Risk factors for mortality in patients with Coronavirus Disease 2019 (COVID-19) in Bolivia: An analysis of the first 107 confirmed cases

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SUMMARY

The present study is aimed to assess the risk factors for mortality in the first 107 rRT-PCR confirmed cases of SARS-CoV-2 infections in Bolivia.

For this observational, retrospective and cross-sectional study, the epidemiological data records were collected from the Hospitals and the Ministry of Health of Bolivia, obtaining the clinical and epidemiological data of the COVID-19 cases that were laboratory-diagnosed during March 2-29, 2020. Samples were tested by rRT-PCR to SARS-CoV-2 at the Laboratory of the National Center of Tropical Diseases (CENETROP), following the protocol Charité, Berlin, Germany. The odds ratio (OR) with respective 95% confidence interval (95%CI) for mortality as dependent variable was calculated.

When we comparatively analyzed survivors and non-survivors in this first group of 107 cases in Bolivia, we found that at bivariate analyses, age (≥60 years old), hypertension, chronic heart failure, diabetes, and obesity, as well as the requirement of ICU, were significantly exposure variables associated with death. At the multivariate analysis (logistic regression), two variables remained significantly associated, age, ≥60 years-old (OR=9.4, 95%CI 1.8-104.1) and hypertension (OR=3.3, 95%CI 1.3-6.3). As expected, age and comorbidities, particularly hypertension, were independent risk factors for mortality in Bolivia in the first 107 cases group. Further studies are required to better define risk factors and preventive measures related to COVID-19 in this and other Latin American countries.

Keywords: COVID-19, SARS-CoV-2, mortality, risk factors, Bolivia.

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INTRODUCTION

Over the pandemic of the Coronavirus Disease 2019 (COVID-19), caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), one of the major concerns with its arrival to the different countries, and regions, is not only the spreading of infection but the clinical course and evolution, with the consequent risk of complications and deaths, such as the Acute Respiratory Distress Syndrome (ARDS) [1, 2].

Most of the data, provided from multiple studies, is mostly from China, Europe and North America, few studies in Latin America have been reported so far [2-12]. The most affected countries include Brazil, Ecuador, Chile, Peru, Mexico, among others, such as is the case of Bolivia.

In Bolivia, the first SARS-CoV-2 case was confirmed on March 2, 2020. Up to March 28, 2020, we have confirmed 107 cases in the country, by rRT-PCR to SARS-CoV-2 at the Laboratory of the National Center of Tropical Diseases (CENETROP) following the protocol Charité, Berlin, Germany [13]. The first 12 cases, already reported, had a median age of 39 years (IQR 25-43), six of them male, only with a 60 y-old woman with hypertension that required hospitalization but evolved well. None of those patients required ICU nor fatalities occurred in the group [8].

In the current analysis we evaluated the associated risk factors for mortality, in those patients confirmed with COVID-19, that died, compared to those that survived.

PATIENTS AND METHODS

Bolivia is a South American country constituted by nine departments (main administrative level), 112 provinces (second administrative level) and 337 municipalities (third administrative level). The territory presents climatic, geographic, social, and epidemiological conditions suitable for the transmission of many infectious diseases [14, 15]. Before SARS-CoV-2 arrival, Influenza and RSV, among other respiratory viruses, represented significant causes of hospitalization in different cities of the country, especially among children under one year of age [8].

For this observational, retrospective and cross-sectional study, the epidemiological data records were collected from the Hospitals and the Ministry of Health of Bolivia, obtaining the clinical and epidemiological data of the COVID-19 cases that were laboratory-diagnosed during March 2-29, 2020. Samples were tested by rRT-PCR to SARS-CoV-2 at the Laboratory of the National Center of Tropical Diseases (CENETROP), following the protocol Charité, Berlin, Germany [13].

Continuous variables were summarized as the mean and standard deviation (±SD). Parametric and non-parametric comparisons were performed, according the statistical assumptions: for independent variables, Fisher's exact test or the Chi-square test was used for tabular analysis (as appropriate for the expected cell sizes), including calculation of the odds ratio (OR) with respective 95% confidence interval (95%CI) for mortality as dependent variable; for continuous variables, the two-sample Wilcoxon rank-sum (Mann-Whitney) test was used. Values of $p<0.05$ were considered significant. All analyses were performed using the statistical software Stata-14IC®, licensed to the Universidad Tecnológica de Pereira.

RESULTS

From a preliminary analysis of the first 107 confirmed cases in Bolivia, we have found that 55 (51.4%) were male, with a median age of 43.9 years old (±17.6, SD), 24.3% of the patients were older than 60 years old (3.8% older than 70, 1.9% older than 80) (Table 1).

Table 1 - Number and percentage of cases and deaths in Bolivia stratified by age.

Age (years old)	*N*	*%*	*Deaths**	*%*
<10	2	1.9	0	0.0
10-19	7	6.5	0	0.0
20-29	17	15.9	0	0.0
30-39	18	16.8	0	0.0
40-49	23	21.5	1	4.3
50-59	14	13.1	0	0.0
60-69	22	20.6	3	13.6
70-79	2	1.9	1	50.0
80-89	2	1.9	1	50.0
≥90	0	0.0	0	0
Total	107	100.0	6	5.6

*$\chi 2 = 19.372$, $p<0.001$.

Table 2 - Bivariate and multivariate analysis of risk factors associated with COVID-19 mortality in the first 107 Bolivian confirmed cases.

Variable		*Infected*	*Died*	*%*	*Crude OR*	*95%CI*	*Adjusted OR*	*95%CI*
Age, years old	≥60	26	5	19.2	19.048	2.110-171.932	9.393	1.847-104.081
	<60	81	1	1.2				
Hypertension	Yes	10	3	30.0	13.429	2.276-79.232	3.284	1.276-6.291
	No	97	3	3.1				
Admittance to ICU	Yes	4	2	50.0	24.750	2.742-223.401	NS	-
	No	103	4	3.9				
Chronic Heart Failure	Yes	2	1	50.0	20.000	1.085-368.495	NS	-
	No	105	5	4.8				
Diabetes	Yes	5	2	40.0	16.333	2.104-126.822	NS	-
	No	102	4	3.9				
Any comorbidity	Yes	16	4	25.0	14.833	2.449-89.846	NS	-
	No	91	2	2.2				
Obesity	Yes	6	2	33.3	12.125	1.690-86.948	NS	-
	No	101	4	4.0				
Sex	Female	52	4	7.7	1.104	0.149-8.147	NS	-
	Male	55	2	3.6				

OR, Odds ratio; 95%CI, 95% confidence interval; NS, not significant; ICU, Intensive care unit.

From the total, 38.32% were asymptomatic, 13.1% were hospitalized, 3.74% at intensive care units (ICU), and 5.6% died. From those symptomatic (n=66), 83.3% presented fever, 78.8% dry cough, 53% headache, 51.5% malaise, 42.4% myalgias, and 37.9% sore throat, among other findings.

Among the patients, 14.9% of them presented any comorbidity (Table 2), including hypertension (9.35%), obesity (5.61%), diabetes (4.67%), and chronic heart failure (1.87%). From those presenting comorbidities, one patient had four of them (1.87%), four patients had two (3.74%), and eleven patients had only one risk factor (10.28%) (Table 3).

Table 3 - Comorbidities distribution among those died and survived, Bolivia.

Number of comorbidities	*Died**	*%*	*Survived*	*N*	*%*
0	2	2.2	89	91	85.05
1	2	18.2	9	11	10.28
2	1	25.0	3	4	3.74
3	0	0.0	0	0	0.00
4	1	50.0	1	2	1.87
5	0	0.0	0	0	0.00
Total	6	5.6	102	107	100.00

*$\chi 2$= 24.960, p<0.001.

From the confirmed cases, six patients died, three of them were hospitalized (two at the ICU presenting ADRS), but the remaining three died at home before that, two of these with risk factors (diabetes and hypertension), had reached clinical evaluation after six days of symptoms' initiation.

In those older than 60 years old (n=26), 5 deaths occurred (19.2%) (OR=19.048, 95%CI 2.110-171.932) (Tables 1 and 2). The number of comorbidities was significantly associated with a high proportion of deaths (Tables 2 and 3).

When we comparatively analyzed survivors and non-survivors in this first group of 107 cases in Bolivia (Table 2), we found that at bivariate analyses, age (≥60 years old), hypertension, chronic heart failure, diabetes, and obesity, as well as the requirement of ICU, were significantly exposure variables associated with death (Table 2).

At the multivariate analysis (logistic regression), two variables remained significantly associated, age, ≥60 years-old (OR=9.4, 95%CI 1.8-104.1) and hypertension (OR=3.3, 95%CI 1.3-6.3) (Table 2).

DISCUSSION

Published studies vary in reporting deaths, for example, some indicate none fatalities, but in others, up to 11%, and 15% have been informed [4, 5, 16]. In a recent meta-analysis, including seven studies for this outcome (n=632), the case fatality rate was 13.9% (95%CI 6.2-21%) [2]. So far, only one study has assessed in a multivariable regression the risk factors for mortality of adult inpatients with COVID-19, in Wuhan, China [17]. In that study, the authors found that there were increased odds of in-hospital death associated with older age (OR=1.1, 95%CI 1.0-1.2). At bivariate analyses, the authors found an association for hypertension (OR=3.1, 95%CI 1.6-5.9), as well as diabetes (OR=2.8, 95%CI 1.4-6.1), and coronary heart disease (OR=21.4, 95%CI 4.64-98.76), among others [17].

Our preliminary retrospective study has several limitations. Not all laboratory tests were done in all patients, as many patients were isolated at home. Multiple factors herein might have contributed to the poor clinical outcomes in some patients. Nevertheless, in Bolivia, only qualitative rRT-PCR is being routinely performed in state and private certified laboratories, a quantitative viral RNA detection that could aid in viral load measurement is not implemented. Furthermore, finally, these findings occur in the context of a limited sample size. Despite the mentioned issues, these analyses reaffirm the confirmation of the risk represented in older age groups as well those with risk factors, such as hypertension. More studies are required to define better the course and risk factors for hospitalization, admittance to ICU, and fatal outcomes, among others.

In regions such as Latin America and the Caribbean, with low- and middle-income countries, early assessment and classification of patients in order to provide prompt interventions and diagnosis is even more critical, considering the limited resources of the health care systems, including the availability of ICU beds, that in some countries is less than 1 per 10,000 inhabitants [7].

Competing interests

None of the authors has any conflict of interest to declare.

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