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Research Article

Cardiovascular Risk Factors of Patients with Covid-19 in Pre-Triage in Antananarivo, Madagascar

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Abstract

Introduction: Coronavirus disease-19 (COVID-19) is an infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It is a global public health problem since 2019. Respiratory manifestations dominate the clinical picture but cardiovascular involvement is also frequent and often severe. The presence of cardiovascular risk factors and comorbidities is a factor of poor prognosis of the disease.

Method: We carried out a prospective, descriptive and analytical study over a period of one month on patients with COVID-19 seen at the pre-triage of the Joseph Raseta Befelatanana University Hospital Antananarivo. Our objective was to describe the cardiovascular risk factors found during COVID-19 and to determine their association with the severity of COVID-19.

Results: We found a mean age of 50.18 years and a male predominance with a sex ratio of 1,16. Arterial hypertension (49.4%) was the predominant cardiovascular risk factor. Diabetes (p = 0.0004), dyslipidemia (p = 0.0027), hypertension (p = 0.0024), women aged 60 years and over (p = 0.0273) and the number of cardiovascular risk factors greater than two (p = 0.01) were the main factors associated with the severity of the disease.

Conclusion: It is essential to manage these risk factors before and during COVID-19 for a better prognosis of the patients.

Keywords: *Antananarivo; COVID-19; Cardiovascular Risk Factors; Severe Form*

Introduction

Coronavirus disease-19 (COVID-19) is an infection caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease has been declared a pandemic since 2019 [1]. COVID-19 manifests primarily as viral pneumonitis. The cardiovascular system is consistently affected by the disease. The presence of cardiovascular risk factors and or established cardiovascular diseases expose patients to the severe form of this viral infection [1]. We report a study conducted at the COVID-19 pre-triage of the Joseph Raseta Befelatanana University Hospital (JRB UHC).

Objective of the Study

Our main objective was to describe the cardiovascular risk factors found during COVID-19 and to determine the association between these cardiovascular risk factors and the severity of COVID-19.

Method

We conducted a descriptive and analytical cross-sectional study. All patients seen at the COVID-19 pre-screening at the CHU-JRB Antananarivo Madagascar, from May 1 to 30, 2020, were enrolled. We included patients diagnosed with COVID-19 either by RT-PCR or by a radiological image in favor of COVID-19 pneumopathy with epidemiological context. Patients with incomplete investigation forms and uncooperative patients were excluded. We studied age, gender, cardiovascular risk factors such as hypertension, dyslipidemia, obesity or overweight, smoking, sedentary lifestyle, and cardiovascular heredity. Clinical forms of COVID-19 were also assessed: asymptomatic (no symptoms), mild (acute upper airway or digestive symptoms), moderate (pneumonia without obvious hypoxemia with radiological lesions), or severe (breathing difficulty with obvious hypoxemia (SpO_2 < 93%) and or radiological lesions to more than 50% of the lung parenchyma.

The data were collected and entered on EXCEL © software and processed and analyzed Epi Info © software. The threshold for significance was a p value < 0.05.

Results

We registered 165 patients during the study period. Of the 95 patients who tested positive, we retained 91 patients. The mean age was 50.9 years with a slight male predominance, sex ratio at 1.2. The majority of patients were over 60 years old n = 28 (30.8%). Mild forms predominated (44.0%), followed by severe forms (28.6%), asymptomatic forms (19.8%), and moderate forms (7.7%). The cardiovascular risk factors of the patients were dominated by arterial hypertension identified in 45 patients (49.4%) followed by cardiovascular hereditary (39.6%), diabetes (18.7%) smoking (16.7%), sedentary lifestyle (12.9%), obesity or overweight (9.9%), and dyslipidemia (4.4%) (Figure 1). The proportion of patients accumulating more than two risk factors was 63.7%.

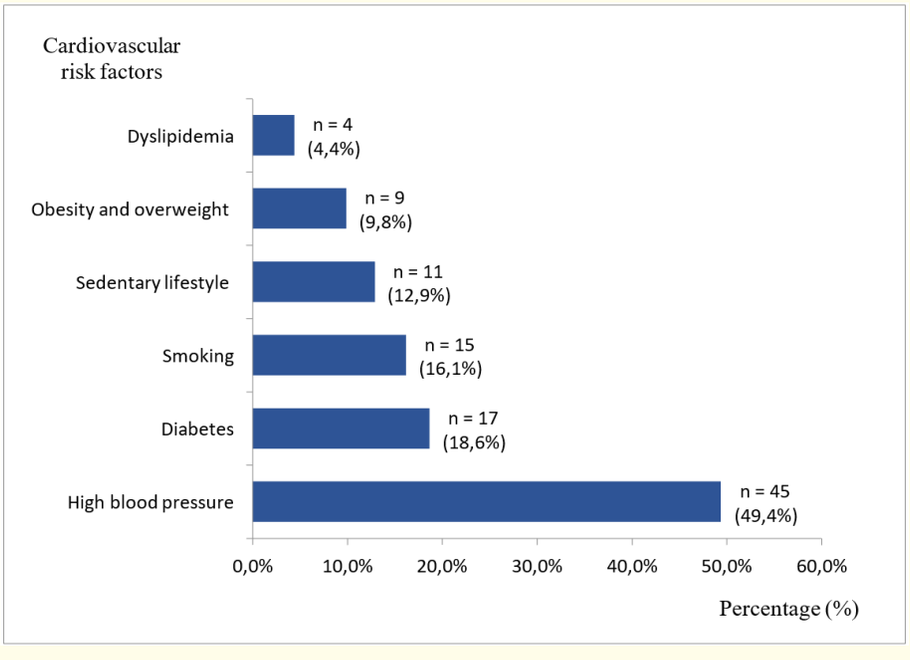

Figure 1: *Distribution of patients according to modifiable cardiovascular risk factor.*

Analysis of the results showed a significant association between hypertension and the severe form of COVID-19 (p = 0.0024). Diabetic patients were at higher risk of developing the severe form of the disease compared to other patients (p = 0.0004). Dyslipidemia exposed patients to the severe form (p = 0.0027). The severe form was common in women aged 60 years and older (p = 0.0273) and in patients accumulating more than two cardiovascular risk factors (p = 0.01) (Table 1).

Risk factors	Severe		Not severe		Total	P
	n = 26	(%)	n = 65	(%)	N = 91	
Male gender	11	(42,3%)	38	(58,4%)	49	NS
Cardiovascular inheritance	12	(46,1%)	24	(36,9%)	36	NS
Age ≥ 55 years for men	9	(34,6%)	13	(20%)	22	NS
Age ≥ 60 years for woman	9	(34,6%)	10	(15,3%)	19	0,0273
High blood pressure	19	(73,0%)	26	(40,0%)	45	0,0024
Diabetes	11	(42,3%)	6	(9,2%)	17	0,0004
Smoking	5	(19,2%)	10	(15,3%)	15	NS
Sedentary life style	5	(19,2%)	6	(9,23%)	11	NS
Obesity and overweight	4	(15,3%)	5	(7,6%)	9	NS
Dyslipidemia	4	(15,3%)	0	(0%)	4	0,0027
Cardiovascular risk factors > 2	19	(73,1%)	38	(58,4%)	57	NS

Table 1: *Results of association between cardiovascular risk factor and severe COVID-19.*

NS: Not Significant.

Discussion

SARS-CoV-2 causes viral pneumonitis. Most patients at risk or with cardiovascular disease develop the severe form of the disease. Our study identified hypertension, diabetes, dyslipidemia, the presence of more than 2 cardiovascular risk factors, and the age of 60 years or older in women as factors favoring the severity of COVID-19.

The mean age of our patients was 50.2 years. In the Middle East, Alshaikh MK., *et al*. had reported similar results in 2020, i.e. a mean age of 55.30 years [2]. In our study, the severe form of the disease was frequent in women over 60 years (47.37%). The association was statistically significant (p = 0.0273). This association between advanced age and the severity of COVID-19 was demonstrated by the study of Petrilli., *et al*. In this American study, Petrilli found a mean age of 68 years in patients hospitalized for severe forms [3].

High blood pressure was the predominant cardiovascular risk factor found in 49.4% of our patients. This high prevalence of hypertension during COVID-19 infection has been described since the beginning of the pandemic. The Dutch study by Collard D found a similar proportion of hypertension (46%) in patients infected with the coronavirus [4]. In the United States, the prevalence of hypertension was even higher in the study by Petrilli C., *et al*. (64.14%) [3]. A significant association between AH and severe disease was demonstrated in our study (p = 0.0024). Our results were consistent with those of the study conducted in China by Li X., *et al*. on 548 patients hospitalized with COVID-19. This study showed a significant association between hypertension and the severity of COVID-19 [5]. A Brazilian meta-analysis, by Silverio., *et al*. confirmed this hypothesis. The authors found that 42 out of 45 studies showed a correlation between hypertension and

disease severity [6]. The internalization of the virus with the ACE2 receptor leads to a decrease in the expression of the latter. This results in a reduction in the conversion of angiotensin II to angiotensin 1-7, a cardio-protective molecule that opposes the pro-inflammatory, pro-oxidative and pro-fibrotic effects exerted by angiotensin II via AT1 receptors [7].

The proportion of diabetic patients in our study was 18.7%. Our results were consistent with those of the study by Sharif., *et al*. in Bangladesh, who reported a prevalence of 14.6% [8]. A higher frequency of diabetes (33.9%) was found in an Italian meta-analysis by Kaminska H and colleagues [9]. A significant association between diabetes and the severe form of COVID- 19 was demonstrated in our study (p= 0.0004). In a meta-analysis by Kaminska H., *et al*. of French, Asian and American studies involving 3671 diabetics and 6917 non-diabetics with COVID-19, six out of nineteen studies showed a significant association between diabetes and disease severity. The vulnerability of diabetics could be explained by the hypercoagulable state and its pro-inflammatory environment. Diabetes induces immune failure which favours infection [9].

Dyslipidaemia, detected in 4.4% of cases, was only found in patients with the severe form. The association between the severity of COVID-19 and dyslipidaemia was significant in our study (p = 0.0027). In the United States, the cohort study by Petrilli C and colleagues in New York demonstrated this significant association. Of 5279 COVID-19 positive patients, 47% of the severe forms had dyslipidaemia [3]. According to a Chinese meta-analysis by Liu Y., *et al*. on 12 studies with 12995 patients with COVID-19, a significant association between dyslipidaemia and the severe form of COVID-19 was found with an OR = 1.27 (p = 0.038) [10]. This association between dyslipidaemia and the severity of COVID-19 is mainly attributed to the role of hypercholesterolaemia in chronic inflammation which is also an independent cardiovascular risk factor [10].

In our study, patients with more than two cardiovascular risk factors accounted for 63.7% of cases. Among the 26 patients admitted with severe disease, more than two cardiovascular risk factors were identified in 73.1%. The association between severe disease and the presence of more than two cardiovascular risk factors was significant (p = 0.01). Our results were consistent with those of the Dutch cohort study by Collard D., *et al*. They showed a significant association between the number of cardiovascular risk factors greater than or equal to 3 and the severity of COVID-19 (p = 0.004). This study showed that mortality was related to the number (≥ 3) of cardiovascular risk factors (p = 0.03) [4].

Conclusion

COVID-19 has been a global health problem since 2019. Risk factors and/or established cardiovascular pathologies cloud the prognosis of the disease. Male gender, advanced age, hypertension, dyslipidaemia and diabetes were the predominant cardiovascular risk factors in COVID-19. High blood pressure, diabetes, dyslipidaemia, age 60 years or older in women and the presence of more than two risk factors were identified as the main risk factors for disease severity. It is essential to manage these risk factors before and during COVID-19 for a better patient prognosis.

Conflicts of Interest

The authors declare no conflicts of interest.

Authors' Contributions

All authors have contributed to this work and have read and approved the final version of the manuscript.

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