

# Serology Screening for SARS-COV-2 Infection in Patients Undergoing Heart Transplantation and their Household Contacts

Ligia Espinosa Schtruk<sup>1,2</sup>, Jacqueline Sampaio do Santos Miranda<sup>1,2</sup>, Giovanna Ianini Barbosa<sup>1,2</sup>, Ana Luiza Ferreira Salles<sup>1,2</sup>, Tereza Cristina Fellipe Guimarães<sup>1,2</sup>, Angela Maria Rodrigues Dantas<sup>1,3</sup>, Vitor Agueda Salles<sup>1,2</sup>, Vaisnava Nogueira Cavalcante<sup>1,2</sup>, Elisangela Cordeiro Reis<sup>1,3</sup>, Luciana da Rocha Ferreira Lobbe<sup>1,2</sup>, Sharon Kugel<sup>1,3</sup>, Bruno Miranda Marques<sup>1,3</sup>, Andrea Alfradique da Fonseca Brollo<sup>1,3</sup>, Filipe Oliveira dos Reis<sup>1,3</sup>, Gabrielle Manso de Carvalho<sup>1,3</sup>, Ruth Stela de Azevedo Maia<sup>1,3</sup>, Adriana Fernandes Duarte Marzullo<sup>1,3</sup>, Danielle Rodrigues Nascimento<sup>1,3</sup>, Helena Cramer Veiga Rey<sup>1,2</sup>

<sup>1</sup>Heart Failure and Transplantation Service of the National Institute of Cardiology (INC), Rio de Janeiro, RJ-Brazil. <sup>2</sup>Participated in research design, the writing of the paper, the performance of the research and in data analysis. <sup>3</sup>Participated in research design and the performance of the research.

**\*Corresponding Author:** Ligia Espinosa Schtruk. Mailing address: Instituto Nacional de Cardiologia. Serviço de Insuficiência Cardíaca e Transplante. Rua das Laranjeiras, 374, 7<sup>o</sup> andar. Rio de Janeiro. RJ.

## Abstract

**Methods:** Prevalence study, epidemiological survey, cross-sectional, for the presence of total antibodies to SARS-COV-2 in a population of heart transplant recipients and their household contacts.

**Results:** 80 participants, 38 (47%) heart transplantation, 42 (43%) household contacts. In Transplanted group: 3(8%) positive serology, 7(18%) symptomatic, 1 (3%) had symptoms and positive serology, 2(5%) were asymptomatic and had positive serology.; In household contacts 10(24%) positive serology, 14(33%) symptomatic, 8 (19%) had symptoms and positive serology, 6(14%) were asymptomatic and had positive serology. In Household contacts group the correlation with symptoms of cough ( $p:0,002$ ), anosmia ( $p:0,005$ ) and ageusia ( $p:0,012$ ) were statistically significant. In the population of transplanted patients, when analyzed separately, clinical symptoms did not correlate with positive serology (fever  $p: 0.225$ , cough  $p: 0.385$ ).

**Conclusions:** The seroconversion rate in heart transplant recipients was lower than that of household contacts. There was no significant correlation between the description of clinical manifestations and the detection of total anti-SARS- COV-2 antibodies in transplant patients.

**Keywords:** COVID-19, transplantation, heart transplantation, acute respiratory distress syndrome, SARS-COV-2 serology, immunity.

## INTRODUCTION

In December 2019, infection with a new coronavirus (SARS-COV-2), causing severe acute respiratory syndrome, was reported in people exposed at a fish market in Wuhan-China<sup>1</sup>. The World Health Organization (WHO), on March 11, 2020, declared coronavirus infection (COVID-19) to be a pandemic<sup>2</sup>. The spread of the virus, causing severe acute respiratory syndrome (SARS) is a worldwide concern.

Heart transplant recipients are among the risk

groups for poor prognosis, both due to the continued use of immunosuppressants, as well as common comorbidities after transplantation, such as: hypertension and diabetes.<sup>3</sup> The immune response depends on individual factors, related to the patient, and the characteristics of the pathogen. The production of antibodies can be early or later, depending on the individual, and be protective or not, according to the characteristics of the antibody produced.<sup>4,5</sup> Recent studies have shown that specific antibodies to SARS-COV-2 are detectable in 80 -100% of patients, two

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weeks after the onset of symptoms.<sup>4,5,6</sup> We do not know the prevalence of serum conversion in heart recipients exposed to COVID-19, in community dissemination areas.

This study aimed to: investigate the presence of total SARS-COV2 antibodies (COVID-19) in cardiac transplant patients and their household contact (s), with or without symptoms associated with SARS-COV-2; evaluate the rate of serum conversion of transplant patients in relation to their home contact (s); to analyze the correlation between the presence of antibodies and the presentation of clinical symptoms.

### MATERIALS AND METHODS

Prevalence study, epidemiological survey, cross-sectional, for the presence of total antibodies to SARS-COV-2 in a population of heart transplant recipients and their household contacts.

Informed Consent Form (ICF) and questionnaire to assess symptoms of the disease by SARS-COV-2 were applied to all participants.

Researched clinical data were obtained via telephone contact made by members of the research team. Asked about: home contact with people diagnosed with SARS-COV-2 infection; comorbidities (cardiovascular disease, diabetes, liver disease, neurological or neuromuscular disease, immunodeficiency, HIV infection, kidney disease, chronic obstructive pulmonary disease, neoplasia); use of regular medication; presence of symptoms (fever, cough, sore throat, dyspnea, nausea / vomiting, headache, coryza, irritability / mental confusion, myalgia, absence of smell, absence of

taste) in the last 3 months; symptomatology time; hospitalization; type of hospitalization unit; use of mechanical ventilation.

The laboratory diagnosis was performed from a venous blood sample using the qualitative serological test for detection of total SARS-COV2 Ab, serological test Elecsys® Anti-SARS-CoV-2, Roche®, with specificity of 100% (95% CI) and sensitivity of 99.81% (95% CI)<sup>7</sup>.

### RESULTS

Included were 80 participants, 38 (47%) patients undergoing heart transplantation, and 42 (43%) household contacts. Transplant patients residing in other States of the Federation and contact persons who did not live with the transplant patient were excluded. The immunosuppressive regimen used was composed of a calcineurin inhibitor (tacrolimus or cyclosporine) and antiproliferative (mycophenolate mofetil or sodium).

In the transplanted patients, the median age was 53 years old and the male gender was the majority (25/66%), in the contacts group, the median age was 43 years old and the female gender was the majority (29/69%). (Table 1).

In household contacts group with positive serology, correlation with symptoms of fever, cough, anosmia and ageusia were statistically significant, see Table 2. In the population of transplanted patients, when analyzed separately, clinical symptoms did not correlate with positive serology (fever p: 0.225 and cough p: 0.385).

**Table 1.** Epidemiological data

	TRANSPLANTS(%)	HOUSEHOLD CONTACTS(%)	TOTAL(%)
PARTICIPANTS	38 (47,5)	42(52,5)	80(100)
RACE			
White	19(50)	22(52)	41(51)
Black	19(49)	20(48)	39(49)
SEXO			
Male	24(63)	13(31)	38(46)
Female	14(37)	29(69)	43(54)
AGE (median)	53	43	
POSITIVE SEROLOGY	3 (8)	10(24)	13(16)
NEGATIVE SOROLOGY	35(92)	32(76)	67(84)
SYMPTOMATICS	7(18)	14(33)	21(26)
SYMPTOMATICS AND POSITIVE SEROLOGY	1(3)	8(19)	9(11)
ASYMPTOMATIC AND POSITIVE SEROLOGY	2(5)	6(14)	8(10)

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**Table 2.** Symptoms in relation to the result of serology

TOTAL PARTICIPANTS			
SYMPTOMS	Serology POS n(%)	Serology NEG n(%)	p
FEVER	5(38,5)	6(9,0)	0,014
COUGH	7(53,8)	9(13,4)	<0,001
ANOSMIA	5(38,5)	2(3,0)	<0,001
AGEUSIA	5(38,5)	3(4,5)	0,002
ODINOPHAGY	3(23,1)	5(7,5)	0,116
DYSPNEA	4(30,8)	6(9,0)	0,052
DIARRHEA	1(7,7)	1(1,5)	0,300
NAUSEA	1(7,7)	0	0,163
HEADACHE	3(23,1)	5(7,5)	0,116
CORYZA	2(15,4)	2(3,0)	0,122
MYALGIA	3(23,1)	5(7,5)	0,116

### DISCUSSION

The prevalence of antibodies in patients who were infected with SARS-COV-2 has varied in different studies, suggesting an association with the severity of the disease, the age of the patient and comorbidities.<sup>8,9</sup>

We observed a low prevalence of antibodies in transplant patients, even in those who had symptoms or diagnosis of infection by RT-PCR. The prevalence of seroconversion in the contacts was 3 times higher in relation to transplant recipients (7.9% vs 23.8%), but this difference was not statistically significant (p: 0.071).

In our sample, some symptomatic transplant recipients had no detectable antibodies, while their contacts were positive. A possible hypothesis to justify such a phenomenon would be the interference in the production of antibodies by the use of immunosuppressants. Transplant patients tend to follow more stringent care in relation to exposure to risk factors for infection, and this can interfere with this data too.

Regarding clinical symptoms, reports of fever, cough, anosmia and ageusia, in the group in general, showed a significant correlation with a positive test, which did not occur with the other symptoms. In the transplant group, there was no correlation between symptoms and positive serology for SARS-COV-2.

Recent studies demonstrate that specific antibodies against SARS-COV-2 may fall over time, especially in the elderly and asymptomatic people or those with mild symptoms.<sup>10,11</sup>

Cases of reinfection have already been described and there is no definition of what level of antibodies, or even its role in preventing the disease.<sup>12,13</sup> Two Italian patients with X-linked agammaglobulinemia (XLA) with COVID-19, male, aged 26 and 34, who were undergoing treatment regular with human gamma globulin without specific antibodies to SARS-COV-2, developed pneumonia and recovered without the need for oxygen therapy.<sup>14</sup> In another Italian study it was observed that the clinical course was milder in patients with agammaglobulinemia when compared to other individuals.<sup>15</sup> It is noted that these patients have, in general, their nonspecific and cellular immunity preserved, including NK cells and phagocytes. These studies demonstrated that agammaglobulinemic patients, unable to develop SARS-CoV-2 specific immunoglobulins, did not develop severe pneumonia, suggesting that the serious complications seen in other patients may be related to the development of acquired immunity.

In our sample there was no case of death among the transplant recipients, despite international studies showing a mortality rate of up to 25% in this group.<sup>16</sup>

### CONCLUSION

The seroconversion rate in heart transplant recipients was lower than that of household contacts.

There was no significant correlation between the description of clinical manifestations and the detection of total anti-SARS-COV-2 antibodies in transplant patients.

### LIMITATIONS

At the time of clinical manifestations, no RT-PCR was performed on symptomatic contacts to confirm

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infection. Small sample makes more studies necessary to expand the statistical significance of the data presented.

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