

# Sociodemographic Characteristics and Transmission Risk Factors In Patients Hospitalized for COVID-19 Before And During The Lockdown In France

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## Research article

**Keywords:** COVID-19, lockdown, sociodemographic characteristics

**Posted Date:** December 29th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-136544/v1>

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**Version of Record:** A version of this preprint was published at BMC Infectious Diseases on August 13th, 2021. See the published version at <https://doi.org/10.1186/s12879-021-06419-7>.

# Abstract

**Background:** The efficacy of lockdown in containing the COVID-19 pandemic has been reported in different studies. However, the impact on sociodemographic characteristics of individuals infected with SARS-CoV-2 has not been evaluated. The aim of this study was to describe the changes in sociodemographic characteristics of patients hospitalized for COVID-19 and to compare the transmission risk factors of COVID-19 before and during lockdown in France.

**Methods:** An observational retrospective study was conducted in a University Hospital in Paris, France. Data from patients hospitalized for COVID-19 in the Infectious Diseases Department between February 26 and May 11, 2020 were collected. The study population was divided into 2 groups: group A of patients infected before lockdown, and group B of patients infected during lockdown, considering a maximum incubation period of 14 days. Sociodemographic characteristics and transmission risk factors were compared between the 2 groups using Student's t-test for continuous variables and Chi-2 test or Fisher exact test for categorical variables.

**Results:** Three hundred eighty-three patients were included in the study, 305 (79.6%) in group A and 78 (20.4%) in group B. Patients in group A were significantly younger (60.0 versus (vs) 66.5 years ( $p=0.03$ )). The professionally active population was larger in group A (44.3% vs 24.4%). There were significantly more non-French-speaking people in group B (16.7% vs 6.6%,  $p<0.01$ ). Most patients from group A had individual accommodation (92.8% vs 74.4%,  $p<0.01$ ). Contact with a relative was the main transmission risk factor in both groups (24.6% vs 33.3%,  $p=0.16$ ). Recent travel and large gathering were found only in group A. The proportion of people living in disadvantaged conditions, such as homeless people or people living in social housing, was significantly higher in group B (11.5% vs 4.3%,  $p=0.03$ ) as was the proportion of institutionalized individuals (14.1% vs 3.0%,  $p<0.01$ ).

**Conclusions:** In this study conducted in patients hospitalized for COVID-19 in Paris, France, the likelihood of being infected despite the lockdown was higher for people who do not speak French, live in social housing, are homeless or institutionalized. Targeted measures have to be implemented to protect these populations.

## Background

The COVID-19 pandemic is an unprecedented public health challenge. From February 2020, restrictive measures were progressively implemented in France as a response to the COVID-19 outbreak, such as a ban on public gatherings in enclosed spaces, closure of nurseries, schools and universities, physical distancing, and the use of face masks. Due to the continuously increasing incidence despite all the above measures and in order to help the healthcare system cope with the ever higher number of patients, the French Government declared, on March 17, a general population lockdown, as well as travel restrictions in the European Union and border closure of the Schengen area. The entire French population was in strict lockdown until May 11.

The efficacy of lockdown in containing the pandemic has been predicted by mathematical modeling (1). Lockdown has also been reported to decrease the spread of COVID-19 in other areas where there was general lockdown of the entire population, such as Wuhan in China and Asian countries (2). However, the impact of lockdown on the sociodemographic characteristics of individuals infected with SARS-CoV-2 has not been evaluated.

The aim of this study was to describe the changes in sociodemographic characteristics of patients hospitalized for COVID-19 in a University Hospital in Paris and to compare the transmission risk factors of COVID-19 before and during lockdown in France.

## **Methods**

### **Study design and population**

In this observational, retrospective, single-center study, we included all confirmed cases of COVID-19 between February 26 and May 11, 2020 admitted to the Infectious Diseases Department of Bichat-Claude Bernard University Hospital in Paris, France. All enrolled patients were diagnosed by positive reverse-transcription polymerase chain reaction for SARS-CoV-2 and/or typical chest computerized tomography characteristics. The study population was divided into 2 groups: group A of patients infected before lockdown, and group B of patients considered to be infected during lockdown. A maximum incubation period of 14 days was considered as suggested by previous studies (3, 4). Therefore, group A consisted of patients with onset of infection between February 26 and March 31, 2020. Group B consisted of patients complaining of initial signs from April, 1 until May 11, 2020.

### **Outcomes and variables**

The sociodemographic characteristics of patients hospitalized for COVID-19 before and during lockdown and the change in transmission risk factors between the 2 groups were collected. Sociodemographic data included age, gender, nationality, spoken language, occupation, healthcare insurance, type of household, and number of household members.

The potential transmission risk groups were assessed for each patient and classified in 8 categories as follows: (1) travel in an endemic international zone or in a cluster zone in France (city of Mulhouse, Oise department, Morbihan department); (2) unusual recent large gathering; (3) profession considered at risk (healthcare worker, caregiver, or public transport agent); (4) recent contact with a relative at high risk of infection (such as healthcare worker), presenting signs of infection or with confirmed COVID-19; (5) disadvantaged conditions (collective housing and homeless people); (6) nosocomial exposure (hospitalization and hemodialysis session); (7) institutionalized (elderly people and disabled persons); (8) not belonging to these transmission risk groups. Patients could belong to multiple transmission risk groups.

### **Data collection and analysis**

Data collection was done using computerized medical records. Continuous variables were described by median and interquartile ranges, whereas categorical variables were represented by numbers and percentages. Student's t-test was used to compare continuous variables. The Chi-2 test or Fisher exact test was used to compare categorical variables according to the distribution and headcounts of variables. A p-value < 0.05 was considered statistically significant.

## **Results**

Sociodemographic characteristics of patients and transmission risk groups before and during lockdown are reported in Table 1.

Table 1  
Sociodemographic characteristics and transmission risk factors before and during lockdown

	<b>Total</b>	<b>Infected before lockdown</b>	<b>Infected during lockdown</b>	<b><i>p</i></b>
<b>Total population, N (%)</b>	<b>383 (100.0)</b>	<b>305 (79.6)</b>	<b>78 (20.4)</b>	
Demographic characteristics				
Men, n (%)	237 (61.9)	187 (61.3)	50 (64.1)	0.65
Age (median ± IQR)	61 (39–83)	60 (39–81)	66.5 (43–90)	0.03
Nationality, n (%)	234 (61.1)	188 (61.6)	46 (59.0)	0.65
- French	18 (4.7)	13 (4.3)	5 (6.4)	
- European	131 (34.2)	104 (34.1)	27 (34.6)	
- Non-European				
Social characteristics				
Occupation, n (%)	154 (40.2)	135 (44.3)	19 (24.4)	0.01
- Active*	51 (13.3)	40 (13.1)	11 (14.1)	
- Unemployed	136 (35.5)	100 (32.8)	36 (46.2)	
- Retired	42 (11.0)	30 (9.8)	12 (15.4)	
- Other or undetermined				
Housing, n (%)	341 (89.0)	283 (92.8)	58 (74.4)	< 0.01
- Individual accommodation	15 (3.9)	10 (3.3)	5 (6.4)	
- Social	7 (1.8)	3 (1.0)	4 (5.1)	
- Homeless	20 (5.2)	9 (3.0)	11 (14.1)	
- Institutionalized				
Number of persons in the household, n (%)	67 (17.5)	56 (18.4)	11 (14.1)	0.92
- 1	199 (52.0)	164 (53.8)	35 (44.9)	
- 2–4	90 (23.5)	73 (23.9)	17 (21.8)	
- ≥ 5 or collective housing				
*Active: employee/self-employed/executive				

	Total	Infected before lockdown	Infected during lockdown	<i>p</i>
Non-French-speaking, n (%)	33 (8.6)	20 (6.6)	13 (16.7)	< 0.01
No health insurance, n (%)	24 (6.3)	18 (5.9)	6 (7.7)	0.60
Transmission risk factors				
Relative, n (%)	101 (26.4)	75 (24.6)	26 (33.3)	0.16
Nosocomial exposure, n (%)	44 (11.5)	35 (11.5)	9 (11.5)	0.99
Profession at risk, n (%)	40 (10.4)	33 (11.1)	7 (9.0)	0.79
Travel, n (%)	30 (7.8)	30 (9.8)	0 (0.0)	< 0.01
Disadvantaged conditions, n (%)	22 (5.7)	13 (4.3)	9 (11.5)	0.03
Institutionalized patients, n (%)	20 (5.2)	9 (3.0)	11 (14.1)	< 0.01
Large gathering, n (%)	10 (2.6)	10 (3.3)	0 (0.0)	0.22
No evident cause of infection, n (%)	136 (35.5)	120 (39.3)	16 (20.5)	< 0.01
*Active: employee/self-employed/executive				

### Sociodemographic characteristics

Three hundred and eighty-three patients were included in the study, 305 (79.6%) in group A and 78 (20.4%) in group B. Patients in group A were significantly younger, with a median age of 60.0 years old (IQR 39–81) versus (vs) 66.5 years old (IQR 43–90) in group B ( $p = 0.03$ ). Occupation was significantly different between the 2 groups ( $p < 0.01$ ). The professionally active population was indeed larger in group A (44.3% vs 24.4%), while the percentage of retirees was higher in group B (46.2% vs 32.8%). However, unemployed people were equally distributed in the 2 groups (13.1% vs 14.1%). Patients were mainly of French nationality, 61.6% and 59.0% in groups A and B, respectively. The proportion of French, European, and non-European citizens was equally distributed in the 2 groups ( $p = 0.65$ ). However, there were significantly more non-French-speaking people in group B compared to group A (16.7% vs 6.6%,  $p < 0.01$ ). Regarding housing, most patients (92.8%) from group A had individual accommodation vs 74.4% in group B, whereas there were more people living in social housing (6.4% vs 3.3%), homeless people (5.1% vs 1.0%), and institutionalized individuals (14.1% vs 3.0%) in group B ( $p < 0.01$ ). Healthcare coverage was not significantly different between the two groups, with 5.9% and 7.7% of the population with no health insurance in groups A and B, respectively ( $p = 0.60$ ).

### Transmission risk groups

Contact with a relative as defined above was the predominant factor reported regardless of the period of infection (24.6% vs 33.3%,  $p = 0.16$ ). Recent travel was only found in group A (9.8% vs 0.0%,  $p < 0.01$ ), as was attendance at a recent large gathering (3.3% vs 0.0%,  $p = 0.22$ ). The proportion of people with a profession considered at risk was equally distributed in the 2 groups (11.1% vs 9.0%,  $p = 0.79$ ). In group B, the proportion of people living in disadvantaged conditions was significantly higher (11.5% vs 4.3%,  $p = 0.03$ ) as was the proportion of institutionalized patients (14.1% vs 3.0%,  $p < 0.01$ ). The nosocomial infection rate was the same in the 2 groups (11.5% and 11.5%,  $p = 0.99$ ). Not belonging to a transmission risk group was more frequent in group A (39.3% vs 20.5%,  $p < 0.01$ ).

## Discussion

In this study, lockdown effectively reduced the number of new infections, with 80% of hospitalized patients being infected before its implementation. The same result has been observed in other countries both in Asia and Europe (2, 5) and reflects a high level of adherence to lockdown in these populations. The protective effect of lockdown was particularly notable in younger, professionally active people living in individual accommodation.

However, our results indicate that some populations remained at risk of infection despite lockdown. First, ethnic minorities represented one-third of the patients hospitalized with COVID-19 in both periods and individuals not speaking French were at higher risk of infection during lockdown. Previous studies in the United-Kingdom have reported a higher risk of COVID-19 infection in black and Asian people than in white people (6, 7). Ethnic minorities may have limited access to information from health authorities and less knowledge about the disease, which may lead to inappropriate behavior (8, 9). Second, people living in social housing and homeless people were more likely to be infected during lockdown. A higher risk of infection in more deprived areas has also been reported in previous studies (6, 7). This may be explained by the absence of social distancing between people living in disadvantaged conditions (9, 10).

In addition, individuals infected during lockdown were older and included more retirees and institutionalized persons. This population is more dependent and requires constant care, leading to a risk of infection by caregivers (11). Implementation of social distancing is challenging in crowded long-term care facilities with shared common areas and low preparedness for infection control (12).

In our study, the number of individuals without any identified risk factor for transmission was high, and even higher before lockdown, when the virus was circulating and the general population was unaware of its route of transmission.

Our patients were mostly infected by a relative before and during lockdown. Mathematical modeling of the effect of lockdown in Italy showed that even with strict adherence to lockdown, transmission will still occur within households (1). Physical distancing is hardly applicable at home, especially in large households.

The risk of infection associated with traveling was reduced by travel restrictions and border closures, and that associated with public meetings and events was reduced by a ban on mass gatherings. Nosocomial and workplace infections remained stable over the two periods, other measures such as the use of personal protective equipment having been implemented before lockdown.

This study identifies specific vulnerable populations at high risk of COVID-19 despite lockdown. However, our results should be interpreted with caution given the retrospective design of the study and may not be similar in other settings.

## **Conclusion**

The lockdown in France effectively contained the COVID-19 outbreak. However, ethnic minorities, vulnerable populations, the elderly, and institutionalized people remained at risk of infection during lockdown. Specific and targeted public health measures have to be implemented to prevent the spread of COVID-19 in these populations. The efficacy of lockdown should also be viewed in light of the collateral effect of prolonged lockdown which may exacerbate socioeconomic inequalities and increase poverty.

## **Abbreviations**

COVID-19

Coronavirus Disease-19

SARS-CoV-2

Severe Acute Respiratory Syndrome-Coronavirus-2

Vs

versus

## **Declarations**

### **Ethics approval and consent to participate**

This study was approved by the Institutional Review Board -IRB 00006477- of HUPNVS, Paris 7 University, AP-HP.

### **Consent for publication**

Patients were informed and did not oppose the collection of data from their computerized medical records.

### **Availability of data and materials**

The dataset used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Competing interests

The authors declare that they have no competing interests to disclose.

## Funding

No funding.

## Authors' contributions

All authors have seen and approved the manuscript and have significantly contributed to the work.

## Acknowledgements

We thank all the healthcare workers who have participated to this work.

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