INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact Factor: 6.078
(Volume 8, Issue 3 - V8I3-1403)
Available online at: https://www.ijariit.com

Investigating the impact of COVID-19 on Transplantation and Transplant patients and observing the further consequences of the virus caused on the lives of the transplanted

Nirvaan Puri
nirvaanpuri7@gmail.com
Step By Step World School, New Delhi, Delhi

ABSTRACT

The purpose of this paper is two-pronged to analyse and assess if COVID has had any impact onthe quality of life/longevity of patients who have received transplants. To identify what (if any) impact COVID has had on the lives of patients waiting for transplants. It aims to compare the physical and psychological challenges faced by transplant patients, after transplant and after COVID. For those waiting for transplants, with COVID restrictions, there was a two year periodin which transplants were stalled or delayed and therefore looks at the consequential impact on those waiting for transplants. A study was conducted with transplant patients of Indian origin, and transplant surgeons and secondary research findings were conducted since the inception of the pandemic.

Keywords: *Transplant, Covid, Quality of Life, Longevity, Indian Origin*

1. INTRODUCTION

This paper aims to throw light on the state of transplant patients in today's COVID world where adeadly virus overwhelmed the population. Currently, there are more than 11,000 COVID-19 cases in India, and they are steadily rising towards another high peak of COVID-19 cases after the situation had seemed to have settled. With over 500,000 transplant patients on the waiting listand 7,443 transplants being performed yearly in India, the environment is hazardous for transplant patients who have a preliminarily compromised immune system.

It is already well known that all tx patients are immunosuppressed and hence not only more susceptible to catching diseases but also much more heavily impacted once they catch it due to their bodies' weak immunities being unable to ward off the disease. The study found that in a sample of 16 transplant patients of Indian Origin, **(8 of whom had been infected by the virus and 8 of whom who had not)**, there was a greater degree of implications on the mental, physicaland physiological conditions of the tx patients once contracting covid, in comparison to after their transplants.

My maternal grandmother presented with restrictive cardiomyopathy in her mid-forties; her sister too had cardiomyopathy and it is believed that their father (my great grandfather) may havehad it as well although it went undiagnosed in his lifetime. She had a heart transplant in 2013 andlived a fairly healthy and active life for 5 years post which she died in 2018 of a cardiac arrest. I am writing this paper to analyze the lives of the immunosuppressed, to see what my grandmother's (a transplant recipient) life would be like if she was with me today. Additionally, having worked with ORGAN India, a not-for-profit organisation focusing on supporting transplant patients and their families, one of the concerning factors come to light has been the reduction in transplant rates during the pandemic.

2. METHODOLOGY

It is not known whether solid organ transplant recipients are at higher risk for acquiring SARS-CoV-2 infection than the general population. However, chronic immunosuppression maylower the infectious dose needed to cause COVID-19 and impair adequate immune control oncethe infection is established.

Like other immunosuppressed persons, solid organ transplant recipients may shed greater amounts of virus for longer durations than otherwise healthy hosts. Thus, they may be more likely to spread the infection to others. However, we could not test whether or not

Transplantpatients are more susceptible to COVID-19 or not as we were not

The study was conducted on an online platform in January of 2022 due to COVID-19 restrictions. In this study, 16 Indian transplant recipients were interviewed and asked a set of questions which studied a variety of the repercussions the transplant patients underwent eitherafter contracting COVID-19 or otherwise pre and post-transplant.

Patients were selected at random to get the most realistic sample of Indian transplant patients. The only criteria were that 8 of them had to have contracted COVID-19 between 2020-and 2022.There was a wide range of transplant patients in the data set of 16, including 6 kidneys, 6 livers, 2 lungs and 2 heart transplant recipients. The study included both male and female transplant patients aged between 30 and 70.

They were asked a list of questions in their interviews which can be seen below in **Appendix 1.**

3. OBSERVATIONS AND ANSWERS

1. Respiratory based Observations

The loss of the sense of smell was seen as one of the defining symptoms of the earliest variants of the CoronaVirus, which resulted in 75%-85% (varying between subquestions) of the patients affected by Covid reporting a 'Yes' for the questions related to the respiratory changes/symptoms. Dissimilarly, during either organ failure, or recovery, none of the transplant patients that Not Contracted COVID-19 faced a loss of either smell or a blocked nose. However,the liver transplant patients and especially lung transplant patients felt an uncontrollable constantcough and a breathless feeling pre-transplant and for a short duration during recovery.

Furthermore, the patients with the same liver and lung transplants mentioned that their complications also involved severe breathlessness and coughing.

2. Cardiovascular based Observations

As seen through previous research on this virus, COVID-19 is a virus that primarily impacts one's respiratory system. Hence it was unsurprising that most of the recipients that contracted COVID-19 reported no such changes in blood clotting or any changes in their blood pressure. However many of the kidney recipients and most of the heart recipients did experience fluctuating blood pressure during their time waiting and also after the transplant occurred for awhile. Alongside this 20% of the patients that contracted COVID-19 experienced low blood pressure due to their body's lower levels of exertion.

3. Gastro-Intestinal based Observations

Covid -19 has very prevalent adverse effects on the gastrointestinal system of anyone unfortunateto contract the virus. Hence one of the main indicators or symptoms of Covid -19 is the loss of smell and taste. 6/8 or 75% of the transplant patients that contracted Covid -19 faced a diminution of their smell. Unlike the Covid -19 symptom, the loss of taste wasn't a symptom normal transplant patients faced pre or post-transplant. However, they did face large abdominal pain, especially those who had kidney and liver failure. 65% of the sample faced these abdominal afflictions which caused them to have problems in locomotion due to the pain.
Alongside this, another large problem associated with the Gastro-Intestinal system is diarrhoea orvomiting. However, in our study, it didn't seem to be a large problem that the patients faced with only 25% of the sample reporting diarrhoea or vomiting as a symptom. Lastly, 70% of the sample recorded that they had to make large changes in their diets. As they were on immunosuppressants most were advised not to eat raw food like salads and fruits with thin skin. They also reported that they had to reduce sodium in their diets cutting down or completely removing salt from their diets.

4. Neurological based Observations

COVID-19, caused by the SARS-CoV-2 virus was observed to have neurological impacts on thedata set of patients that we interacted with through our interviews. 70% of the TX patients reported severe headaches with multiple stating it was followed by constant dizziness and heavyheaded-ness. Around 40% also that these headaches lead to problems in their movement and coordination along with their general ability to perform daily tasks. They said that it leads them to have concentration problems too due to the overwhelming nature of those headaches. These coordination and concentration problems were majorly seen in the patients who had contracted COVID-19.

5. Muscular- skeletal-based questions

Body aches were a very prevent symptom and effect of the COVID-19 virus. Hence around 40%of the data set or ⅝ transplant patients affected with the Coronavirus reported severe muscular pains and spasms during their stent of having COVID-19.

6. Psychological based Observations

COVID-19 created a whirlwind of trauma all around the world as everybody was susceptible tothe deadly virus. Along with the heavy and draining physical complications, the disease led to alarge amount of mental health and psychological repercussions. In our small sample, there were2 clear answers to the Psychological based questions. Around 75% of the transplant patients reported that they faced mental health issues after initially learning about their organ failure or even after testing positively for the Virus. A few reported that they were even taking sessions with therapists after the life-threatening problem that is organ failure occurred. However, the other 25% presented with a positive attitude moving forward even stronger after transplantationand even COVID-19 complications.

7. General (Only for the patients who contracted COVID-19) basedquestions

50% of the patients who had contracted COVID-19 had been vaccinated while the other half hadnot. However, it was common among 75% that their time of sickness lasted more than the common 2-week period which was seen amongst the general population who had been unfortunate to contract the virus. Furthermore, 25% of the 8 people set are still facing some symptoms from the virus in the form of excessive coughing and general dizziness yet the rest have made/had made a full recovery with the underlying symptoms that they continued to face.

Interviews were also done with top Transplant Surgeons in India which lead to further findings:

Upon interviewing **Dr K.R. Balakrishnan**, Director of Heart and Lung Transplant andMechanical Circulatory Support, his observations were:

"The number of Donations dropped from March 2020 - to March 2022 and multiple patients diedwaiting for transplants. Reasons being people couldn't travel for many months due to the travel industry being shut down. Patients who were in line for transplants and were matched with a donor lost the Organ when either they or their asymptomatic family members tested positive for COVID. Several times by the time the next Organ came around, the patient would die."

Dr Ravi Mohanka, a Consultant liver specialist working in MGM Hospital Mumbai said:-

"There is no convincing evidence to show that transplant patients who contracted COVID weresymptomatically worse than non-transplant patients who contracted COVID. What was more concerning was that the number of transplants drastically reduced in the last two years."

Narayanahealth.org states that "**Covid 19** primarily infects the lungs in the affected individualsand severe cases causes' death due to ARDS and pneumonia.", "It has been found that **Covid 19**is a close relative of SARS. SARS is a novel type of virus that was reported in 2007, and like most SARS viruses, Covid 19 affects the respiratory tract in humans. The infection starts with mild flu-like symptoms or no symptoms, and further progress to severe symptoms."

This is synonymous with the evidence of our observations wherein the severe cases ie: the transplant patients affected by Covid primarily experienced symptoms similar to the flu which gradually progressed to severe cough, breathlessness and high fevers. The symptoms were very rough on the patients that contracted the virus leaving many in critical conditions. These symptoms experienced were completely novel to many and varied differently from when patientsinitially were on the waitlist for a transplant or recovering from their transplants being so heavilyimmunocompromised due to the suppressants.

Apart from these physical implications which were analyzed previously by studies all across the globe, this paper successfully also captured the psychological repercussions that both the transplant process along with the contraction of the virus evoked among the patients. It either acted as a launchpad for positivity reflecting on the fact that "if they survived this they can survive it all.", alternatively it led many down a spiral of confusion and distress as they were demoralised and remained in complete isolation in fear of contracting the virus in their weakenedstates.

A graphical representation of the Data from the interviews can be found in *Appendix 3* ofthe Paper

Effects of COVID-19 on the Process of Transplantation

Donor-derived SARS-CoV-2 infection has been reported with lung transplantation. Data from case series have shown that transplantation of non-respiratory organs from SARS-CoV-2 infecteddonors can be successfully performed while transplantation of those organs in the respiratory system ie; the Lungs cannot. Blood-borne transmission of the COVID-19 virus has not been reported and is not expected, as doctors and previous research articles stated.

To minimize the risk of infection and conserve hospital resources, elective transplantation (eg, living-donor kidney transplantation) and nonurgent, deceased-donor transplantation were beingdeferred at some transplant centres where the community prevalence of COVID-19 is high and/or where resources are limited.

Life-saving transplantation continued to be performed, and the Centers for Medicare & MedicaidServices have classified organ transplantation as a tier 3B activity: "Do not delay, on the basis ofassessment of the potential risks compared with known benefits." The risk-benefit ratio for delaying elective transplantation during the pandemic is not clear. Limited data suggested that patients who are waitlisted for kidney transplantation had a higher risk of hospitalization and death compared with patients who were transplanted. Modelling data provided further support for kidney transplantation during the pandemic, at least for select populations.

All organ donors and potential recipients were to be screened for COVID-19 prior to organ procurement. This was necessary to prevent the initiation of potent induction immunosuppression in the context of active infection and for the safety of the organ transplant recipients (who are typically potently immunosuppressed in the immediate posttransplant period) and the organ procurement team.

Reverse-transcriptase polymerase chain reaction (RT-PCR) was the main technique used forscreening. The utility of serology (primarily used to detect past infection) for pretransplant screening had not been established.

4. CONCLUSION

Through the observations, consultations with medical professionals and secondary research, the paper has concluded the impact of

the COVID-19 virus on the large group of immunocompromised transplant patients. The virus is so novel and yet with so much variation is inherently very taxing on any person unfortunate to contract it. Yet the paper informs readers how the symptoms in transplant patients are so much more heightened lasting for generally double the duration of the general COVID to any common person. Transplant patients being immunocompromised had more severe symptoms and the outcome of covid infections in them was much worse. Also as most transplant patients were aware of the problem they isolated earlier and for a lot longer. This had a detrimental effect on their psychological state and theimpact of the pandemic on them was worse.

COVID has drastically impacted organ donation across the world, leading to untold misery for thousands of patients who have been waiting for organs. As seen In Appendix 2, National transplant surgeries went from 10340 surgeries in 2018 to 7443 in 2020 which meant a 28% drop in the number of transplants surgeries. Early rules on the use of organs from COVID-positive or affected donors were stringent due to the fear of the spread of disease or thrombotic complications in patients who received these organs.

However much has changed in the past two years. Most of our adult population has either been infected with COVID has received two doses of vaccine, or both. The current variant, despite being more infective, is associated with mild disease, especially in those who have been vaccinated Our armamentarium against severe COVID has improved dramatically in the past year- we have effective vaccines, monoclonal antibodies for the treatment of mild COVID in high-risk patients and post-exposure and antiviral prophylaxis and treatment which can substantially reduce the risk of severe COVID requiring ICU admission. The risk of transmission of COVID infection has to be balanced against the risk of patients dying from the end-organ disease. We will have to learn to live with COVID this also means investigating whether organs from donors who are or have been COVID positive can be used with acceptable risk-benefit in selected patients with end-stage organ failure. This document is a summary of evidence and information regarding donor screening for SARS-CoV-2 and considerations for organ acceptance from donors with a history of COVID-19.

Furthermore, It is not known whether solid organ transplant recipients are at higher risk for acquiring SARS-CoV-2 infection than the general population. However, chronic immunosuppression may lower the infectious dose needed to cause COVID-19 and impair adequate immune control once the infection is established. Like other immunosuppressed people, solid organ transplant recipients may shed greater amounts of virus for longer durations than otherwise healthy hosts. Thus, they may be more likely to spread the infection to others.

Thus, the findings through primary research suggest COVID-19 infection in transplant patients may have greater discomfort and heightened symptoms after contracting COVID-19. The symptoms are predominantly respiratory and associated with fever, but have also caused larger psychological and neurological complications. Furthermore, through secondary research it was analysed that hundreds of patients who were awaiting transplants didn't get the organs they required, possibly facing death or progressing into worse conditions.

Appendix 1 - Questions from the Interview

Respiratory

- 1. Did you notice a loss in your sense of smell?
- 2. Did you have a cough?
- 3. Did you have a blocked nose?
- 4. Did you have any shortness of breath?

Cardiovascular

- 5. Did you see any changes in your heart rate or your blood pressure?
- 6. Did you have any blood clotting problems?

Gastro-intestinal

- 7. Did you lose your sense of taste?
- 8. Did you have any abdominal pain?
- 9. Did you have any diarrhoea or vomiting?
- 10. Did you have to change your diet in any way?

Neurological

- 11. Did you experience headaches?
- 12. Did you find any difficulty in movement or coordination?
- 13. Did you notice any lack of concentration?

Muscular- skeletal

- 14. Did you have any body or muscle pains?

Psychological

- 15. Did you or your family notice any changes in your day-to-day behaviour?

- 16. Did you feel under stress or depressed?
- 17. Did you find yourself more cautious and isolated from society?

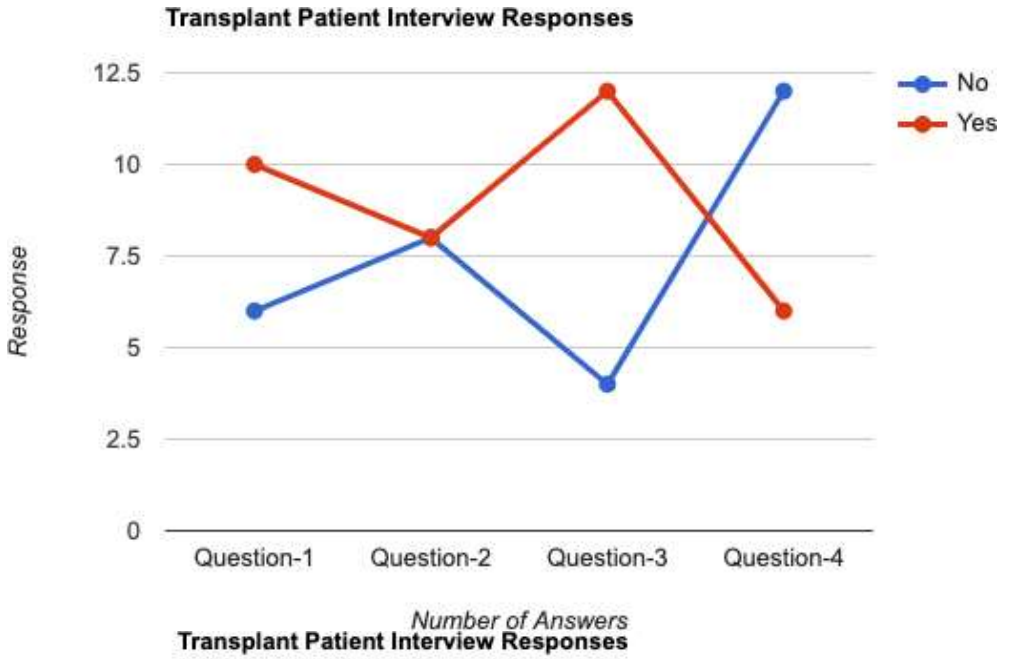
General - Only for the patients who contracted COVID-19

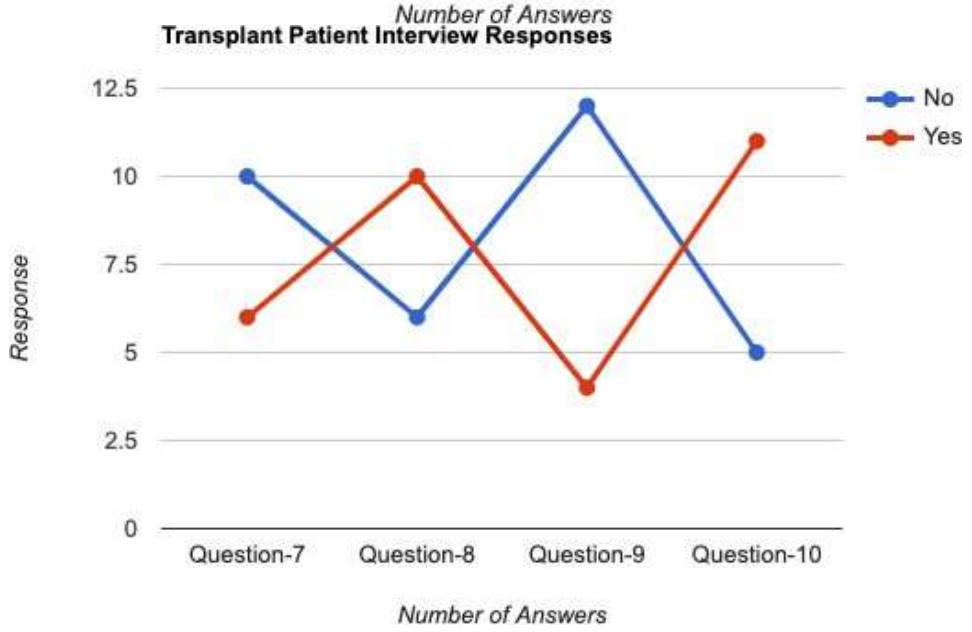
- 18. Were you vaccinated or not?
- 19. Did it take you more than the General 12-14 Day period to recover?
- 20. Have you any residual effects from COVID?

Appendix 2 - Transplant Details in India in 2018 and 2020

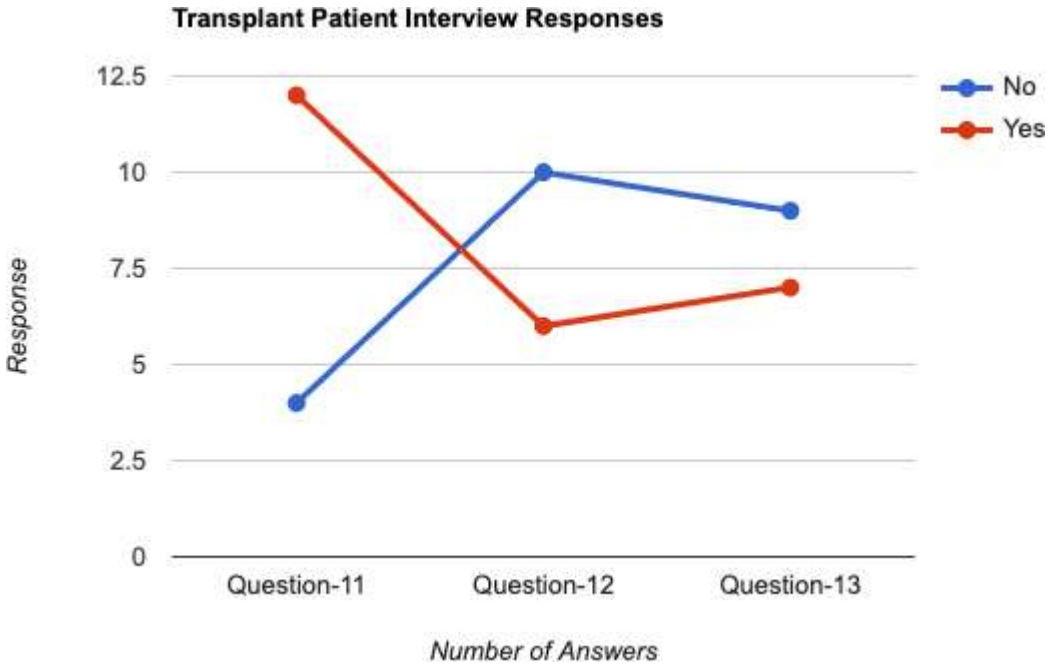
Data presented in absolute number and rate per million inhabitants (pmp) (-) Data Not Available or Not Applicable	India	South-East Asia	Global
ACTUAL DECEASED DONORS (DD)	875 (0.65)	1,136 (0.8)	39,521 (6.7)
ACTUAL DD AFTER BRAIN DEATH (DBD)	872 (0.64)	1,133 (0.8)	30,694 (5.2)
ACTUAL DD AFTER CIRCULATORY DEATH (DCD)	3 (0)	3(0)	8,708 (1.48)
TOTAL KIDNEY TRANSPLANTS	7,936 (5.86)	8,604 (6.05)	98,070 (16.62)
DECEASED KIDNEY TRANSPLANTS	1,164 (0.86)	1,845 (1.16)	61,978 (10.51)
LIVING KIDNEY TRANSPLANTS	6,772 (5)	6,959 (4.89)	35,840 (6.08)
TOTAL LIVER TRANSPLANTS	1,945 (1.44)	2,058 (1.45)	34,883 (5.91)
DECEASED LIVER TRANSPLANTS	631 (0.47)	713 (0.5)	27,438 (4.65)
LIVING LIVER TRANSPLANTS	1,313 (0.97)	1,344 (0.94)	6,500 (1.1)
HEART TRANSPLANTS	241 (0.18)	267 (0.19)	8,442 (1.43)
LUNG TRANSPLANTS	191 (0.14)	191 (0.13)	6,481 (1.1)
PANCREAS TRANSPLANTS	25 (0.02)	29 (0.02)	2,368 (0.4)
SMALL BOWEL TRANSPLANTS	2 (0)	2 (0)	163 (0.03)
TOTAL ORGAN TRANSPLANTS	10,340 (7.64)	11,151 (7.83)	150,407 (25.49)

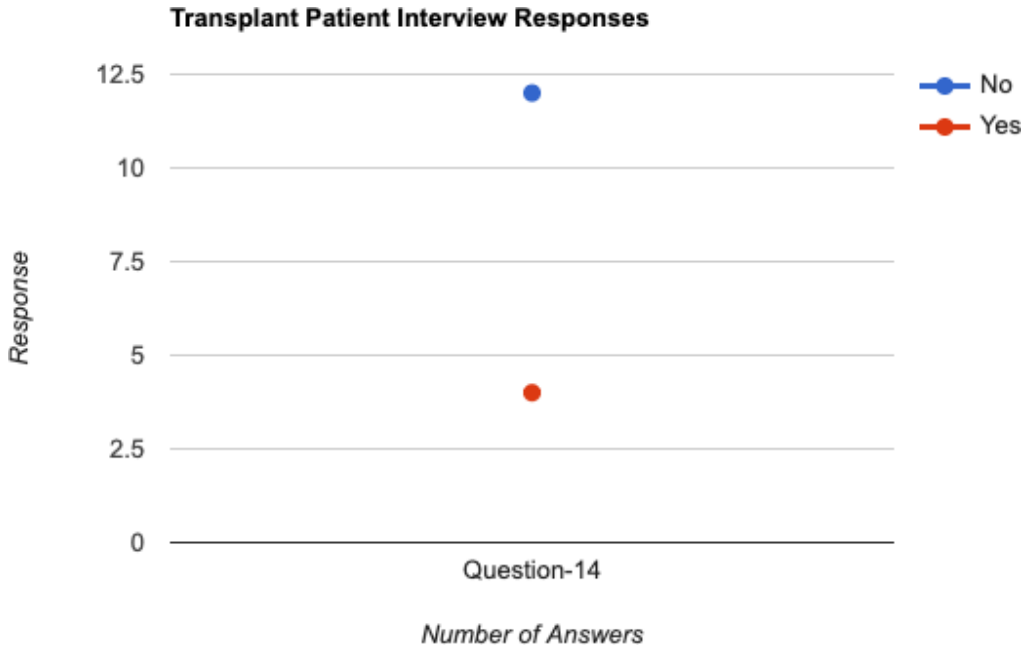
Data presented in absolute number and rate per million inhabitants (pmp) (-) Data Not Available or Not Applicable	India	South-East Asia	Global
ACTUAL DECEASED DONORS (DD)	351 (0.25)	764 (0.47)	36,100 (5.8)
ACTUAL DD AFTER BRAIN DEATH (DBD)	347 (0.25)	760 (0.46)	27,934 (4.49)
ACTUAL DD AFTER CIRCULATORY DEATH (DCD)	4 (0)	4(0)	8,166 (1.31)
TOTAL KIDNEY TRANSPLANTS	5,486 (3.98)	6,661 (4.07)	80,926 (13)
DECEASED KIDNEY TRANSPLANTS	516 (0.37)	1,192 (0.73)	55,258 (8.88)
LIVING KIDNEY TRANSPLANTS	4,970 (3.6)	5,469 (3.34)	25,668 (4.12)
TOTAL LIVER TRANSPLANTS	1,780 (1.29)	1,916 (1.17)	32,586 (5.24)
DECEASED LIVER TRANSPLANTS	291 (0.21)	396 (0.24)	25,285 (4.06)
LIVING LIVER TRANSPLANTS	1,487 (1.08)	1,518 (0.93)	6,663 (1.07)
HEART TRANSPLANTS	89 (0.06)	122 (0.07)	8,101 (1.3)
LUNG TRANSPLANTS	67 (0.05)	68 (0.04)	5,940 (0.95)
PANCREAS TRANSPLANTS	14 (0.01)	15 (0.01)	1,970 (0.32)
SMALL BOWEL TRANSPLANTS	7 (0.01)	7 (0)	158 (0.03)
TOTAL ORGAN TRANSPLANTS	7,443 (5.39)	8,789 (5.37)	129,681 (20.84)

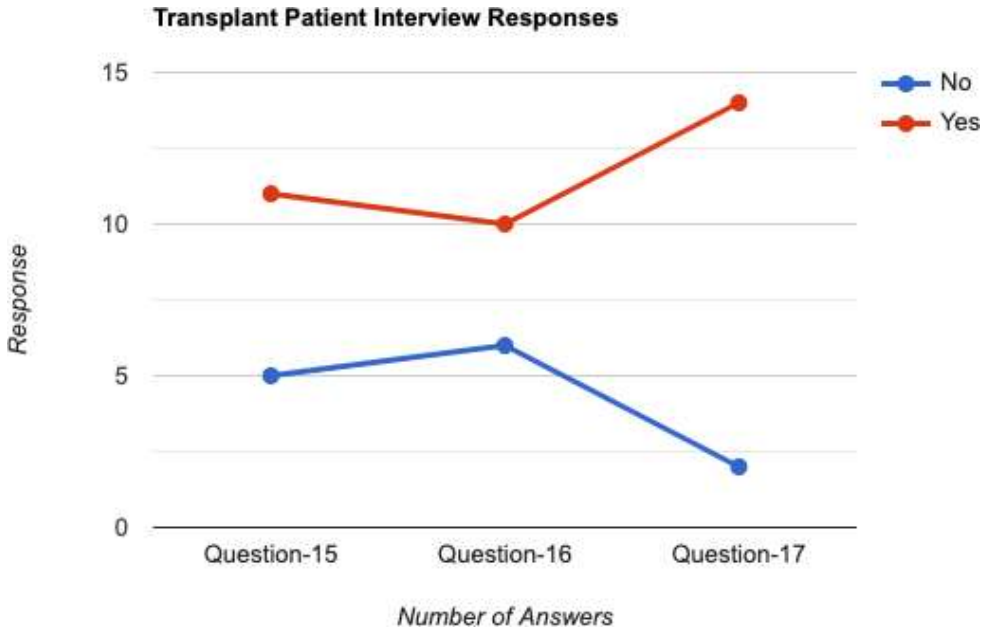


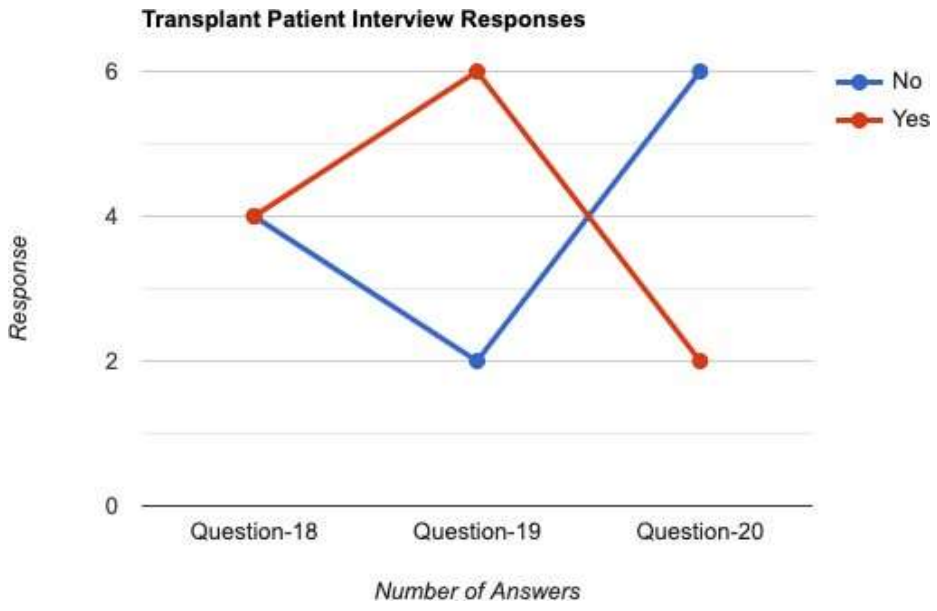


Appendix 3 - Data from Interviews









REFERENCES

1. COVID-19: Issues related to solid organ transplantation

Authors: Ajit P Limaye, MD, FACP, FIDSAKaren Hardinger, PharmD, BCPS**Section Editors:** Daniel C Brennan, MD, FACPEmily A Blumberg, MD **Deputy Editors:** Albert Q Lam, MDSheila Bond, MD

2. Medline ® Abstract for Reference 2 of 'COVID-19: Issues related to solidorgan transplantation

Koval CE, Poggio ED, Lin YC, et al. Early success transplanting kidneys from donors with new SARS-CoV-2 RNA positivity: A report of 10 cases. Am J Transplant 2021; 21:3743.

3. Medline ® Abstract for Reference 3 of 'COVID-19: Issues related to solidorgan transplantation

Neidlinger NA, Smith JA, D'Alessandro AM, et al. Organ recovery from deceased donors with prior COVID-19: A case series. Transpl Infect Dis 2021; 23:e13503.

4. Consensus Statement on Organ Donation from COVID

- Positive Deceased Donors
- Indian Society of Organ Transplantation, Liver Transplant Society of India and Indian Society for Heart and Lung Transplantation

Sonal Asthana1,2, Vivek Kute3, Unmil Shah4, Ravi Mohanka2,5, Manisha Sahay6, Chinnadurai R7, Swati Rajagopal8, Sujata Patwardhan9, Narayan Prasad10, Sandeep Guleria11, Shyam Bansal12, Arpita Roy Choudhary13, Deepak S Ray14,15, Sanjay Kolte16, Sanjeev Gulati17, Sandeep Seth18, Sanjay K. Agarwal19, Jai Prakash Ojha15,20, PP Varma21, Sunil Shroff22*

5. Clinical characteristics, management practices, and outcomes among lungtransplant patients with COVID-19

Manish R. Mohanka, MD,a Luke D. Mahan, MSN, APRN,a John Joerns, MD,a Adrian Lawrence, MD,a Srinivas Bollineni, MD,a Vaidehi Kaza, MD,a Ricardo M. La Hoz, MD,b Corey D. Kershaw, MD,a Lance
S. Terada, MD,a Fernando Torres, MD,a and Amit Banga, MD

6. COVID-19 and Solid Organ Transplantation: A Review Article

Yorg Azzi, MD,1 Rachel Bartash, MD,2 Joseph Scalea, MD,3 Pablo Loarte-Campos, MD,1 and Enver Akalin, MD, FAST, FASN1

7. The effects of COVID-19 on the world of Transplantation

https://www.uptodate.com/contents/covid-19-issues-related-to-solid-organ-transplantation?csi=f1d21a4e-06ce-4255-b453-944baffa1e22&source=contentShare

