

# Risk factors for mortality of patients with COVID-19 in Morocco: A retrospective cohort study

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## Abstract

Nowadays, COVID-19 remains one of the major public health issues of our time. More than 70 million cases and 1.6 million deaths have been reported worldwide. The epidemiological, clinical and biological characteristics of patients who died with severe COVID-19 and the risk factors for mortality have not been well described. The main objective of our study is to describe the epidemiological, clinical and some biological characteristics of nine COVID-19 patients deceased, as well as the risk factors for morbi-mortality. In this retrospective cohort study, we included nine adult patients with laboratory confirmed COVID-19, who had died. Demographic, clinical and biological data were collected and collated from the patients' medical records. The results of our study, of patients aged 46 to 78 years, showed a male predominance of 67%. All cases had a comorbidity, with hypertension and diabetes being the most common [44.45%]. Evaluation of the ratio of diseased to healthy lung shows that the majority of deaths (77.78%) showed a degree of severe lung involvement (50%-75%). The results also show that these severe cases manifest an intense elevation of certain biological markers of inflammation and blood clotting processes, including C-Reactive protein (CRP) and D-dimers. Lymphopenia is manifested in 77.78% of cases. The Results of these experiments showed the potential risk factors of older age, C reactive protein, d-dimer and lymphopenia. These factors could help to identify patients with poor prognosis earlier.

**Keywords:** COVID-19; Mortality; Risk factors; Co-morbidity

## Introduction

A new infectious disease appeared in China on December 31, 2019, named Coronavirus Disease 2019 (COVID-19).

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COVID-19 is a viral disease caused by the SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2).

This new virus could generate severe forms, requiring intensive care hospitalization and associated with a high mortality rate. As of 15 December 2020, more than 70 million cases and 1.6 million deaths have been recorded worldwide [1].

To address this problem, we propose a retrospective, observational and descriptive study of nine deceased severe COVID-19 cases. The aim of this study is to describe the epidemiological, clinical and biological profile of these deaths as well as the risk factors for morbi-mortality.

## Materials and Methods

This is a retrospective, observational and descriptive study of nine COVID-19 patients who died in the intensive care unit of the Hospital Tangier during two weeks of August 2020. Data were collected and collated from the patients' medical records. Quantitative variables were expressed as an average and qualitative data were expressed as a percentage.

## Results and Discussion

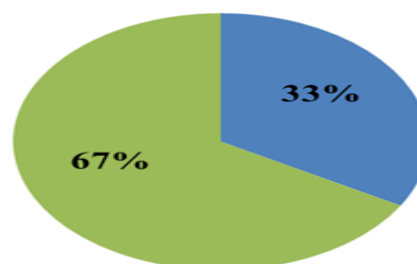
### Demographics and clinical characteristics

A total of 9 deaths by COVID-19 are included in this study (Figures 1 and 2).

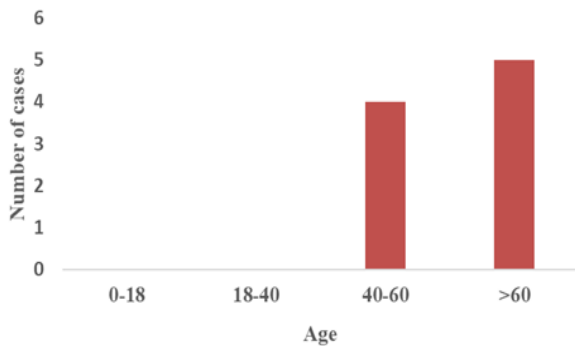
The distribution of COVID-19 deaths by gender and age is shown in the following graphs:

**Figure 1:** Distribution of COVID-19 deaths by gender.

**Note:** ■ -33%, ■ -67%.



**Figure 2:** Distribution of COVID-19 deaths by age.

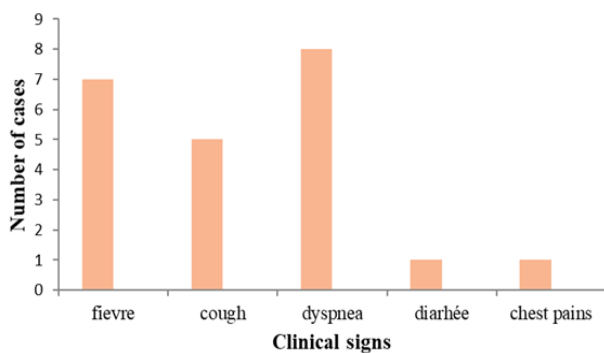


The male gender was predominant, accounting for 67% of the deceased cases.

The average age was 64.89 years. The age group most affected by COVID-19 was over 60 years of age.

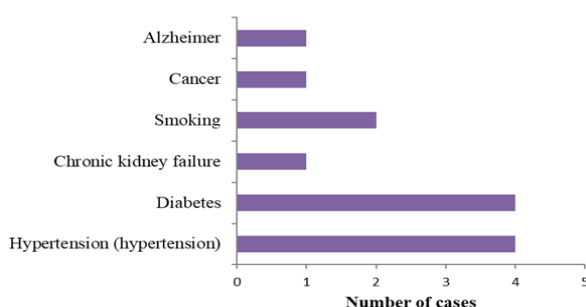
In all cases, the most common symptoms were respiratory dyspnea (88.89%), fever (77.78%) and cough (55.56%) followed by fatigue and chest pain (Figure 3).

**Figure 3:** Clinical signs of death COVID-19.



The graph below shows the complications (co-morbidities) associated with a severe course of COVID-19 leading to death. (Figure 4).

**Figure 4:** Different types of co-morbidities in deaths.



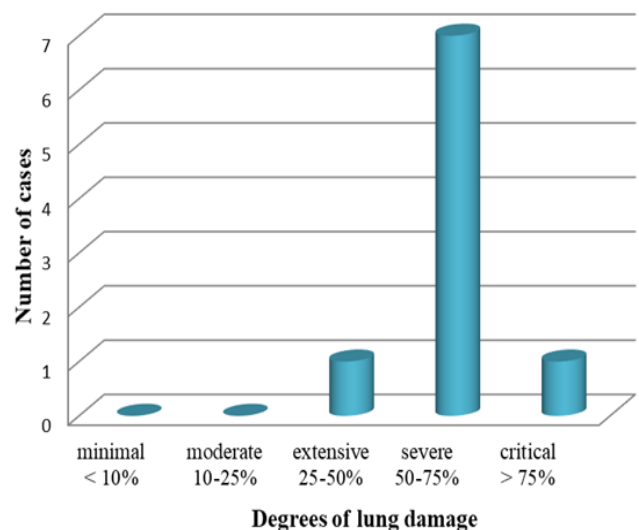
This is a retrospective, observational and descriptive study of nine COVID-19 patients who died in the intensive care unit of the Hospital Tangier during two weeks of August 2020. Data were collected and collated from the patients' medical records. Quantitative variables were expressed as an average and qualitative data were expressed as a percentage.

All cases have co-morbidities, including hypertension and diabetes (44.45%).

**Characteristics of Thoracic Computed Tomography (CT) Scanning:**

The graph below shows the different degrees of lung involvement in COVID-19 deaths. (Figure 5).

**Figure 5:** Different degrees of lung involvement in deaths.

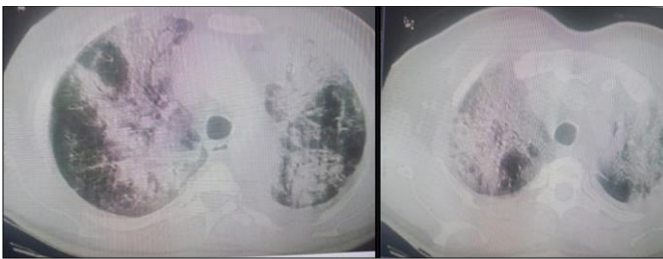


Evaluation of the ratio of pathological to healthy lung shows that the majority of deaths (77.78%) manifested a degree of severe lung damage (50%-75%).

The chest CT scan of all cases shows a "crazy paving" image, which is defined as an area of pulmonary parenchyma with increased density.

The chest CT scan in Figure 6 shows an example of 75% "critical" lung damage with "crazy paving" image of severe COVID-19 patients (Figure 6).

**Figure 6:** CT sections shows a "critical" lung involvement with "crazy paving" image of COVID-19 deceased patients.



### Biological characteristics

C-Reactive Protein (CRP) is one of the biological markers that attracts attention in deaths. A very high level of this marker has been noted, averaging 209.89 mg/l versus a normal level that should be less than 12 mg/l. The level of CRP could be among the biological characteristics reflecting intense inflammatory activity in severe cases of COVID-19.

In addition, there was an imbalance in the lymphocyte immune response in the deaths, who had very marked lymphopenia. The majority of cases (77.78%) showed lymphopenia, a lymphocyte count of less than 1500/mm<sup>3</sup>.

In addition, the measurement of plasma D-dimer levels in COVID-19 positive patients is of primary importance as an indicator of the presence of a blood clot or thrombus in patients, a stigma of coagulopathy associated with severe and predictive forms of mortality.

Plasma levels of D-dimer, in all cases, showed very high D-dimer values with an average of 3086.75 µg/l versus a normal level below 500 µg/l. 44.45% of the cases showed pulmonary embolism.

Our cohort consisted of nine cases who died from complications of COVID-19. We were able to describe these patients in terms of demographics (age, gender, co-morbidities, degree of pulmonary involvement).

In this cohort, the most affected age group was over 60 years of age with a predominance of males. This prevalence are similar to those obtained by Du et al. where the patients in the deceased group were of an age ≥ 65 ans with male predominance [2] and several studies suggest that adults under 65 years of age had a lower risk of death than the elderly [3,4]. This shows that our results are consistent with those in the literature and that age and gender could be powerful predictors of death from CoV-2 SARS infection. It is not yet clear why COVID-19 is so severe in the elderly, but in general could be due to the weakened immune system and their vulnerability to respiratory infections. The male predominance could be due to biological differences between the genders (the inflammatory process, expressivity of ACE2 and gender hormones) [5].

As expected, our analysis also revealed that all cases have co-morbidities, including hypertension (44.45%) and diabetes (44.45%).

These results are consistent with several studies [2, 3] suggesting that cardiovascular or cerebrovascular

disease, as well as other diseases such as diabetes, contribute to elevated mortality from COVID-19. This could be explained by the fact that co-morbidities influence disease severity by improving the physiopathological mechanisms of COVID-19 (inflammation, coagulopathy) [6].

The CT lung damage of COVID-19, in patients in our series, manifested as "crazy paving ". Quantification of the extent of the lesion in these cases shows that the majority of deaths (77.78%) manifested a degree of severe lung involvement (50%-75%). Several studies have been done to investigate the impact of extent of injury on the severity of COVID-19 [7,8]. They have found that CT lesion extent correlates with the clinical severity of COVID-19 disease.

We also focused on biological tests associated with inflammation or organ damage, which are C-reactive protein and D-dimers. The level of C-Reactive Protein (CRP) in all deaths was very high, averaging 209.89 mg/l.

In several studies, CRP is considered an early biomarker for predicting the severity of COVID-19 because most severe cases had high levels of CRP [9,10]. The cytokine storm, an overproduction of inflammation cytokines such as IL2, IL6 and TNF, is among the pathological pictures that explains the high CRP levels in COVID-19 severe patients.

Plasma levels of D-dimer, in all cases, showed very high values with an average of 3086.75 µg/l. Elevation of D-dimer is considered a marker of severe COVID-19 coagulopathy [4-11].

Lymphopenia is manifested in most cases (77.78%). Numerous clinical studies report a high frequency of CD4 and CD8 lymphopenia, particularly in severe forms of the disease and associated with the occurrence of death [12,13]. This lymphopenia extends over the entire lymphocyte population.

### Conclusion

COVID-19 is a disease that has caused a high health risk this year, resulting in the death of a very high number of people. The results obtained in severe cases of COVID-19 deaths, in resuscitation, all present an inflammatory syndrome and coagulopathy with respiratory distress and co-morbidities. All these factors were responsible for their mortality. Further studies are needed to discover other risk factors to predict severe prognosis cases.

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