clinical report of patients during hospitalization.

A twelve-lead ECG was recorded and evolution of troponin values were registered, considering the highest value of troponin during the evolution, and the diagnosis of myocardial injury if this value exceeds 99th percentile of the laboratory range validated in the hospital.
We used SPSS 24.0 for statistical analysis that includes descriptive, bivariate analysis, and multivariate analysis (binary logistic regression). A p-value of less than 0.05 was considered statistically significant (95% confidence level).

The project was authorized for the emergency department and the Ethics and investigation committee for COVID-19 in EsSalud. The principle of confidentiality was guaranteed. Informed consent was not obtained because the source document was secondary (an electronic clinical record), and there was not any intervention for the patient.

Results

One hundred six hospitalized patients were evaluated. 47 (44.34%) had more than 65 years of age and 81 (76.4%) were of male gender (Table 1). Cardiovascular risk factors among the study population were hypertension (46.2%), diabetes (28.3%), and obesity (28.3%). Sixteen patients (6.76%) report a previous cardiovascular disease (15.09%).

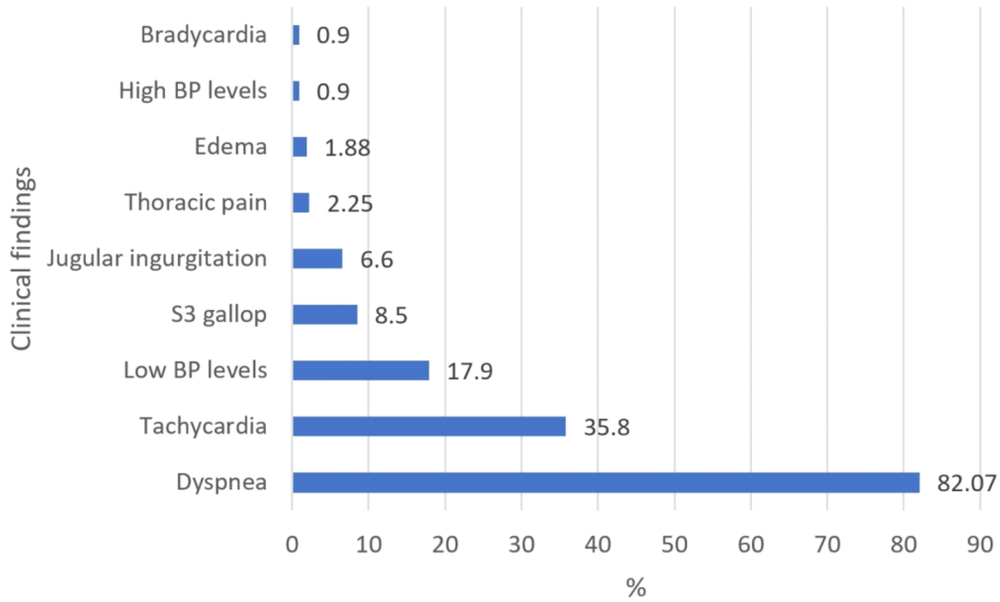
They arrived in the emergency room with more than seven days of symptoms: 7.35 (SD 3.53). 54.71% with more than seven days (Table 1).

Table 1. Clinical , demographical and laboratorial features of patients with COVID-19

Variable	N	%
Age distribution		
<30 years	3	2.83
30-64 years	56	52.83
65-84 years	39	36.79
≥85 years	8	7.55
Gender distribution		
Male	81	76.4
Female	25	23.6
Cardiovascular risk factors		
Hypertension	49	46.2
Diabetes	30	28.3
Obesity	30	28.3
Previous history of cardiovascular disease	16	15.1
Time of symptoms at arrival		
Less than 3 days	16	15.1
From 3 to 7 days	32	30.2
More than 7 days	58	54.7

The most frequent signs and symptoms during emergency arrival (Figure 1) were dyspnea (82.07%), tachycardia (35.8%), and higher levels of blood pressure (17.9%). Myocardial injury was found in 40 of 79 patients tested (50.6%). The median value of troponin value was 0.033 (IQR 0.047).

Figure 1. Clinical findings at the ER income



In 40 patients, 12-lead ECG recorded was obtained. 22 (55%) had an ECG without specific alterations. In the rest of the patients, some arrhythmias and other ECG changes were documented (Table 2).

Table 2. ECG findings

ECG finding	N	%
Normal ECG	22	55
Arrythmia	11	27.5
-atrial fibrillation	4	10
-sinus bradycardia	2	5
-sinus tachycardia	1	2.5
-First degree AV block	2	5
-Third degree AV block	1	2.5
-Ventricular extrasystolia	1	2.5
Left ventricular hypertrophy	3	7.5
Acute ischemia	3	7.5

The median of hospitalization was eight days (IQR 12.25). In 64.15% of cases, the time of admission was higher than seven days, and in 17 patients (16.04%) was more top than 30 days. 22 (20.75%) patients entered to invasive mechanical ventilation.

Fifty-six patients died, which corresponds to a mortality rate of 52.8% (Figure 2). Mortality associated factors were age more than 65 years, myocardial injury, mechanical ventilation, and arterial hypertension were associated with statistical differences in bivariate analysis. In the multivariate analysis, we found arterial hypertension, myocardial injury, and mechanical ventilation as associated factors (Table 3).

Discussion

The present report describes cardiovascular risk factors and some clinical, laboratory, and electrocardiography findings in a group of patients hospitalized for moderate to severe COVID-19 attended in a national reference hospital of social security.

Although multiple studies have reported the clinical findings in COVID-19,20-27 and some of the associated risk factors (25,26), few in Latin America have shown the relationship between cardiovascular risk factors and fatal outcomes (26).

The prevalence of cardiovascular risk factors was similar to CDC and Italian reports (from the Lombardy region) for arterial hypertension (46.2%) and higher in comparison with reports of Chinese hospitals (30.5%). A similar phenomenon occurs for diabetes found in 28.3%, which was identical to the CDC report and superior to Italian and Chinese reports, 17.3% and 14% respectively (3,5,6,16). But the prevalence of cardiovascular risk factors and previous cardiovascular disease is higher in patients with severe COVID-19 and in patients who died due to COVID-19 (21).

However, these prevalences in hospitalized patients with COVID-19 were superior to the Peruvian TORNASOL report, which corresponds to a national evaluation for hypertension and other cardiovascular risk factors, carried out in 2011,

Figure 2. Survival rates of the patients by time

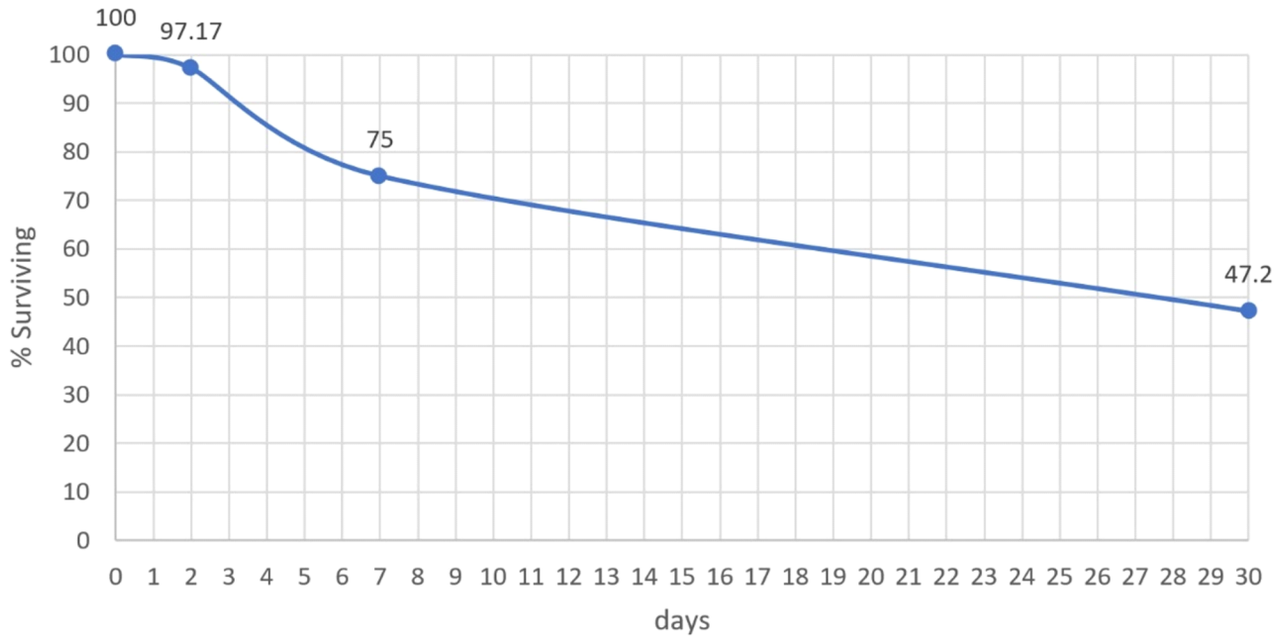


Table 3. Mortality associated factors

Variable	OR_c	95%CI	OR_a	95%CI
Arterial hypertension	4.28	1.880-9.730	1.343	1.089-1.667
Myocardial injury	4.7	1.810-12.210	1.303	1.031-1.642
Mechanical ventilation	5.44	1.690-17.470	1.262	1.034-1.665
Age more than 65 years	2.76	1.220-6.200	1.07	0.848-1.354
Obesity	1.24	0.520-2.900	1.055	0.848-1.323
Male gender	1.59	0.640-3.920	0.959	0.747-1.217
Diabetes	0.85	0.360-1.980	0.879	0.691-1.097

ORc=crude odds ratio (bivariate analysis); ORa=adjusted odds ratio (multivariate analysis).

where a prevalence of 27.3% was found (13). At the national level, the prevalence of Diabetes in Peru was reported in ranges between 5 and 7% (14)

Hypertension and cardiovascular disease were associated with a higher risk of severity and mortality in patients infected with COVID-19 because their conditions could damage the vascular structure, and it is more likely to develop into critical disease during the infection. Moreover, patients with chronic cardiovascular disease are more likely to be infected due to their weakened heart function and low immunity, developing severe disease patterns (20-22).

Recent studies indicate multi-organ tropism of SARS-CoV-2, including heart, vascular system, and the circulation, which is speculated to influence the course of the disease as well as aggravate preexisting conditions. The increased-myocardial expression of ACE2 in patients with cardiovascular disease and COVID-19 has been suggested as a possible mechanism of myocardial cell invasion and injury levels to worse outcomes (21).

Myocardial injury is manifested as an elevation of troponin levels above the 99th percentile of superior normality level and is associated with an increase in mortality. It could be presented with electrocardiographic and echocardiographic changes. In some cases, could evolution to a fulminant myocarditis (1,2,6,15).

We found a prevalence of myocardial injury of 50.6%, superior to report in the hospitalized population (7-17%), and ICU population (22-31%) (1,12,15). Moreover, in a recent metanalysis of 26 clinical studies with 11,685 patients, the prevalence was 20% (17). However, in subpopulations of severe or critical COVID-19 cases, similar to the cases described in this report, the prevalence could be much higher: from 65.2% and 80% (21).

In a retrospective study of 191 patients, older age was recognized as a risk factor of mortality and has been reported as a significant predictor of mortality in SARS and MERS, probably because of age-dependent defects in T-cell and B-cell function and the excess production of type 2 cytokines that could amplify viral replication and prologs proinflammatory responses (23). Other factors like the presence of comorbidities in older patients (particu-

larly hypertension) are believed to be risk factors for severe disease and death for SARS-Cov-2 infection.

Moreover, in deceased patients, higher levels of cardiac troponins were associated with poorer outcomes and mortality, as was described in several reports (16,24). In a recent study in Bolivia, the mortality rate was 5.6%, but age and hypertension (OR=3.284, 95%CI 1.276-6.291) were the main associated factors with the fatal outcomes, very similar to our current findings for this factor (Table 2) (26).

Previously a preliminary description of patients with severe COVID-19 was reported in our hospital. This study described 17 patients, 5 of them died. Authors identified advanced age (6), arterial hypertension (4), and obesity (3), as the main observed risk factors in these patients (27).

This study is an exploratory case-series without randomization, that obtain data from electronic clinical reports. We did not register body mass index, and there was not a formal criterion to get troponin dosage or ECG recording in every patient hospitalized for COVID-19. Although there is an essential number of patients in this region, and describe the cardiovascular findings associated with this disease (27,28).

Conclusions

Dyspnea, tachycardia, and a higher level of blood pressure at admission were the most frequent clinical manifestations. We found myocardial injury in almost half of the total population and ECG changes in more than a fourth of our population. On the other hand, arterial hypertension, the use of mechanical ventilation, and myocardial injury were associated with higher mortality in our patients in multivariate analysis.

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None.

Conflict of Interests

None.

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