

(RESEARCH ARTICLE)



## Troponin level in SARS-CoV-2 patients in a biochemistry lab in Antananarivo Madagascar

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World Journal of Biological and Pharmaceutical Research, 2023, 04(01), 006–010

Publication history: Received on 28 November 2022; revised on 09 January 2023; accepted on 11 January 2023

Article DOI: <https://doi.org/10.53346/wjbpr.2023.4.1.0046>

### Abstract

**Objective:** To describe the epidemiological and biological profile and the cardiac troponin level of patients infected with SARS-CoV-2 who underwent troponinemia testing.

**Methods:** Retrospective descriptive and analytical study during a period of 5 months in which were included all patients with COVID-19, hospitalized at the Joseph Ravoahangy Andrianaivalona University Hospital (CHU-JRA) in Antananarivo Madagascar and having performed a high sensitive cardiac troponin (hs-cTn) determination at the Biochemistry Laboratory of the same Hospital. Study parameters were demographics, reasons for admission, medical history, oxygen saturation and patient outcome and paraclinical parameters were troponin level, chest CT image.

**Results:** Among the 103 cases collected, 46.6% had an elevated hs-cTn level and mostly patients aged 71 to 80 years. Of the 43 patients who died, 60.5% were men. Most had cardiovascular risk factors, oxygen desaturation and critical parenchymal damage on chest CT. There was a significant difference between hs-cTn positivity and female gender and that therapeutic management was corrected after the troponin result. Among the deceased patients, 28 (65,11%) have high troponin levels.

**Conclusion:** Troponin testing is important in patients with COVID-19 to detect the risk of mortality due to cardiovascular complications.

**Keywords:** Cardiovascular risk factor; Madagascar; SARS-CoV-2; Troponinemia

### 1. Introduction

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. It is spreading rapidly around the world and has become a public health emergency of international concern, declared a pandemic by the World Health Organization (WHO) in March 2020[1].

Morbidity and mortality rates are very high with over 13.7 million confirmed cases and approximately 0.58 million deaths in 216 countries and regions in just 7 months [2]. The cardiac implications of COVID-19 are far from marginal [3,4]. Indeed, multiple cardiovascular complications are associated [1]. Some laboratory indicators that can predict COVID-19 deterioration have been identified including biomarkers of cardiac injury [5] including highly sensitive cardiac troponin (hs-cTn) which was significantly elevated in more than half of the patients who died [4].

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## 2. Methods

This is a retrospective cross-sectional and analytical study carried out from April 2021 to August 2021 at the biochemistry laboratory of CHU-JRA Antananarivo. Were included in this study all biochemical results of patients, of any age and any gender, suspected and/or confirmed to be infected by the coronavirus, hospitalized at the CHU-JRA and having performed a blood troponin test at the UPFR Biochemistry of CHU-JRA ;

Incomplete records and unavailable results were excluded. Troponin values above 30 ng/mL in men and above 14ng/mL in women were considered positive. Study parameters were demographics, reasons for admission, medical history, oxygen saturation and patient outcome.

Paraclinical parameters were troponin level, chest CT image with percentage of parenchymal involvement. Blood troponin level assay was carried on using a VIDAS® machine (Biomérieux) on venous blood which technology principle is a sandwich-type enzyme-linked immunoassay. The results are quantitative and obtained in less than two hours after samples' collection. Data were collected by consulting medical records and statistical analysis were performed on Epi info 7.0. A p-value less than 0.05 was considered statistically significant.

## 3. Results

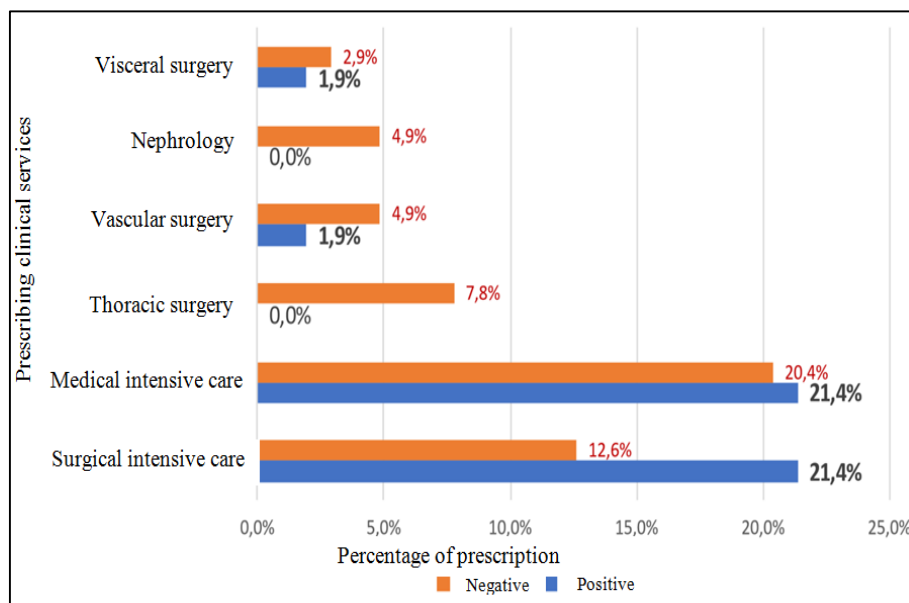
Among the 173 requests for Troponin assays received by the Biochemistry Laboratory of the CHUJRA during the study period, 103 files were included. The medianage of the patients was 56 years [18-95 years] with a sex ratio of 1.39.

Majority (41.7%)of troponin test's prescription was dispensed by medical intensive care unit followed by the surgical intensive care unit (34%) (Figure 1). Clinically, dyspneadominated with 46.6% of cases followed by chest pain (13.6%).

Hypertension and diabetes were found in 50.4% and 21.3% of the patients' histories respectively. In the present study, 45.6% of the patients had a SpO2 greater than 90%.

In this study series, 46.6% of the patients had a positive troponin level of which 56.25% had a significant elevation.

On chest CT, 33% of our study population had a parenchymal involvement of 75% to 100%. As for the outcome of the patients at the end of our study, 41.7% (n=43) died, 35.9% (n=37) were discharged from the hospital and 15.5% (n=16) transferred to other departments.



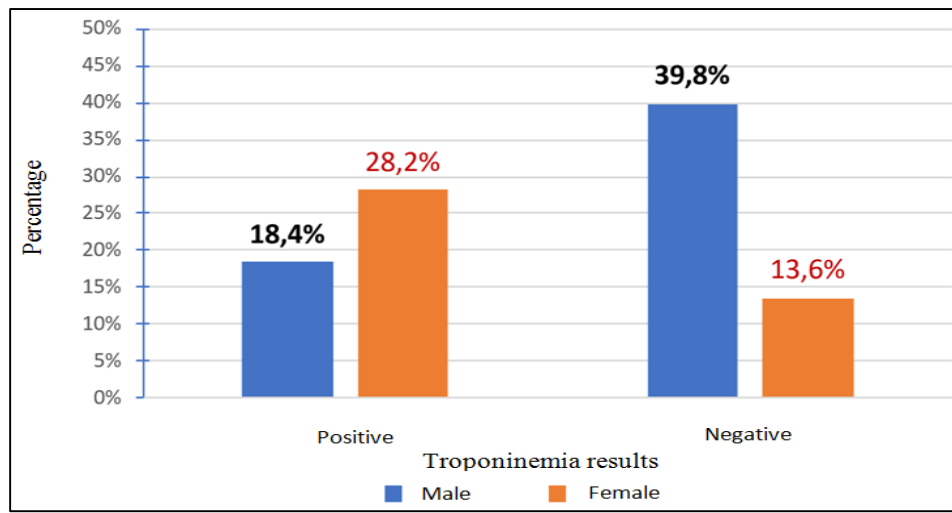
**Figure 1** Troponinemia positivity rate according to the prescribing service

Among women, 44.19% had a significant troponinelevation and a significant difference between the degree of troponinelevation and gender was found (p=0.0202) (figure 2).

There was no significant difference between age and troponin positivity (p=0.0919).

There was a change in treatment strategy in 39.8% of patients testing positive with a significant difference between change in treatment and troponin positivity (p<0.001). Young adults between 41 and 50 years of age predominated among the deceased with 23.3%. A predominance of 60.5% among the deceased patients was found among males but no significant difference was shown between mortality and gender (p=0.6998).

In our study population, 65.11% of the deceased patients had a positive but non-significant troponin level(p=0.118) (Table 1).



**Figure 2** Cardiac Troponin level according to gender

**Table 1** Cardiac troponin level in deceased patients

Troponinemia in men	Number of cases	Troponinemia in women	Number of cases
< 30 ng/mL	13	<14 ng/mL	2
30 – 60 ng/mL	3	14 – 60 ng/mL	1
60 – 90 ng/mL	0	60 – 90 ng/mL	2
>90 ng/mL	11	> 90 ng/mL	11
TOTAL	27	TOTAL	16

#### 4. Discussion

Cardiac troponin is a biomarker of myocardial injury, and in patients with COVID-19, this injury may be more frequently of non-ischaemic origin or due to an imbalance in oxygen supply, which may involve all organs [6]. Thus, troponin should be taken into account to identify cardiac damage in patients at higher risk of severe forms of COVID-19.

In our study, of those who tested positive, 56.25% of the population had a significant high troponin level. An American study has shown that higher plasma troponinelevation is predictive of a poor prognosis in patients infected with SARS-CoV-2 [7].

Regarding gender, in women, a significant elevation of troponin was found in 44.19% versus 13.33% in men. A significant difference between the degree of troponinelevation and female gender (p=0.0202) was found. Few studies

have shown that elevated hs-cTn was found to have a stronger association with cardiovascular events and mortality in women [8].

In patients with suspected acute coronary syndrome, sex-specific hs-cTn thresholds have been identified in up to five times more women than men with myocardial injury [9].

However, the literature states that males predominate among those with elevated troponin levels. Duthil et.al reported that there was no significant gender difference between the group of those with normal troponin levels and those with elevated troponin levels [10].

In response to the biological result of elevated troponin levels, a change of treatment was initiated by the physicians for the majority of patients.

A significant difference was shown between hs-cTn positivity and change of treatment ( $<0.0001$ ). An increase in cardiac troponin levels is of significant clinical value.

A comprehensive judgement based on the clinic and combined with ancillary investigations such as electrocardiogram and imaging is required [11]. The ESC states that patients with elevated troponin levels but who are clinically stable may benefit from initial conservative management [12]. An observation published in the European Heart Journal showed the effectiveness of the combination of corticosteroids and immunoglobulins in the treatment of fulminant coronavirus myocarditis [13]. The use of ACE inhibitors and statins may be associated with a lower risk of in-hospital death [14].

Age group between 41 and 50 years old shows the most deaths with 23.3%. In the literature, age greater than or equal to 65 years has an impact on mortality in patients infected with COVID-19 in Strasbourg [10]. Olderage and cardio-metabolic diseases (hypertension, diabetes) are the most important risk factors for mortality from COVID-19 infection according to Li X et al [15].

High troponin levels play a role in the mortality of patients with COVID-19. In a study by Shi et al. myocardial damage was frequently observed and the mortality rate increases with the magnitude of the hs-cTn level [16]. Which is consistent with our study. There is a correlation between death in patients infected with COVID-19 and elevated troponin levels according to Aazri et al [17]. Troponin levels rise progressively and in parallel with the severity of COVID-19 and the development of Acute respiratory distress syndrome (ARDS) [18]. However, our study showed no significant difference between troponin positivity and patient outcome. This discrepancy could be related to the limitations of our study (limited sample size and single-center study) and to our inclusion criteria Among the 173 requests for Troponin assays received by the Biochemistry Laboratory of the CHUJRA during the study period, 103 files were included. The medianage of the patients was 56 years [18-95 years] with a sex ratio of 1.39.

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## 5. Conclusion

Troponine miatesting remains a reference test for the detection and monitoring of myocardial damage. It has been prescribed for patients with COVID-19 although the cost and accessibility is not within the reach of all Malagasy patients. Increased awareness of prescribing clinicians and improved biological technology would greatly improve the management of cardiovascular complications of COVID-19 in low-income countries.

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## Compliance with ethical standards

### *Acknowledgments*

We would like to thank all the staff of the laboratory of the University Hospital of Ravoahangy Andrianavalona.

### *Disclosure of conflict of interest*

The authors declare that there is no conflict of interests regarding the publication of this paper.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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