SHORT COMMUNICATION

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Impact of SARS-CoV-2 outbreak on heart and lung transplant: A patient-perspective survey

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Abstract

Background: The risk of COVID-19 is expected to be higher among solid organ transplant. The aim of the present study was to evaluate the incidence of COVID-19 and the impact of the SARS-CoV-2 outbreak on the personal hygiene and expectations in heart and lung transplant recipients.

Methods: A telephone survey of heart (n = 69) and lung (n = 41) transplant patients and a group of controls (n = 41) was conducted concerning personal hygiene before and after the outbreak; the impact on subjective expectations regarding graft outcome; symptoms possibly associated with SARS-CoV-2 infection; and diagnosis of COVID-19.

Results: Seventy nine percent of the patients declared they increased the use of face masks and handwash. Behavior at home regarding self-isolation did not change. About half the patients said they were afraid of the virus. A higher percentage of Lung transplant (LTX) were convinced that SARS-CoV-2 could have a negative impact on the outcome of their graft. 28% declared that they were afraid to come to the hospital for routine examinations and asked to postpone. Nine LTX and five Heart transplant (HTX) patients experienced symptoms that could have been associated with SARS-CoV-2 infection, but none of them underwent a nasopharyngeal swab. Only one LTX was diagnosed with the infection.

Conclusions: In our study, we observed a low incidence of COVID-19 in heart and lung transplant patients (0.9%), similar to that of the general population of our Region. Isolation measures were already observed before the pandemic and were further strengthened in most cases. Particular attention should also be paid to new psychological and physical complications indirectly linked to the COVID-19 pandemic.

KEYWORDS

COVID-19, heart transplantation, lung transplantation, patient survey

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Part 1—Personal hygiene before and after the SARS-CoV-2 outbreak					
The following questions refer to usual hygiene practices before coronavirus:					
Did you usually use the face mask?	Yes/No				
How many times a day did you wash your hands?	1-3; 3-5; >5				
Were you using disposable gloves?	Yes/No				
If so, in the house or out-door?					
Did you live in isolation from your family at home?	Yes/No				
Were you eating at the same table as your family?	Yes/No				
Did you sleep in a single room or with your partner?	Yes/No				
How did your habits change with the coronavirus?					
Do you use the face mask?	Yes/No				
Do you wash your hands more often?	Yes/No				
How many times per day?	1-3; 3-5; >5				
Do you use disposable gloves?	Yes/No				
If so, in the house or out-door?					
Did you live in isolation from your family at home?	Yes/No				
Do you eat at the same table as your family?	Yes/No				
Do you sleep in your room alone or with your partner?	Yes/No				
Are you afraid of the coronavirus?	Yes/No				
Do you think this virus has an impact on the course of your transplant?	Yes/No				
Are you afraid to come to the hospital to do your regular checkups at your transplant center?	Yes/No				
Have you called your transplant centre from 21st February to date to get more information about the coronavirus?	Yes/No				
Part 2—Diagnosis of COVID-19, symptoms possibly associated with SARS-CoV-2 infection					
The following questions relate to the period between 21st February and today:					
Have you had any of the following symptoms since February 21st to date? Cold, cough, wheezing, fever, loss of sense of smell, loss of taste, please specify					
If so:					
Have you been visited by your general practitioner, or Emergency medical center or Emergency department or Transplant center doctor?	Yes/No				
Did you call the emergency number?	Yes/No				
Did you access to the emergency room?	Yes/No				
Have you been hospitalized for these symptoms?	Yes/No				
Were you swabbed for the coronavirus?	Yes/No Yes/No				
Have you been hospitalized to a COVID-19 ward?	Yes/No				
Were you admitted to the hospital between February 21st and today for reasons other than the coronavirus?	Yes/No				

1 | INTRODUCTION

The risk of pneumonia and progression to septic shock and acute respiratory distress syndrome (ARDS) is expected to be higher among solid organ transplant recipients who contracted COVID-19 than in the non-transplant population.¹ However, it has been postulated that long-term post-transplant immunosuppression could

somehow impede the hyperinflam matory syndrome caused by the cytokine storm that leads to multiorgan failure and deaths attributed to SARS-CoV-2.²

The aim of the present study was to evaluate the incidence of COVID-19 in solid organ transplant recipients and the impact of the SARS-CoV-2 outbreak on the personal hygiene and expectations of heart (HTX) and lung (LTX) transplant patients by means of a patient-perspective survey.

2 | METHODS

We conducted a telephone survey of heart and lung transplant patients monitored at the Regional Referral Centres for Heart and Lung Transplant at the University Hospital of Siena, Italy. The survey consisted of two parts: The first concerned personal hygiene before and after the SARS-CoV-2 outbreak (use of face mask, handwash, use of surgical gloves, and isolation from the community and family members), relationship with the transplant center, and the impact on subjective expectations regarding graft outcome; the second part concerned diagnosis of COVID-19, symptoms possibly associated with SARS-CoV-2 infection, and hospitalization for COVID-19 or other reasons in the period February 21 (date of the first case in Italy) to May 6, 2020.

In consideration of the type of investigation, the audience for which it was intended and the medium with which we conducted the interviews (telephone), we set a closed-ended questions survey in Italian to be sure that the questions were received by all the respondents in the same way; the questionnaire was designed with the following characteristics: clarity, brevity, unambiguity, and completeness (Table 1).

All patients who were actively monitored at our center were asked to participate. Forty-one lung transplant recipients and 69 heart transplant recipients were interviewed by the same operator (EDV); 3 HTX and 4 LTX patients refused to participate. The survey was conducted on May 7, 2020. A group of controls, consisting of 41 patients (19 female, age 62.75 \pm 14.93 year) with different respiratory diseases (asthma 8, COPD 14, IPF 9, sarcoidosis 8, lymphangioleiomyomatosis 1) was also included. All patients gave their informed consent to participate in the study.

3 | STATISTICS

The statistical analysis was conducted with GraphPad Prism v 6.0 for Macintosh; differences with P < .05 were considered significant. The difference between the two groups was studied by t test; for comparing three or more groups, ANOVA analysis was used; differences in prevalence on contingency tables was tested with the Fisher or chi-square test. All data were expressed as mean \pm standard deviation.

4 | RESULTS

Lung transplant patients were significantly younger than HTX and controls. Immunosuppressive regimen was similar between groups; however, less than half of HTX patients were on steroids, while all LTX patients were taking prednisone accordingly to our protocol. In our cohort, 79% of the patients interviewed declared that they increased their use of face masks after outbreak of the pandemic; most were HTX patients: In this cohort, the routine use of masks was significantly lower than in LTX patients before the pandemic

(11.6% vs 41.5%, respectively, P = .0007). Both groups also washed their hands more often/more thoroughly, despite the fact that most responders said that they already washed their hands more than 5 times a day before the pandemic. The percentage of HTX and LTX who used gloves before the COVID-19 outbreak was 23.18% and 14%, respectively, compared with 57.97% and 73.17% afterward (P < .0001 in both cases).

Neither group changed its behavior at home regarding self-isolation, which patients declared was only strictly observed in the first months after the transplant, whereas during the pandemic, subjects did not isolate themselves from the rest of the family. However, a significantly higher number of LTX declared that they already slept separately from their partner before pandemic (58.53% vs 21.73%, P = .0002).

The attitude toward COVID-19 was broadly similar in the two groups, where about half the patients said they were afraid of the virus. A higher percentage of LTX were convinced that SARS-CoV-2 could have a particular negative impact on the outcome of their graft. Thirty percent of our cohort contacted their transplant centers for information about COVID-19, and 28% declared that they were afraid to come to the hospital for routine examinations and asked to postpone.

Nine LTX (21.95%) experienced symptoms that could have been associated with SARS-CoV-2 infection during study period, but only two contacted the healthcare system. Likewise, five HTX experienced such symptoms and three contacted the healthcare system. None of the patients underwent a nasopharyngeal swab to investigate the symptoms. Regarding diagnosis of COVID-19, only one LTX was diagnosed with the infection and was hospitalized for this reason (incidence 0.9%). A total of seven LTX and seven HTX were hospitalized for other reasons during the study period. The results of the survey and basal characteristics are reported in Table 2.

Controls declared that they have had increased significantly the use of face masks, handwash, and home isolation from family members respect to transplant patients since pandemic. They also felt that SARS-CoV-2 outbreak could have a negative impact on their diseases more often than reported by transplant patients. A significantly lower percentage of controls reported the presence of symptoms that could be due to COVID-19, and they contacted less their respiratory physicians but more often their GP than transplant patients.

5 | DISCUSSION

Solid organ transplant patients would be expected to be at high risk of COVID-19 infection due to their immunosuppressed condition and comorbidities; however, a relatively low incidence has been reported in this population.¹ In our study, we observed a very low incidence of COVID-19 in heart and lung transplant patients (0.9%), similar to that of the general population of our Region (0.2760% at June 18, 2020) (Italian civil protection, Protezione

TABLE 2 Basal characteristics of the cohort subdivided in heart (HTX) and lung (LTX) transplants and controls are reported in the table, together with the results of the survey

	LTX (n = 41)	HTX (n = 69)	<i>P</i> -value (LTX vs HTX)	Controls (n = 41)	P-value (all groups)	
Age	51.74 ± 12.43	59.72 ± 10.34	<.001*	62.75 ± 14.93	<.001*	
Sex (female)	53.65%	27.53%	<.05*	51.21%	.06	
Immunosuppressive regimen						
Prednisone	100%	44.92%	<.001*	12.19%	<.001*	
Cyclosporine/Tacrolimus	97.56%	89.85%	.25	0	-	
Azathioprine/Mycophenolate Mofetil	48.78%	56.52%	.55	0	-	
Everolimus/Sirolimus	9.75%	14.49%	.56	2.43%	.12	
Behavior before and after SARS-CoV-2 outbreak						
Increased use of face mask	65.85%	88.40%	.03*	100%	<.001*	
Increased handwash	70.73%	60.86%	.30	85.36%	.02*	
Increased isolation at home	21.95%	11.59%	.17	9.75%	.21	
Increased isolation from family members while eating/sleeping	9.75%/58.53%	17.39%/21.73%	.40/<.001*	4.87%/0%	<.001* <.001*	
How the SARS-CoV-2 pandemic influenced personal expectations						
Fear of virus	53.65%	42.02%	.32	65.85%	.005*	
Fear of negative impact on graft/ disease outcome	60.97%	43.47%	.11	65.85%	.04*	
Relationship with transplant center						
Contacted doctor in charge for more information	31.70%	30.43%	>.99	9.75%	.02*	
Avoided follow-ups because of outbreak	26.82%	31.88%	.66	26.82%	.79	
Diagnosis of COVID-19 or presence of associated symptoms						
Symptoms that could be due to COVID-19 during the pandemic	21.95%	7.24%	.03*	39.02%	<.001*	
Contacted health system because of symptoms	4.87%	4.34%	>.99	19.51%	.01*	
Diagnosed with SARS-CoV-2	2.5%	0%		0%		
Hospitalized for COVID-19 or other reasons	17.07% (other reasons) 2.5% COVID-19	7/62 10.14% (other reasons) 0% COVID-19	.24	9.75% (other reasons) 0% COVID-19	.29	

Note: P-values represent statistical differences between HTX and LTX groups.

*Statistical significance.

civile italiana) (P = .2615). However, the survey revealed the negative impact of this serious worldwide outbreak on patients' outlooks and expectations.

Isolation and use of personal protective equipment (PPE) have proven to be the most effective measures of control of the pandemic. In our population, the personal hygiene measures of isolation from the community and use of PPE (face masks, handwash, and gloves) were already high, especially among LTX, and increased further, although the same cannot be said for isolation from the rest of the household, which remained unchanged.

The pandemic has had a negative emotional impact, resulting in lower transplant expectations in both groups, especially among LTX,

probably because the virus mainly affects the respiratory system. One third of patients felt the need to contact their transplant center for more information about the infection, saying they were afraid to go to the hospital for routine checks, which they postponed at the risk of new complications. Psychological distress was documented among Italians during the COVID-19 pandemic and, similarly, a survey to investigate its impact on bariatric care from the patients' point of view reported high percentage of anxiety about health status in regard to the present epidemiologic state.^{3,4} Transplant centers should be aware of their patients' higher levels of depression and anxiety, and active remote monitoring can represent a new resource for chronic patients during pandemic that needs to be explored.

Interestingly, a significantly higher percentage of controls than transplant patients reported negative expectations of SARS-CoV-2 outbreak on their disease even if they rarely reported the presence of symptoms that could be due to COVID-19.

A minority of patients experienced symptoms compatible with SARS-CoV-2 infection (14.5%) but not all contacted the health service and not one had a nasopharyngeal swab. Only 1/110 patient contracted the virus infection, developing severe pneumonia, and was hospitalized for this reason.

Our results suggest that SARS-CoV-2 infection poses a marginal risk in our heart and lung transplant population, even if the risk of COVID-19 is commonly expected to be higher among solid organ transplant recipients.¹ In March 2020, D'Antiga published the first descriptive analysis of clinical observations in SARS-CoV-19positive transplant patients and suggested that unlike infections due to common viral agents, SARS-CoV-19 infection may not lead to a worse general condition in immunosuppressed patients.² Leukopenia and marked lymphopenia are observed in most patients, and low lymphocyte count in COVID-19 patients is associated with a severe course of the disease.⁴ It has been postulated that the chronically immunosuppressed patients may undergo a unique but equally dysfunctional inflammatory response in the setting of SARS-CoV-2 infection.⁵

It is evident that solid organ transplant patients may be protected from infection by the isolation measures they already observed before the pandemic and which they further strengthened in most cases. However, the hypothesis of immunosuppressive therapy as a protective factor against the infection, or otherwise determining a mild form of the disease, is intriguing and worthy of further evaluation. Likewise, patients with rheumatic diseases treated with biological drugs have been shown to be less susceptible to SARS-CoV-2 infection.⁶

Further studies are needed to better characterize the impact of this new infection in heart and lung transplant patients, with particular regard to preventive factors possibly offered by immunosuppressive therapy. Particular attention should also be paid to new psychological and physical complications indirectly linked to the COVID-19 pandemic. Despite specific conditions, telemedicine can represent a way to reduce the negative impact of the pandemic on chronic patients and should be part of modern chronic care models.

CONFLICTS OF INTEREST

Authors have no conflicts of interest to disclose.

AUTHOR CONTRIBUTIONS

David Bennett performed study design, data collection, data analysis, and data interpretation, coordinated the study, and wrote the manuscript; Elda De Vita performed telephone interviews, data collection, and data analysis, and wrote the manuscript; Vittoria Ventura performed data collection and data analysis; Sonia Bernazzali, Antonella Fossi, Piero Paladini, Luca Luzzi, Massimo Maccherini, Serafina Valente, Elena Bargagli, and Bruno Frediani performed data collection and data interpretation; Piersante Sestini participated in study design and critical revision of the manuscript.

ETHICS APPROVAL

The research was approved by the local ethics committee (OSS_ REOS n° 12908).

CONSENT TO PARTICIPATE

All subjects gave their consent to the study.

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