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Features of fragile people with SARS-CoV-2 infection in isolation in a COVID-19 hotel in Rome, Italy

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Abstract. – OBJECTIVE: Temporary COVID-19 hotels have been established in Italy to assist the homeless people that test positive for SARS-CoV-2 and require isolation. This observational study aimed to investigate the characteristics of the subjects who were isolated at the *Casa tra Noi* COVID-19 hotel in Rome between October 2020 and May 2021 and to estimate the duration of SARS-CoV-2 positivity according to their main socio-demographic, behavioural and clinical features.

SUBJECTS AND METHODS: Socio-demographic data, clinical history, and anamnestic data of guests were collected by the clinicians reviewing the medical documentation and face-to-face interviewing. Nasopharyngeal swabs were performed every 7 days and the presence of SARS-CoV-2 was assessed by RT-PCR. Median duration of SARS-CoV-2 positivity according to socio-demographic, behavioral factors and clinical condition was calculated.

RESULTS: The 196 guests (161 males, 82.1%) had a median age of 41 years (IQR: 30-53), and were mostly African (87, 44.4%). Only asymptomatic/paucisymptomatic infections were observed. Almost half of the individuals (84, 42.9%) were affected by at least one co-morbidity, the frequency of which was higher among women (57.1% *vs.* 39.8%, *p*=0.06). The date of the negative SARS-CoV-2 molecular test was known for 144 guests (73.5%). Among these, the median duration of positivity was 21 days (IQR: 14-26) and did not significantly vary with age, country of origin, smoking status, alcohol or drug abuse. Among the co-morbidities, only infectious diseases significantly modified the duration of positivity, which increased from 21 to 34 days (*p*=0.013).

CONCLUSIONS: Hotel guests were frequently affected by physical/mental co-morbidities. Duration of SARS-CoV-2 positivity was significantly prolonged only in individuals affected by an infectious disease.

Key Words:
Homeless, Fragile, SARS-CoV-2, COVID-19, Isolation, COVID hotel, Co-morbidity.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the causative agent of Coronavirus Disease 2019 (COVID-19), emerged in late 2019 and posed a global health threat within a few months[1,2]. Consequently, on 11 March 2020, the World Health Organization (WHO) declared COVID-19 as a pandemic[3].

The symptoms of SARS-CoV-2 infection include fever, cough, dyspnea, expectoration, headache, and myalgia or fatigue. Diarrhea, hemoptysis, and shortness of breath are less common[4]. In a few cases, particularly in elderly and immunocompromised people, SARS-CoV-2 may lead to severe pneumonia and subsequently death[5]. Despite the fact that SARS-CoV-2 has affected all segments of the population, the infection had a significantly worse impact on fragile subjects, such as homeless persons[6-9]. Not only are homeless populations more likely to become infected[10], but they also have a higher prevalence of co-morbidities that increase the risk of severe disease and mortality from SARS-CoV-2, e.g.,

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tuberculosis, hepatitis C, and HIV[3-5]. In addition, previous research has shown[11,12] that homeless persons may have physical and mental diseases that cause a higher mortality than the general population, and COVID-19 might further worsen this disparity[11,13].

The burden of SARS-CoV-2 among homeless people is scarcely known. Especially when asymptomatic, they may represent a hidden source of virus transmission, which may be difficult to trace and control[14]. Indeed, people experiencing homelessness live in congregate settings that may promote SARS-CoV-2 spread, as they share common spaces, often without adequate social distancing and individual protections. Positivity for SARS-CoV-2 has been demonstrated in elevated proportions of homeless people living in shelters in the USA (approximately, 20-70%)[13,15]. Notably, much lower rates have been reported in shelters where preventive measures were implemented[16-19]. A meta-analysis[20] estimated a pooled prevalence of 32.6% as the peak reached in homeless shelter outbreaks.

Given the lack of permanent housing, there has been a need for temporary medical shelters to assist homeless people that test positive for SARS-CoV-2. To this aim, several private hotels have been established as COVID-19 hotels for people requiring isolation or quarantine, especially in the US[21,22], but also in Italy.

The objective of this observational study was to describe the characteristics of the fragile population, mainly homeless people that have been isolated at a COVID-19 Hotel in Rome because of SARS-CoV-2 positivity. We also aimed to estimate the duration of SARS-CoV-2 positivity according to the main socio-demographic, behavioural and clinical features of the hosted individuals.

Subjects and Methods

Study Population

A retrospective study was conducted on all homeless individuals admitted to the *Casa Tra Noi* Hotel (located in the center of Rome, Italy, close to the Vatican City), between October 2020 and May 2021 for isolation purposes after a positive SARS-CoV-2 molecular test. These subjects had been tested in different scenarios: i) because of clusters in their shelters; ii) in order to be admitted to a shelter where a negative test was a pre-requisite for entrance; iii) when attending primary care services for fragile people. Individuals with any of the following conditions were not admitted: body temperature >37.5°C, peripheral oxygen saturation <94%, chronic obstructive pulmonary disease, unstable cardiovascular disease, severe mental illness, non-self-sufficiency. Individuals who could not understand the Italian language and thus could not provide an informed consent were excluded from the study.

Socio-demographic data (age, gender, country of origin) and clinical history (physical and mental disorders) of the guests were recorded by the clinicians reviewing the medical documentation. Additional anamnestic data were collected by interviewing the guests.

Guests remained isolated and had access to the necessary services until they met the criteria to discontinue isolation based on the Italian Ministry of Health guidelines[23]: i) after 10 days with a laboratory-confirmed negative test; ii) in case of positivity, isolation could be discontinued after 21 days for those without symptoms for at least a week.

The study was conducted in accordance with the principles of the Helsinki Declaration. Informed consent was obtained from all individual participants included in the study.

Health Assessment

Physicians of the San Gallicano Dermatological Institute IRCCS (Rome, Italy), "Istituto di Medicina Sociale" and "ASL Roma 1" were involved in the medical assistance of the guests on a 24-hour basis. A basic evaluation of health status was performed at admission. Measurements of body temperature, blood pressure, and peripheral oxygen saturation, along with screening of possible COVID-19 symptoms were performed at admission and subsequently on a daily basis until the discharge from the hotel.

SARS-CoV-2 Testing

A nasopharyngeal swab was taken by the staff of ASL Roma 1 following standard procedures. Presence of SARS-CoV-2 was assessed by RT-PCR. Screening tests were performed every 7 days.

Statistical Analyses

Descriptive statistics were used to summarize the basic features of the study population in terms of socio-demographics, lifestyle, and co-morbidities (percentages, median and interquartile range [IQR]). A Chi-square test was used to compare female and male populations regarding the categorical variables (socio-demographics, behavior-

Table I. Socio-demographic and behavioural characteristics of the study group overall and stratified according to sex.

Characteristic	All N=196	Females N=35	Males N=161	*p*-value[a]
Age, years, median (IQR)	41 (30-53)	47 (32-63)	40 (30-52)	**0.046**
Country of origin, n (%)				**0.013**
Africa	87 (44.4)	17 (48.6)	70 (43.5)	
Asia	28 (14.3)	0 (0.0)	28 (17.4)	
Europe	75 (38.3)	15 (42.9)	60 (37.3)	
Other[b]	6 (3.0)	3 (8.5)	3 (1.8)	
Smoking status, n (%)				
Never	115 (58.7)	20 (57.1)	95 (59.0)	0.68
Former	3 (1.5)	0 (0.0)	3 (1.9)	
Current	78 (39.8)	15 (42.9)	63 (39.1)	
Alcohol abuse, n (%)	39 (19.9)	7 (20.0)	32 (19.9)	0.98
Drug abuse, n (%)	11 (5.6)	2 (5.7)	9 (5.6)	0.97

[a]*p*-value for the comparison between females and males; significant differences are highlighted in bold.
[b]Australia, North and South America.

al data, and frequency of co-morbidities). Median duration of SARS-CoV-2 positivity for the individual co-morbidities was calculated only for the conditions observed in at least 4 patients.

Comparison of median values was performed using the Mann-Whitney test or Kruskal-Wallis test, as appropriate. The statistical analyses were conducted using the MedCalc Statistical Software version 20.009 (MedCalc Software Ltd, Ostend, Belgium; https://www.medcalc.org; 2021).

Results

Study Population

A total of 196 subjects were admitted to the *Casa Tra Noi* Hotel during the study period. They were all hosted in single rooms over the entire isolation period. The majority of the guests were males (161, 82.1%). The main socio-demographic and behavioral characteristics of the study population are reported in Table I. Female patients were significantly older than male patients (median age: 47 *vs*. 40 years, p=0.046). The majority of the individuals came from Africa (87, 44.4%). Asia was among the continents of origin only for the male population. Women and men did not differ significantly regarding their smoking status (p=0.68), the majority of them having never been smokers. A relevant proportion of subjects reported alcohol abuse (approximately 20%), whereas drug abuse was less frequent (less than 6%).

Prevalence and Type of Co-Morbidities

Almost half of the study subjects were affected by at least one co-morbidity (84/196, 42.9%). The frequency of co-morbidities tended to be higher among women, i.e., 20/35 (57.1%) *vs*. 64/161 (39.8%), p=0.06. The specific co-morbidities observed in the overall population and according to gender are shown in Table II. Hypertension was the most frequent condition among women with 28.6% of them being affected *vs*. 11.2% among men (p=0.008). Among men, dermatitis and eczema were the most frequently observed condition (13.0%). Malignancies and infectious diseases only affected a minority of the subjects. Cancer patients were not receiving cancer therapies at the time of isolation.

Mental/psychiatric conditions (schizophrenia, anxiety, depression, psychosis, bipolarity) were more frequent among women (10/35, 28.6%), although with no significant difference compared to men (28/161, 14.4%), p=0.13 (data not shown). Where necessary, assistance from mental health services was requested.

SARS-CoV-2 Positivity and COVID-19 Symptoms

For 144 out of the 196 hotel guests (73.5%), the date of the laboratory-confirmed negative test was available. For the other 52 subjects, the date of negativization remained unknown since they left the hotel with a positive test after 21 days, i.e., after the prescribed isolation period for those still testing positive but without symptoms. However, in several cases, those who had reached the end of the isolation period despite their positivity (having been asymptomatic for at least one week), were unwilling to leave the hotel. This was motivated either by the need to be admitted to a shelter that required a laboratory-confirmed negative test or by a lack of alternative housing.

Table II. Distribution of the co-morbidities among the 196 homeless, overall and stratified according to sex.

Co-morbidity	All N=196 n (%)	Females N=35 n (%)	Males N=161 n (%)	*p*-value[a]
Metabolic				
Diabetes mellitus	8 (4.1)	2 (5.7)	6 (3.7)	0.59
Obesity	3 (1.5)	1 (2.9)	2 (1.2)	0.49
Heart and cardiovascular				
Heart failure	5 (2.6)	1 (2.9)	4 (2.5)	0.89
Hypertension	28 (14.3)	10 (28.6)	18 (11.2)	**0.008**
Atrial fibrillation	4 (2.0)	2 (5.7)	2 (1.2)	0.09
Buerger disease	1 (0.5)	0 (0)	1 (0.6)	0.64
Lung				
Chronic lung disease	11 (5.6)	2 (5.7)	9 (5.6)	0.98
Kidney				
Renal failure	6 (3.0)	1 (2.9)	5 (3.1)	0.94
Blood				
Anaemia	3 (1.5)	1 (2.9)	2 (1.2)	0.48
Liver				
Cirrhosis	2 (1.0)	0 (0.0)	2 (1.2)	0.51
Neurological				
Neuropathy	2 (1.0)	0 (0.0)	2 (1.2)	0.51
Ataxia	1 (0.5)	0 (0)	1 (0.6)	0.64
Dermatological				
Non melanoma skin cancer	10 (5.1)	2 (5.7)	8 (5.0)	0.86
Psoriasis	5 (2.6)	1 (2.9)	4 (2.5)	0.90
Dermatitis and eczema[b]	26 (13.5)	5 (14.3)	21 (13.0)	0.84
Other[c]	6 (3.0)	2 (5.7)	4 (2.5)	0.32
Malignancy[d]	4 (2.0)	2 (5.7)	2 (1.2)	0.09
Infectious[e]	6 (3.0)	2 (5.7)	4 (2.5)	0.32
Other[f]	8 (4.0)	4 (2.5)	4 (11.4)	**0.016**

[a]*p*-value for the comparison between females and males; significant differences are highlighted in bold; [b] seborrheic dermatitis, prurigo nodularis, lichen simplex; [c] rosacea, acanthosis nigricans, scabies; [d] lung cancer, breast cancer, bone cancer; [e] three HBV, one TB, one HIV and one Echinococcosis; [f] arthrosis, gastritis, trauma, hypothyroidism.

The median duration of positivity for SARS-CoV-2 estimated for the subjects with the data available was 21 days (IQR: 14-26). Table III shows the median duration of positivity based on selected socio-demographic and behavioral factors. No significant difference was observed between men and women, p=0.72. In addition, the median duration did not significantly vary with age, country of origin, smoking status, alcohol or drug abuse.

Having co-morbidities did not significantly modify the duration of positivity, the median time being 21 days (IQR: 14-28) among those with at least one physical condition and 21 days (IQR: 14-25) among those with no co-morbidity (p=0.37). Subjects with mental/psychiatric conditions did not differ significantly in terms of median positivity duration from those in which these conditions were not observed. In fact, positivity lasted a median of 20 days (IQR: 14-25) in the former group of individuals *vs*. 21 days (IQR: 14-25) in the latter one, p=0.93.

Duration of SARS-CoV-2 positivity according to the specific co-morbidities is shown in Table IV. The only significant difference emerged when considering infectious diseases. Those affected by an infectious disease remained positive for a median of 34 days (IQR: 27-42) *vs*. a median of 21 days (IQR: 14-26) for those not affected, p=0.013.

None of the guests required hospitalization while staying at the hotel. Thirty-nine subjects (19.9%) developed very mild symptoms (low fever, sore throat, and rhinitis).

Discussion

The COVID-19 pandemic has exacerbated health and social disparities[24]. Because of their

Table III. Median duration of positivity for SARS-CoV-2 molecular test according to selected socio-demographic and behavioral factors among 144 homeless people.

Characteristic	Median duration, days (IQR)	*p*-value
Sex		0.72
females	21 (12-28)	
males	21 (14-26)	
Age, years		0.74
≤40	21 (14-25)	
>40	20 (13-28)	
Country of origin		0.94
Africa	21 (14-25)	
Asia	23 (14-27)	
Europe	20 (13-29)	
Other[a]	20 (17-28)	
Smoking status		0.73
never	22 (14-26)	
former	21 (19-22)	
current	20 (13-25)	
Alcohol abuse		0.71
no	21 (14-26)	
yes	20 (14-28)	
Drug abuse		0.90
no	21 (14-26)	
yes	20 (13-25)	

[a]Australia, North and South America.

frequent co-morbidities and very limited access to health facilities, homeless people are a particularly fragile population, and their vulnerability became critical during the pandemic. Indeed, they have been shown to be more likely to become infected by SARS-CoV-2 during lockdown[25]. Unfortunately, since they lack stable housing, the isolation of these individuals has represented a critical issue given the need to offer medical assistance but also to limit SARS-CoV-2 spread. In spite of their fragile condition, homeless people were not initially considered as a vaccine allocation priority in Western countries[26].

The present study outlines the characteristics of 196 SARS-CoV-2 positive subjects, mainly homeless, hosted in a COVID-19 hotel in Rome. The majority of them came from Africa, but Europeans represented a significant proportion of the guests. Almost half of the hosted people had at least one physical health condition, with a higher prevalence observed among women. Overall, hypertension was the most common co-morbidity, and women were more frequently affected than men. These observations are in agreement with findings on homeless guests of hotel-based isolation sites obtained by others[22]. In fact, along with poor socio-economic status and marginalization, people experiencing homelessness frequently suffer from multi-morbidity[27,28]. Importantly, obesity, diabetes, hypertension, and chronic pulmonary disease, which were all observed in our study population, are among the most common risk factors for severe COVID-19 symptoms and outcomes in the general population and among homeless people[29].

Mental/psychiatric conditions were frequent among women, with almost one out of three women affected. Notably, there is a need to take into account the profound impact of the pandemic on the mental health of marginalized populations. A French study showed that around one out of three homeless individuals suffered from moderate to severe depression after the first lockdown[30].

The analysis, which was restricted to the individuals for which the date of negativization was known, showed that the median duration of SARS-CoV-2 positivity was 21 days, with no significant differences between men and women. Median positivity was not affected by age or behavior (smoking, alcohol or drug use). In addition, no significant change in the duration of positivity was observed in those with at least one physical co-morbidity when compared to those with no health conditions. No effect was observed when the co-morbidities were analyzed individually, with the exception of infectious diseases. Subjects with an infectious disease (HIV, HBV, TBC) remained positive for a median of 34 days compared to 21 days of unaffected individuals, although infectious diseases were only observed

Table IV. Median duration of positivity for SARS-CoV-2 molecular test according to clinical conditions among 144 homeless people.

	SARS-CoV-2 positivity median duration, days (IQR)		
Co-morbidity	**No**	**Yes**	***p-value***[a]
Metabolic	21 (14-26)	13 (11-21)	0.05
Diabetes mellitus	21 (14-26)	13 (12-19)	0.11
Obesity	n.a.	n.a.	n.a.
Heart and cardiovascular	21 (14-26)	20 (14-25)	0.68
Heart failure	n.a.	n.a.	n.a.
Hypertension	21 (14-26)	20 (14-26)	0.87
Atrial fibrillation	n.a.	n.a.	n.a.
Buerger disease	n.a.	n.a.	n.a.
Lung			
Chronic lung disease	21 (14-26)	19 (15-26)	0.88
Kidney			
Renal failure	n.a.	n.a.	n.a.
Blood			
Anaemia	n.a.	n.a.	n.a.
Liver			
Cirrhosis	n.a.	n.a.	n.a.
Neurological	n.a.	n.a.	n.a.
Neuropathy	n.a.	n.a.	n.a.
Ataxia	n.a.	n.a.	n.a.
Dermatological	20 (14-25)	21 (16-30)	0.13
Non melanoma skin cancer	21 (14-26)	27 (20-36)	0.12
Psoriasis	n.a.	n.a.	n.a.
Dermatitis and eczema[b]	20 (14-25)	22 (16-30)	0.15
Other[c]	21 (14-26)	12 (12-25)	0.31
Malignancy[d]	21 (14-26)	16 (13-19)	0.20
Infectious[e]	21 (14-26)	34 (27-42)	**0.013**
Other[f]	21 (14-26)	14 (11-18)	0.07

[a]significant differences are highlighted in bold; [b]seborrheic dermatitis, prurigo nodularis, lichen simplex; [c]rosacea, acanthosis nigricans, scabies; [d]lung cancer, breast cancer and bone cancer; [e]HBV, HIV, TB; [f]gastritis, trauma, hypothyroidism n.a., not assessed.

in four individuals. HIV and SARS-CoV-2 co-infection was observed in 47-year-old women from Bosnia-Erzegovina, who was undergoing therapy with Biktarvy (INN-Bictegravir/Emtricitabine/Tenofovir Alafenamide). Even though data regarding the interplay between HIV and SARS-CoV-2 are in part inconsistent, risk of severe COVID-19 and rates of hospitalization seem to be higher among people living with HIV (PLWH), particularly those with a low CD4+ T-cell count[31]. Two men were HBV-infected and had chronic liver disease which was not being treated. Interestingly, SARS-CoV-2, HIV, and HBV may all cause kidney dysfunctions through a variety of inflammatory mechanisms[32]. However, none of those co-infected by SARS-CoV-2 and HIV or HBV showed symptoms of kidney failure.

A 63-year-old woman from Bosnia-Erzegovina had a pulmonary TB. She had been on a regimen with rifampicin and isoniazid for 4 months. Cases of TB and SARS-CoV-2 co-existence have been already documented. Interestingly, one case was described in a homeless man in Poland, unfortunately with a lethal outcome[33]. However, no firm conclusions can be reached regarding influence of TB on COVID-19 outcome.

Conclusions

We described the characteristics of homeless people with asymptomatic/paucisymptomatic SARS-CoV-2 infection isolated in a COVID-19 hotel. We found a high prevalence of physical co-morbidities. Mental issues were also quite common among women. Median duration of SARS-CoV-2 positivity was not affected by presence and type of co-morbidity, with the only exception of

infectious diseases, which significantly increased duration of positivity. Despite the long duration of positivity in some guests, none of those admitted during the study period showed COVID-19 symptoms that required hospitalization.

It has been estimated[34] that homeless people may still experience high rates of SARS-CoV-2 infections even if incidence in the general population remains low. COVID-19 hotels could play a key role in avoiding prolonged hospital-based isolation and in providing medical assistance to SARS-CoV-2 infected people who lack stable housing and are frequently affected by physical/mental co-morbidities. Several strategies have been adopted to protect homeless people during the pandemic in Italy[35]. Among these, anti-COVID-19 vaccination should be strongly encouraged.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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