Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Efficacy and safety of SARS-CoV-2 vaccines in living donor liver transplant recipients

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Severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2) pandemic has led to significant morbidity and mortality all over the world. As third wave of pandemic receding in India and elsewhere in world, risk of future outbreaks still remains. Widespread use of vaccines is the key component for pandemic control. Immunocompromised patients including solid organ recipients may have increased risk of SARS-CoV-2 infection as well as weakened response to vaccine. World health organization (WHO) approved vaccines excluded this group of patients in their preauthorization clinical trials [1,2]. Limited evidence shows that solid organ transplant recipients do not mount adequate immune response and neutralizing antibody titre levels post-vaccination remain very low in these patients [3]. Most of the SARS-CoV-2 vaccine studies recruited the patients who received mRNA vaccines [4]. There is scarcity of data regarding immunogenicity of viral vector and inactivated vaccines in liver transplant recipients especially from India. So, we conducted a prospective observational study to assess the immunogenicity of adenovirus vector and inactivated SARS-CoV-2 vaccine in liver transplant recipients .

This was a prospective observational study. All adult living donor liver transplant recipients of more than 18 year of age who hadm received organ transplantation at least 3 months prior to vaccination and were on stable dosages of maintenance Immunosuppression, were enrolled into the study. Aim of the study was to determine the safety and effectiveness of SARS-CoV-2 vaccines in liver transplant recipients currently available in India. Patients who were excluded from the study were those who had past history of SARS-CoV-2 infection, had undergone liver transplantation with-in last 3 months, patients on high dosages of steroids (≥2 mg/kg of body weight or ≥20 mg/day of prednisone for ≥14 consecutive days) and patients with acute or chronic graft rejection. Patients with active sepsis, pregnancy or history of allergic rection to vaccine or its components were also not included in the study. All the enrolled subjects took two dosages of one of the two currently available vaccines in India. These two vaccines were Covishield (AZD1222/ChAdOx1) manufactured by Serum Institute of India and Covaxin (BBV152) manufactured by Bharat Biotech, India. Covishield is a non-replicating adeno viral vector vaccine while Covaxin is an inactivated virus vaccine [1,2]. Two dosages of same vaccine were given at 4–12 weeks interval as per Indian health ministry guidelines. Any adverse reaction post-vaccination was recorded and managed as per protocols. Post-vaccination all the patients underwent serological testing for quantitative determination of immunoglobulin (Ig G) antibodies against S1 and S2 domain of the SARS-CoV-2 spike protein. We used LIAISON SARS-CoV-2 S1/S2 IgG test kit (DiaSorin, Italy) which is based on chemiluminescence immunoassay (CLIA) technology. Test was done 2 weeks after the administration of 2nd dose of vaccine. A level of <12AU/ml negative, 12–15 equivocal and ≥15 AU/ml was considered positive as per manufacturer recommendation.

Total 30 patients were enrolled into the study however, due to lack of complete data only 19 patients could be included in the final analysis. Out of 19 patients, thirteen patients (68.42%) had positive response to vaccination. Characteristics and comparison of the patients with and without positive response is given in table1. No participant in this study had history of previous COVID-19. However, prevaccination testing for SARS-CoV-2 infection was not done in our study. Total four patients had minor adverse events like local erythema, pain and mild fever after vaccination. No patient had serious adverse events in our study. All study patients had stable liver graft function.

In contrast to some initially published studies, more recent studies have shown better immune response to COVID-19 vaccines in this

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Table 1
Comparison of demographics and other parameters between study patients with positive (group A) and with negative or equivocal immune (group B) response to vaccine.

Parameters	Group A- Patients with Positive antibody titre (n = 13)	Group B- Patients with Negative or equivocal antibody titre (n = 6)	Total patients (n = 19)	P value
Age (Mean± SD), years	58.46 ± 7.67	53.33± 9.20	56.84 ± 8.29	0.268
Sex Male/Female	13/0	4/2	17/2	0.082
Duration since transplant -Median (IQR), years	3 (3–5)	4 (2–5)	3 (2.5–5)	0.607
Comorbidities Present n (%)	6(46.15%)	3(50%)	9 (47.4%)	1.00
Patients on 2 Immunosuppressive drugs (Tacrolimus + MMF)	4 (30.70%)	2(33.33%)	6(31.6%)	0.83
Type of vaccine given	Covisheild −11 (84.61%), Covaxin −2 (15.3%)	Covisheild 2(33.33%), Covaxin 4 (66.6%)	Covisheild 13 (68.4%), Covaxin 6 (31.6%)	0.046
T. Bilirubin Median (IQR), mg/dl	0.75 (0.3–0.9)	0.72 (0.6–0.9)	0.72(0.42–0.90)	0.808
AST, Median (IQR), IU/Lit	35.0 (24–39)	26.0 (25–61)	34.00 (24–43)	0.615
ALT, Median (IQR), IU/Lit	31.00 (26–35)	46.0 (30–78)	31.00 (26–51)	0.426
Alkaline phosphatase, Median (IQR), IU/Lit	79.0 (73–124)	85.8 (85–138)	85.8 (131–74)	0.766
Serum Albumin Median (IQR), gm/dl	4.40 (3.89–4.40)	4.20 (3.8–4.7)	4.02 (4.5–3.7)	0.738
COVID Antibody titre Median (IQR), AU/ml	134.0 (104.1–1140.0)	3.2 (2.4–9.5)	104.08 (11.01–275)	0.036
Mild adverse events n (%)	3(23.07%)	1(16.66%)	4(21.05%)	0.560

vulnerable group of patients. In a recently published study 73.9% liver transplant recipients were positive for anti-SARS-CoV-2 antibodies after second dose of vaccine. Although response was lower as compared to patients with liver cirrhosis and control group [5]. Previous studies in solid organ transplant recipients were mostly done with mRNA vaccines like Pfizer–BioNTech and Moderna vaccines. In our study Covishield and Covaxin vaccines were used which are adenovirus vector and inactivated vaccines respectively [1,2]. Although, given the lack of control arm and small number of study subjects we cannot conclude that type of vaccine affected the outcome.

In conclusion this study emphasizes that Both Covishield and Covaxin appears safe in liver transplant recipients and produce antibody response in about 2/3rd patients. Vaccination programs should continue to adopt newer strategies especially for the vulnerable groups like immunocompromised patients. Provision for one or more booster doses may further improve immune response rate in liver transplant recipients.

Conflicts of Interest

All authors declare no conflicts of interest.

Author contribution

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Disclosure

None of the authors have any financial, professional or personal conflicts that are relevant to the manuscript.

Informed consent was taken from study participants for this study. Study was approved by ethical committee of institution.

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