SHORT COMMUNICATION

Covid-19 vaccine efficacy in immune compromised people

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ABSTRACT

SARS-CoV-2 transmission has resulted in the continuing global covid-19 epidemic. By November 2021, more than 250 million people had been diagnosed with covid-19, and more than four million people had died around the world. Covid-19's morbidity and mortality, as well as its comorbidities and wide-scale economic impact, have motivated vaccine research at an unprecedented rate. New technology mRNA vaccines like BNT162b2 (Pfizer-BioNTech) and mRNA-1273 (Moderna), non-replicating viral vector vaccines like Janssen's Ad26.COV2.S (Johnson & Johnson), and traditional inactivated whole virus vaccinations like CoronaVac have all been licensed for use thus far (Sinovac Biotech).

Key Words: *Covid-19; Vaccine; Immune Compromised*

INTRODUCTION

The efficacy and safety of these vaccinations have been tested in trials and continuing investigations. High vaccine efficacy against symptomatic laboratory confirmed SARS-CoV-2 infection has been reported, with more than 50% efficacy after the first dose of BNT162bz and 90% efficacy after the second dose, compared to 70% efficacy after the second dose of Oxford-viral AstraZeneca's vector vaccine, AZD1222 (ChAdOx1 nCoV-19) [1]. Regardless of the vaccine class or previous illness status, high sero conversion rates were observed. Immune-compromised groups, such as cancer patients, organ transplant recipients, and individuals with hematological illnesses, have been excluded from vaccine trials, leaving a scarcity of data on vaccine efficacy and safety in these groups. These patients, who make up around 3% of the adult population, are of particular interest because of the possibility of immune system suppression or over-activation due to the main disease or concomitant therapy. Immune-compromised patients require immediate research, since infection and viral shedding have been observed to be more severe and chronic in this population [2]. 89 Active cancer patients are known to have a higher risk of severe covid-19 and death. To limit the likelihood of graft rejection, transplant recipients must be on long-term immunosuppression, which has been linked to an increased risk of severe covid-19 and poor results in previous trials. Those with autoimmune and inflammatory rheumatic disorders who require immunosuppressive medication have poorer outcomes from covid-19 than patients of similar age and sex who do not have such conditions [3]. People living with HIV are also more likely to be admitted to the hospital for severe covid-19 and to die while in the hospital

Other vaccines, such as influenza and pneumococcal vaccines have shown varying efficacy in immune compromised groups, depending on factors such as vaccine type, underlying disease, and concurrent medicines [4]. In a meta-analysis evaluating the immunogenicity of influenza vaccine in organ transplant recipients, transplantation within six months, receiving antimetabolites, and lung transplantation were all found to be risk factors for decreased sero conversion. Other studies have found that individuals with cancer, organ transplant recipients, and those on other anti-CD20 immunosuppressive medicines, such as rituximab in those with rheumatic illnesses [5], have a lower antibody response after getting the influenza vaccination. Patients with active solid organ cancers; patients with active hematological cancers; organ transplant recipients; patients with active immune mediated inflammatory disorders save asthma or receiving immunosuppressive or immune modulatory drugs; people with HIV/AIDS; studies that included [6].

DISCUSSION

Primary and secondary outcomes, study design, sample size, dropout and non-response rates, and inclusion and exclusion criteria were among the study's characteristics. Age, sex, disease and treatment history, including immunosuppressive regimen [7], were all included in the participant data. Vaccine type and brand, dosage schedule, number of individuals getting each type and brand of vaccine, and median or mean interval between doses were all included in the intervention data. Assay type, antibody tested, method of measurement, sample collection intervals, and number of measurements were among the outcome-related variables [8]. For non-randomized included studies, the Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool was used to rate risk of bias. This technique evaluates seven domains: confounding risk, participant selection, and intervention classification, deviations from intended interventions, missing data, outcome measurement, and reported results selection [9]. These domains were rated by two reviewers (ARYBL and SYW) as having a low, moderate, serious, or critical risk of bias, or no information. A third reviewer's independent judgment was used to resolve all disagreements. If all of the areas were deemed to be low risk, a study would be considered to have a low overall risk of bias. If one domain was found to have a high risk of bias, the study would be considered to have a high risk of bias.

Sero conversion following the first and second doses of the covid-19 vaccine was the major outcomes of interest. We looked for direct evidence of vaccine protection, such as asymptomatic and symptomatic covid-19 infection, need for oxygen supplementation, and hospital or intensive care unit stay in both immune compromised patients and immune competent controls, because the brand and type of assay, type of immunoglobulin [10], and definition of sero conversion varied across studies. For these outcomes, no studies satisfied our inclusion criteria. After a first and second dose of covid-19 vaccinations, secondary outcomes of interest included mean or median serological titers and cumulative incidence of sero conversion. When compared to immune competent controls, immune compromised groups of organ transplant recipients, patients with solid malignancies, hematological cancers, and immunological mediated inflammatory illnesses had lower sero conversion after the first and second doses of covid-19 vaccination. Organ transplant recipients (risk ratio 0.06), patients with hematological tumors (0.40), immunological mediated inflammatory disorders (0.53), and solid cancers (risk ratio 0.06) had lower pooled risk ratios for seroconversion following the first vaccine dose than immune competent controls (0.55) [11]. After the second dose, the antibody response improved dramatically. After the second dose, the pooled risk ratios for organ transplant recipients climbed to 0.39, 0.63 for patients with hematological cancers, 0.75 for patients with immune-mediated inflammatory disorders, and 0.90 for patients with solid tumors. Despite the fact that the quantity of studies despite the fact that data on sero conversion after the first dosage among HIV-positive persons was insufficient for a meta-analysis, the immunological response to covid-19 vaccinations was found to be sustained after the second dose (risk ratio 1.00). After both vaccine doses, organ transplant recipients had low sero conversion rates.

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The importance of the second dose of covid-19 vaccinations, as well as subsequent third vaccine (booster) doses, is shown by our findings [13]. Both for covid-19 and for pre-existing vaccines like the inactivated polio vaccine, the benefits of further doses and boosters of vaccines are well known. Similarly, a second dose of covid-19 vaccination is critical, especially for immune compromised patients. A second dose of vaccine was linked to significantly higher sero conversion and antibody titer levels in all of the studies evaluated. In organ transplant recipients and patients with hematological malignancies, a second dose was linked to increased immunogenicity and protection. After both the first and second doses of covid-19 vaccinations, our meta-analyses show significant immunogenicity variability amongst distinct immune compromised groups. After the second dose, organ transplant recipients' responses were notably different. This could be due to changes in immunosuppressive regimens in transplant populations following the publication of data on poor responses to the first vaccine dose, or the release of a multi-society joint statement advocating vaccination for all organ transplant recipients in the middle of several of the studies. Vaccination schedules may need to be adjusted based on the reason and severity of immune compromise [14].

The covid-19 mRNA vaccines are a product type of vaccination. It's difficult to compare the covid-19 mRNA vaccines' sero conversion rates to those of more traditional, widely used vaccines. In a subgroup comparison of mRNA and conventional vaccinations in patients with immune-mediated inflammatory diseases, we found no significant differences. In non-immune compromised patients, mRNA vaccines were compared to conventional vaccines, which summarized the safety and efficacy of the three primary vaccine platforms (mRNA, non-replicating viral vector, and inactivated) reported in phase III trials. When the total number of patients with confirmed covid-19 in each (vaccinated v control) group was examined, mRNA vaccines appeared to be the most efficacious after two doses (risk ratio 0.05, 95 percent confidence interval 0.02 to 0.13) compared to non-replicating vaccines [15].

There are a few issues in this study. To begin with, the research presented is all observational. Comorbidities and age, which may influence the immunological response to the vaccine, may not be accounted for in the immune compromised group and the immune competent control group. To solve this problem, we conducted subgroup analyses, which revealed no significant effect modification between studies with varied median ages of participants. Second, the term "immune compromised" was defined differently in different research [16]. As a result, we defined immune compromised in advance and ran subgroup analyses to see if there was a difference in sero conversion rates across groups of immune compromised patients. Organ transplant recipients, HIV patients, and patients with solid malignancies, hematological cancers, and immune mediated inflammatory illnesses all exhibited significant differences in these analyses.

Although the sero conversion rate indicates an immunological response to a vaccination, it is simply a proxy for the vaccine's impact on covid-19 infection frequencies and severity [17]. Clinical effectiveness endpoints such as covid-19 infection rates in vaccinated immune compromised populations are currently missing. Finally, the definition of sero conversion and the type of immunoassay employed in the research were not similar. To address this constraint, we conducted subgroup analyses to see if effect modification existed between studies that employed different brands of immunoassays. The results were contradictory. Sero conversion rates after covid-19 vaccination may also be influenced by vaccine type. However, because the majority of the investigations in this review used mRNA vaccines, evaluations of probable differences were limited [18].

CONCLUSION

We found that sero conversion rates and antibody titers after covid-19 vaccinations are considerably lower in immune compromised patients compared to immune competent people in this meta-analysis. Organ transplant recipients had the lowest rates of sero conversion among the major types of immune compromised patients, whereas patients with solid tumors had the highest. Immune compromised individuals, in particular, acquire lower antibody titers after sero conversion than immune competent controls, raising concerns regarding sero protection's effectiveness. Additional methods, such as adding a third vaccination dose to the standard two-dose mRNA covid-19 vaccine regimen, might be necessary to increase sero protection for these patients.

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